SUSTAINING DAIRY

Georgina Villarreal Herrera

Propositions

1. While dairy in Europe has undergone many changes in the last few years, we have yet to see a fundamental shift from post-war policy logic.
(this thesis)

2. Social and environmentally relevant dairy-related challenges are only addressed by dairy processors when an effective link to profit can be established.
(this thesis)

3. The power of sustainability as a concept resides not in the definition but in the capacity to inspire a reflection about the directionality, distribution, and diversity of change. (Inspired by The New Sussex Manifesto)

4. Life-cycle analyses should either include the social and ethical impacts of production systems, or change their name to environmental impact analyses.

5. Effective climate governance acts across policy levels as it connects the global need to survive and flourish with the operational specificities of localities.

6. When we task businesses with the wellbeing of society, human rights will be delivered through products and services available only to paying consumers as opposed to goods accessible to all citizens.

7. With all its flaws, the pursuit of scientific understanding forces a crucial dialogue about what the world is, how it works, and what it could be.

Propositions belonging to the thesis, entitled

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SUSTAINING DAIRY

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SUSTAINING DAIRY

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Nothing in life is to be feared, it is only to be
understood. Now is the time to understand more,
so that we may fear less.

Marie Curie

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Acronyms

AHDB	Agriculture and Horticulture Development Board
BRC	British Retail Consortium
CAP	Common Agricultural Policy
CBL	Centraal Bureau Levensmiddelenhandel (Dutch Food Retail Association)
CBS	Centraal Bureau voor de Statistiek (Central Statistics Office)
CD	Caring Dairy
CHAWG	Cattle Health and Welfare Group
CIWF	Compassion in World Farming
CMO	Common Organization of the Markets
CSO	Central Statistics Office
DAFM	Department of Agriculture, Food, and the Marine
DEFRA	Department for Environment, Food and Rural Affairs
DSCF	Dairy Supply Chain Forum
DZK	Duurzame Zuivelketen (Sustainable Dairy Chain)
EEC	European Economic Community
EPA	Environmental Protection Agency
ESS	Environmental Stewardship Scheme
EU	European Union
FAI	Food Animal Initiative
FAO	Food and Agriculture Organization of the United Nations
FAWC	Farm Animal Welfare Committee
FC	FrieslandCampina
FTSE	Financial Times Stock Exchange
GHG	Greenhouse Gas
GIIL	Glanbia Ingredients Ireland
GlobalGAP	Global Good Agricultural Practice
GMO	Genetically Modified Organism
GVA	Gross Value Added
IFA	Irish Farmers' Association
IFCN	International Farm Comparison Network
IFS	International Food Standard
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
KKM	Keten Kwaliteit Melk (Quality Milk Chain)
LEI	Landbouw Economisch Instituut (Agricultural Economics Research Institute)
LTO	Land- en Tuinbouworganisatie (Dutch Farmers' Organization)

MINAS	Mineral Accounting System
MLP	Multi-level perspective
MMB	Milk Marketing Board
MMBEW	Milk Marketing Board of England and Wales
MRSA	Methicillin-Resistant Staphylococcus Aureus
NAVS	National Anti-Vivisection Society
NDFAS	National Dairy Farm Assurance Scheme
NFU	Nationals Farmers' Union
NGO	Non Governmental Organization
NMV	Nederlandse Melkveehouders Valkbond (Dutch dairy farmers' organization)
NVZ	Nitrate Vulnerable Zones
NZO	Nederlandse Zuivel Organisatie (Dutch Dairy Organization)
OG	Origin Green
OPP	Obligatory Passage Points
PLC	Private Limited Company
RSPCA	Royal Society for the Prevention of Cruelty to Animals
RTRS	Round Table on Responsible Soy
SDAS	Sustainable Dairy Assurance Scheme
SDC	Sustainable Development Commission
SEA	Strategic Environmental Assessment
SNM	Strategic Niche Management
SQF	Safe Quality Food
TCG	Tesco Cheese Group
TM	Transition Management
TSDG	Tesco Sustainable Dairy Group
UDV	Uitvoeringsagenda Duurzame Veehouderij (Implementation Agenda for Sustainable Livestock)
UNESCO	United Nations Educational, Scientific and Cultural Organization
WAP	World Animal Protection
WHO	World Health Organization

Introduction

1

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Dairy production: past and future

Dairying is tightly interlinked with our history as a species. The agricultural revolution (or Neolithic revolution) is to this day a fundamental twist in human history, a gradual yet powerful game changer that transformed hunter-gatherers into sedentary communities of animal and plant domesticators (Arjamaa & Vuorisalo, 2010). This co-evolution is visible in the landscape and ingrained in culture; it is even visible in our genes.[1] Dairying also has a present, one that negotiates its unfolding between the past and the future ahead. In this thesis I share the results of my exploration into the current changes taking place in European dairy. The aim is to increase the understanding of these changes and discuss their implications in terms of the sustained social and environmental viability of dairy.

The Greek philosopher Heraclitus argued that the only thing that is constant is change (Graham, 2015). In the last years in particular this has rang very true for those involved in European dairying. After thirty years of having a milk production quota for EU Member States, the scheme was abolished in March 2015 (European Commission, 2015d). The intensification of European dairy farming—a trend originated in post-war days—continues, both regarding yield per cow and number of cows per farm (Alvarez et al., 2008; Oenema, 2007). Following a string of food safety and animal welfare scandals, concerns related to how food is grown and processed are palpable to the public (Bánáti, 2014; Bureau Européen des Unions de Consommateurs, 2014; Scott-Thomas, 2013). Additionally, evidence about the environmental impacts of intensive livestock farming continues to increase (Gerber et al., 2013; Steinfeld et al., 2006). Questions about the social and environmental sustainability of dairy come to the fore and regain relevance as dairy export opportunities are revealed: While European dairy markets are expected to remain stable, market analyses forecast a continuous increase in dairy demand, mainly in Asian markets (Astley, 2013; European Commission, 2015b). In the midst of all these developments, we observe the introduction of sustainability programs by European dairy processors. These are internal codes or policies based on a triple bottom line logic (i.e., people-planet-profit) designed to reduce the negative impacts of dairy farming by modifying their actions and the actions of farmer suppliers and

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[1] The workings of this interaction is a classical example of gene-culture co-evolution. The ability to digest milk as adults is linked to the presence of the lactase enzyme. Lactase persistence increased significantly in the last 10,000 years in Europe, which coincides with the domestication of dairying animals and milk use. To be more precise, it is the T allele situated 13,910 bp upstream from the actual lactase gene in Europeans that actually rose rapidly in Europe. This increase in frequency happened as the agriculturalist lifestyles emerged and milkable domestic species from Anatolia were introduced. Similarly, dairying was most suited for lactase persistent populations, that is, populations who were able to drink fresh milk in addition to consuming dairy in its lactose-low forms such as cheese and yogurt and benefit from its nutritional value (Leonardi et al., 2012).

other actors in the supply chain. Given this context, the question that emerges is: How is the European dairy regime actually changing? By regime, I refer to the established practices, formal and informal rules, and cognitive frames that guide the modus operandi in dairy. This question is explored through the analysis of three dairy processors and the dairy sector in which they operate. These cases are each located in a different European country. In this section I will explain in more detail why unpacking this question is relevant, how this question was approached through research, and finally I will offer a glimpse of the contents of this book and a roadmap to guide you through it.

Post-war development of dairy in Europe

Intensification of dairy farming

In the last decades, animal farming has shown a global tendency toward intensification; this trend has also permeated the dairy sector. The intensification of dairy production generally refers to one or all of the following changes: An increase in the number of cattle per unit area, the use of genetically improved dairy cattle, and the boost in milk yield through the increased use of feed concentrates in the diet (Alvarez et al., 2008). The structural changes in the European dairy sector have been significant, but what is the background to this trend of intensification? In the aftermath of the Second World War, food supply and self-sufficiency became a serious concern for all European governments. Dairy production in particular had been sacrificed in most European countries during the war. As trade of staple grains decreased, especially towards the end of that period, the choice between feeding animals or humans favored the latter (Brassley, 2012). The decision to support the expansion and modernization of agricultural production was operationalized through national agricultural policy, which then was further institutionalized at a supranational level through the Treaty of Rome (1957) and the Common Agricultural Policy (CAP) (1962) (Breeman, 2006). The CAP aimed to guarantee sufficient and affordable food for consumers and fair prices for farmers (Boulanger & Philippidis, 2015; European Commission, 2012a). Measures adopted to protect the common EU market and stimulate production—such as income support, price support, import tariffs and export subsidies—were established to counter the impact of changes in food prices and availability for both farmers and consumers. Two decades later, European agricultural production, including dairy, had increased significantly. The increase was sharp and farmers were producing above market demand. Government intervention guaranteed fair prices for the farmers, which in turn led to the EU having to buy the surplus at an intervention price. Surpluses were considerable, so much so that they came to be known as 'butter mountains' and 'milk lakes.' Despite the fact that the surplus would later be sold by the EU at below market price to global markets, the cost of the CAP quickly became problematic (Dammers & Keiner, 2006).

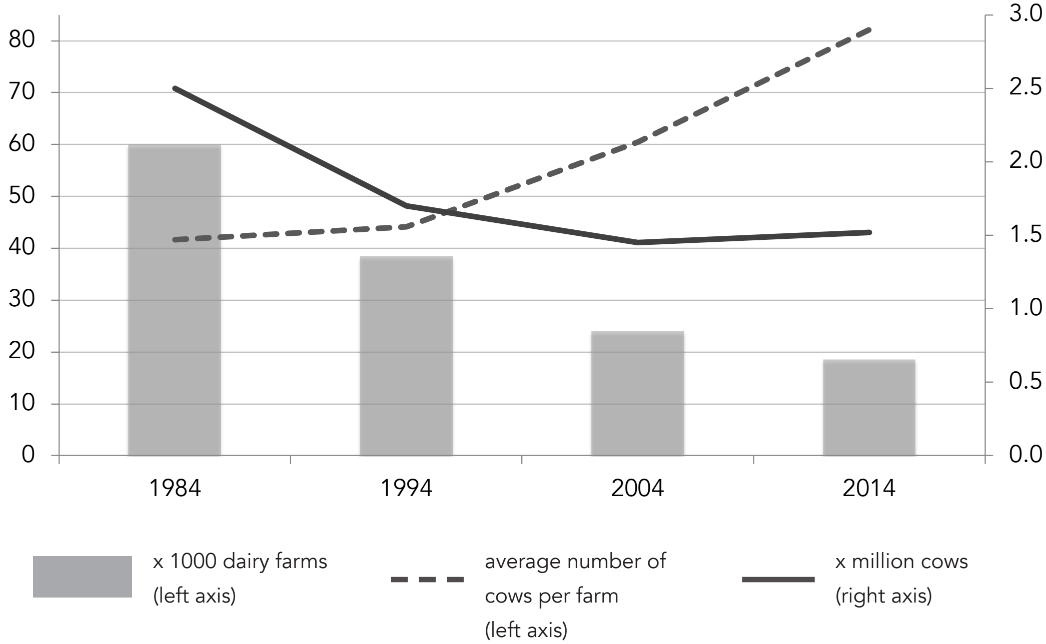
As a reaction to the structural overproduction of dairy of the late 1970s and early 1980s, milk quotas were introduced in 1984. Through this system, fixed production quotas were established for EU members; they took the then current production values as a basis and agreed on an initial period of five years. The quota scheme also included a levy to be paid in case production exceeded the established limit (European Commission, 2015d). The increasing labor costs, as well as the prevailing expectation and aim to modernize agriculture inter alia, shifted the attention of dairy farmers to maximizing production at the lowest possible cost per unit. Increasing the scale of production became, and continues to be, one of the main strategies that farms employ to impact competitiveness and reduce the costs of production per milk unit (Huettel & Jongeneel, 2011; Van Arendonk & Liinamo, 2003). A key example of this development is the Dutch dairy sector. Figures 1.1 to 1.3 show how in the period from 1984 to 2014—when production was capped by the milk quotas—dairy intensified significantly.

For the majority of EU production this intensification race also resulted in the use of high input/high output systems (Van Arendonk & Liinamo, 2003). The cost structure of these systems is such that feeding can constitute up to 50% of the total production costs (as the feed is imported as opposed to grown on the farm) (Beldman et al., 2010). Such cost structures create a vulnerable position for family farms, which regardless of the intensification are still the dominant dairy operation type in Western Europe (Beldman et al., 2014). They are particularly susceptible to price fluctuations. Milk price volatility has proved very challenging to dairy farmers since 2007; it impacts cash flow estimations and complicates financial planning. Although analyses show that biofuels had less influence in the high food prices of 2007–2008 than originally hypothesized (Gilbert, 2010), the price of feed is indeed influenced by biofuel demand in the case of dairy, which means the milk price can often be too low to cover production costs (Beldman et al., 2010). Intensive dairy systems are not only prone to being vulnerable as operation costs are increasingly affected by other commodities and milk price fluctuates, but they also provoke changes in the connected landscape services (Van Arendonk & Liinamo, 2003).

Market concentration

Similar to the intensification of farming, a significant concentration of market actors has been observed in the dairy processing sector. Gardebroek and colleagues (2010) borrow from Tozanli (1997) to describe the current structure of dairy processing as "oligopolistic market with fringes" (p. 285). They explain that the dairy sector consists of a small number of large dominating processing organizations and a large number of small enterprises oriented to niche markets. The concentration of processing actors has come through mergers, acquisitions, and other alliances; as a result, large organizations now have a significant share of the market. This trend, however, is mostly seen in the North of Europe (except for Germany) and less so in South or Eastern Europe. If we look at table 1.1 we see the three-firm ratio for dairy

Figure 1.1 Number of dairy farms and cows in the Netherlands



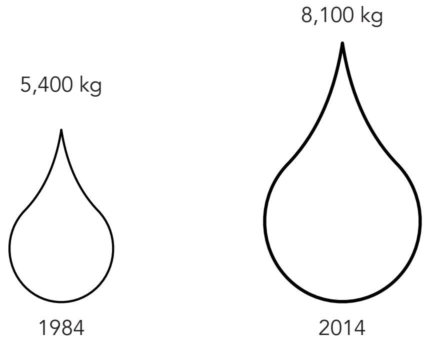
(CBS, 2015a. Amended by author)

processing in some northern European countries; these ratios show the percentage of milk that is delivered for processing to the top three dairy processors.[2]

This is the main reason why in this study I look at dairy processors; given their scale and influence, their programs can potentially have an impact that goes beyond their operations. Frequently they influence the standards and expectations at a sector-wide level.

As part of the context in which all of this unfolds, post-Second World War market concentration in food retailing has been

Figure 1.2 Increase in average annual milk yield per cow

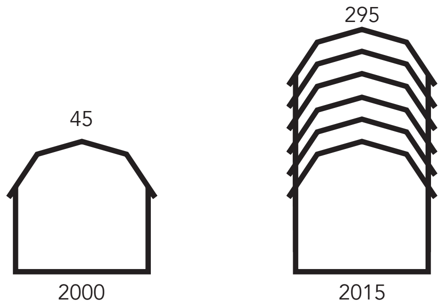


(CBS, 2015c; ZuivelNL, 2014. Figure by author)

[2] Shares were calculated based on the information reported on 'share on national milk delivery' on IFCN's Dairy Report 2012. This edition of the report included a breakdown of the share per dairy processor, a feature that is not included in every edition. Finally, the pertinent calculations were made to reflect the recent merges of dairy processing organizations in the UK. Further detail is included in the case study chapters.

unprecedented. Concentration at the national level has increased steadily; additionally the development of the common European market furthered the scaling up of operations. In the last few decades, European food retailers have increasingly ventured outside the region into international markets, which has consolidated their market position and turned them into the largest firms within Europe (Dawson, 2006). Additionally, buyer groups or buying desks emerged as a figure to consolidate procurement practices, this together with multi-retailer alliances adds to the already highly concentrated demand in food markets (Dobson et al., 2003). This concentration creates a situation where market competition is skewed. Dominant firms, whether processors or retailers, possess strong bargaining power, standard setting capabilities, and procurement practices that favor similarly large and corporatized organizations (Knežević et al., 2014).

Figure 1.3 Number of dairy farms in the Netherlands with 250 or more cows



(CBS, 2015a. Figure by author)

Table 1.1 Three-firm ratio in dairy processing

Country	Three-firm ratio
Ireland	70%
United Kingdom	80%
The Netherlands	90%
Sweden	90%
Denmark	90%

(IFCN, 2012. Updated by author)

Agricultural and food policy

Regarding food policy, national regulatory frameworks are usually complemented or underpinned by EU-level policies. These policies outline standards for dairy farming, as well as processing and marketing activities for dairy products. In the last decades the main development in the food policy realm is the retraction of the government concerning market and price policy and the emerging focus on environmental, food safety, and animal welfare issues (Baylis et al., 2008; Boulanger & Philippidis, 2015; Garrod, 2009). If we look at environmental supranational regulation, a key policy related to dairy farming is the Nitrates Directive. Concerns about the increase in farm animals and the acidification of soils and waters during the 1970s and 1980s (Starmans & van der Hoek, 2007) led to the introduction of the Nitrates Directive in 1991. This directive then translated into regional and national policies targeting efficient use and management of nutrients. It was among the first to address pollution and improvement of water quality at a supranational level imposing limits to animal manure use (European Commission, 2010). Another important policy development is the incorporation of environmental considerations into the CAP; these environmental objectives have been addressed in two ways, by conditioning direct payments to the compliance of environmental standards and practices by farmers (cross-compliance) and by remunerating farmers who employ agri-environmental measures (Matthews, 2013).

In relation to food safety, dairy production is subject to legislation through the EU food hygiene package (European Commission, 2015e). Other key developments in EU food safety regulation include the establishment of the European Food Safety Authority in 2002, the introduction of risk assessment protocols and norms for relevant contaminants, as well as the harmonization of European norms (Bánáti, 2011,2014). Animal welfare concerns have also been increasingly integrated into EU regulation by means of Directive 98/58/EC, which lays down the minimum standards for farmed animals (Schmid & Kilchsperger, 2010).

Other directives focus on welfare criteria for specific categories of animals (e.g., pigs, laying hens, broilers, and calves) as well as themes such as transport and conditions of stunning and slaughter (Veissier et al., 2008). Although there is no specific legislation for cattle, the general rules on minimum standards for the protection of animals apply (European Commission, 2016c). Finally, there are marketing standards, which set basic quality requirements (i.e., fat and protein content) for foodstuffs that are intended for human consumption and aim to be marketed in the EU as milk or milk related products (European Commission, 2013a,2013b).

While the inclusion of environmental, food safety, and animal welfare related standards shows efforts are made to integrate broader concerns into European food related policy, experts argue that such policies and specially the latest CAP reform fall short if seen in the light of the pressing challenges faced by the agricultural sector such as biodiversity (Pe'er et al., 2014), animal welfare and antibiotic use (Stevenson, 2012; Westhoek et al., 2012), as well as higher environmental objectives (Matthews, 2013).

If we look at market and price policy, the last two decades have seen a withdrawal of governmental regulation in the dairy sector. The most significant development to discuss is the abolition of the milk quota scheme. What was initially planned to last five years ended up being a thirty-year milk production restriction. Instituted, as discussed earlier, to stop the structural overproduction of milk by EU Member States, the milk quota recently came to an end (on March 31st, 2015). The quota removal was not unexpected. In 2003, as part of the CAP mid-term review process it was decided to abolish the quotas by 2015. The key aim behind the move towards a deregulated dairy regime was to orient the dairy sector to be more market-driven—namely, to respond to market opportunities such as the emerging dairy demand in

Asian countries, and eliminate distortion in farmers' response to price signals (Astley, 2012). The decision to abolish quotas was later confirmed during the CAP Health Check that took place in 2008, where a gradual increase of quota levels (on the order of 1% per year) was decided to slowly erode their value (European Commission, 2016m). The measures intended a 'soft landing' of their removal and according to monitoring reports by the European Commission, actual milk production was under quota values for the last years of the scheme in almost all Member States while quota prices were close or equal to zero (European Commission, 2012b). Nevertheless, the removal of the quotas represents a significant change for dairying; many farmers of today, for example, have farmed either a significant part, or all of their working lives under the quota scheme. As McDonald and coauthors (2014) state, "Dairy quota abolition essentially represents an economic but also socio-cultural disruption for a sizeable cohort of farmers, requiring adaptation to more market-driven production strategies" (p.14).

In recognition of future market-related challenges for the dairy sector, some safety net measures have been put in place. The milk sector is part of the Common Organization of the Markets (CMO) in agricultural products and as such there are a number of policies related to market intervention, marketing and production rules, and trade with third countries that can be used should markets become seriously imbalanced (European Commission, 2016l). Along similar lines, the Milk Package, an amendment to the single CMO regulation, was adopted in 2012 and is currently being implemented. The aim of the Milk Package is to boost the position of dairy producers in the dairy supply chain and in addition support the sector in preparing for a more market-oriented future. The Milk Package gives the possibility to Member States to make written contracts between dairy producers and processors and for the former to collectively negotiate (up to a limit) contractual terms (European Commission, 2016j). These are measures that show a retraction of the government regarding market and price policy.

A final note on food regulation concerns the evolution of private sector initiatives over the last decades and their interaction with national and supranational public law. Coutrelis (2011) describes how private standards have gained increasing prominence in the regulation of food:

> *Worldwide initiatives from the private sector have turned the legal and regulatory environment for food businesses upside down. Litigation is no longer solely framed by legislative requirements, but ever more by private standards such as GlobalGAP, BRC, IFS, SQF and ISO. Private standards incorporate public law requirements, thus embedding them in contractual relations and exporting them beyond the jurisdiction of public legislators. [. . .] food businesses are inspected more often by private auditors than by public inspectors (Coutrelis, 2011, p. 21)*

Additionally, Litjens and colleagues (2011) argue that the economic weight or relevance that voluntary private standards can have for food businesses is significant. They discuss that "participation may be voluntary as understood in contract law theory, because parties bind themselves through a meeting of minds resulting in explicit agreement. [. . .] it is not voluntary in economic reality, because saying 'no' is not a viable option" (Litjens et al., 2011, p. 332). The effects of obtaining or not being granted certification could overshadow public law sanctions.

This short primer on EU food policy shows the complexity and layered nature of the food regulatory framework. Friedmann (2005) argues that the governance implications are important. She states that while complicated intergovernmental trade negotiations hinder the move beyond basic standards concerning public food law, privately delivered standards related to food safety and consumer trust go beyond public requirements. The consequence is that citizens have access to only the basic standards in food while consumers with a higher purchasing power get products that went through stricter quality assurance schemes. In line with Friedmann's analysis, one could argue that environmental or social concerns get filtered out by what standards can measure and certify as well as what is deemed to be market relevant.

In order to understand the different developments in European dairy, it is perhaps more relevant or productive to zoom in into dairying practices in different Member States and observe how these trends and policies take shape. For instance, the total EU milk production is estimated to be 159 million tons per year; in terms of distribution however, only six Members States provide 70% of the total volume (i.e., Germany, France, the United Kingdom, Poland, the Netherlands and Italy) (European Commission, 2015f). With regards to the trend of constant decline in the number of farmers; in the case of dairy in Europe in the last 30 years, the decrease has been on average 6% per year. Parallel to that, average herd sizes together with milk yield per cow have tended to increase. On the ground however, these trends take differentiated forms. Table 1.2 shows the differences in dairy herd size and milk yield between farms located in EU-15 [3] countries, EU-10 [4], as well as Bulgaria and Romania.

This illustrates the fact that each Member State has followed a differentiated development path and thus has certain structural features embedded in distinctive societal contexts.

[3] EU-15 refers to Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

[4] EU-10 refers to Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia and Slovakia.

Table 1.2 Differences in dairy farming across Europe

	Average herd size	Annual average milk yield (kg per cow)
EU-15	54	7,300
EU-10	19	5,700
Bulgaria & Romania	5	3,400

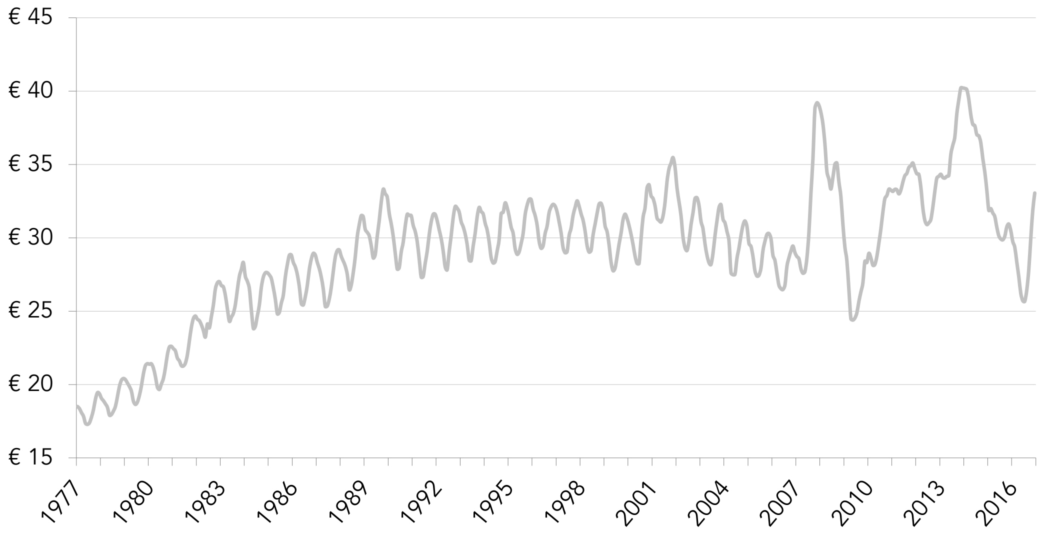
(European Commission, 2015d. Amended by author)

Changes ahead: production growth, environmental limits and societal concerns

South East Asia represents a "huge commercial opportunity" for dairy exporters; this was the key message of *Milk for the Tigers*, a report released in 2013 by Rabobank, a Netherlands-based financial service provider focusing on agriculture and food. Their study on the market potential of the ASEAN-6 (i.e., Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam) concluded that given a combination of factors, namely, population growth, rising incomes, changing diets (towards more animal proteins), and school milk programs, the market potential of the region is significant. Dairy consumption is expected to grow 2.4% annually through 2020 and local dairy actors are unable to cover the emerging dairy demand. Local producers face limitations concerning suitable land, climate, and access to credit. Additionally, the offer from producers in Europe and Oceania in terms of supply security, traceability, food safety records, and innovative product range is stronger than what the Asian dairy sector can currently offer. The study also looked into the structural challenges that the region posed for dairy exporters and provided an updated insight into the specifics of such market opportunity (Rabobank, 2013). The trends and prospects of increasing demand in Asia have been recognized for a while; the reason for removing the EU production quotas, a decision that was made official in 2003, was precisely to enable European dairy processors to fully benefit from the rising global consumer demand (European Commission, 2015d).

Certain concerns are attached to the prospects of growth and supplying international dairy demand. The sector faces a set of challenges that force a reflection about not only how to approach such opportunity but also about the current status and practices in domestic markets. These challenges stem from the background of the sector, as detailed in the previous section. Therefore they are neither new nor unannounced; rather they are unfolding changes related to farming intensification, market concentration, market liberalization, and an increasing understanding of the social and environmental impact of the sector. Although these challenges have somewhat differentiated effect on dairy processing across Europe (related to diverse farming and production practices, cost structures, and market concentration in each member state), increasing European dairy production is not a straightforward undertaking. Analyses about post-quota market conditions predict price fluctuations to continue (Jongeneel & Van Berkum, 2015; ZuivelNL, 2016). Milk price fluctuation is not an entirely new phenomenon for farmers; it is strongly connected to seasonality and milk availability. However, if we look at figure 1.4 which graphically shows the historical price of 100 kg of cow's raw milk in Euros since the late 1970s, one can observe that after 2006 the graph looks more like a polygraph detecting a lie than the index of a stable agricultural sector.

Figure 1.4 Weighted average EU price of cow's raw milk (per 100 kg)



(European Milk Market Observatory, 2016. Amended by author)

Price fluctuation is connected to a large set of variables. Land and agricultural inputs have alternative uses (e.g., feed production vs. biofuels). Decisions on how these agricultural inputs are used are shaped by context-specific market demands, as well as the power distribution of the supply chain constellation in which these are embedded. However, what can be said for the EU market in general is that during the last few years the price variation has reached critical points. The international milk price review for 2014 described that year as one with exceptionally high variation in milk prices, citing that the difference between the milk price at the start and the end of the year had never been so great (between January and December there was an average decrease of 25%). Even if the last couple of years have seen relatively high prices, fluctuation impacts financial stability for dairy farmers as it can be below production costs, it can also hinder investment planning. Finally, the report describes that the short term holds "few bright spots in prospect or none at all" (p.3), as price fluctuation will increase in the future and the prospects of increased milk production now that quotas are abolished will intensify the need for financial buffering by farmers to cope with market volatility (ZuivelNL, 2015a).

Sustainability debate

When thinking about expansion of dairy production in Europe, the prospect of milk price fluctuation is not the only variable to consider. There is an increasing debate about the impacts of dairy production on the environment, as well as animal welfare, food safety, and rural development. This debate has developed gradually and has gathered academic, policy, and societal attention recently, not only as a spillover of the general discussion about sustainable development and sustainable food or agriculture, but through targeted studies about the impacts of dairy systems.

Animal welfare and food safety

The Brambell report released in the UK in 1965 introduced a discussion about poor conditions in animal husbandry and the physical and mental suffering that it could cause farm animals. Veissier and colleagues (2008) argue that the report had influence well beyond the UK borders. The key points introduced by the Brambell report continued to resonate in the decades that followed. Food safety concerns also emerged as a consequence of several scandals. In the late 1980s an epidemic of bovine spongiform encephalopathy (also known as mad cow disease) affected over 185,000 cows in the UK (OIE, 2016). Other European countries were affected but on a smaller scale. The impact of this event is also derived from the death of almost 200 people to date due to the related human variant Creutzfeldt-Jakob disease (vCJD); this disease has a long incubation period and it surprised the world when the first death happened in 1995 (Brown et al., 2001; Meikle, 2012). A swine fever epidemic in 1997 put the Dutch pig industry through a critical 14-month period that lead to a full export ban. Over 400 farms were affected and the exponential transmission of the classical swine fever virus resulted in losses of almost ten million pigs (Stegeman et al., 1999; Termeer & Van der Peet, 2009). Moreover, the 2001 foot-and-mouth outbreak in the UK had devastating effects on the livestock sector. Around 6 million animals were killed across the UK, causing not only severe economic consequences for farmers and other actors connected to the sector (Keeling et al., 2001; National Audit Office, 2002) but also significant distress and lack of trust in authorities and systems of control among rural residents in the affected areas (Mort et al., 2005). The foot-and-mouth outbreak made its way to other European countries such as Ireland and France, but the Netherlands, where the epidemic caused the loss of approximately 260,000 animals, was the worst affected outside of the UK (Bouma et al., 2003).

Other food-related accidents involving E. coli, high levels of dioxin in milk—such as the ones detected in 2004 in a Dutch farm—as well as the rise in antimicrobial resistance due to the intensive use of antibiotics in animals, among other incidents have shaken consumers' confidence on the ability of the food system to deliver safe food (Bánáti, 2014; Noordhuizen & Metz, 2005; The Alliance to Save Our Antibiotics, 2015; WHO, 2014b). Finally, the 2013 horsemeat scandal revealed just how complex food chains have become as well as major issues related to traceability. Horsemeat is not unsafe to consume but it was deceitfully included (i.e., inadequately or completely undeclared) in what was meant to be a cow product causing a major fall in sales of frozen meat products in the UK and a significant loss of trust in all related food organizations (Bánáti, 2014; Czinkota et al., 2014).

Environmental impacts

The environmental debate that started in the 1970s and focused on the discussion of the impact of nitrates and ammonia began to broaden in 2006, when the Food and Agriculture Organization of the United Nations (FAO) released an in-depth assessment of the various impacts of the world's livestock sector. The report, entitled *Livestock's Long Shadow*, was intentionally termed as such to raise awareness around the significant contribution of animal husbandry to environmental climate change, air pollution, land, soil, and water degradation, as well as a reduction of biodiversity (Steinfeld et al., 2006). A following report, *Tackling Climate Change Through Livestock*, confirmed that the total greenhouse gas emissions from the livestock sector (estimated at 7.1 gigatonnes CO2-eq per annum for the 2005 reference period) made up 14.5% of all human-related emissions, of which cattle alone represent 65% (Gerber et al., 2013). Other studies examining greenhouse gas emissions and land use change, both in relation to climate change continued to emerge (Del Prado et al., 2011; Garnett, 2008; Sevenster & de Jong, 2008).

Concerning other impacts of dairy production, Alexander and colleagues (2015) conducted a study on the drivers for global agricultural land use change over a period of fifty years (1961–2011). The results showed that despite yield improvements, the increase in dairy and meat production has dominated global land use change. These commodities have larger land requirements than staple crops and the land use change attached to increased demand for dairy causes potential harm to ecosystems, for example through deforestation (Alexander et al., 2015). This signals that if agricultural expansion is let unaddressed, further land degradation is likely to occur (Jongeneel & Slangen, 2013).

Mega farms

Another debate that has gained increased attention, especially after the removal of the milk quotas, is that of mega farms. There are several aspects to this debate that are relevant to mention. First, what is referred to as mega farms varies across contexts. For example, in the US mega farms, which are also known as concentrated animal feeding operations, are rearing operations where 1000 or more cows are confined with no access to grass, vegetation or open areas to roam (US EPA, 2015). In public debates in New Zealand, Australia and the UK, farms with 700 to 1,000 cows are referred to as mega dairies (Dairy Australia, 2015; McColl, 2015; Piddock, 2014; Revoredo-Giha & Thompson, 2015). For countries with smaller average herd sizes (i.e., between 45 and 90 cows) such as France, Ireland, the Netherlands, and Germany, debates about mega farms usually focus on herd sizes between 250 to 500 cows or more (CIWF, 2013; Gies et al., 2007; Krauskopf, 2014; Sebald, 2015). Another key aspect of this debate is that despite the different herd sizes associated with mega farms across European countries, what is not differentiated is the societal discontent towards large-scale farming; the disapproval is clearly visible. In the last six years several requests for either expansion of current farms or for the development of 1,000 or more cow dairy projects have been submitted to local governments for approval. These requests have met stark societal opposition in France (Andre, 2015; Association Agir pour l'Environnement, 2015), the UK (Wasley, 2015a), Germany (Bossert, 2015; BUND, 2015), and the Netherlands (Gies et al., 2007; Redactie Foodlog, 2012). Why the opposition? Today, mega farms are the least common farm type in European dairy and it could be argued that firsthand experience of their impact is somewhat limited. However, these expressions of resistance are informed by the negative experiences of mega farms in other livestock sectors in Europe such as pig and poultry (Appleby, 2003; Bock & Van Huik, 2007; Soil Association, 2014; Van Asselt et al., 2015; Walters, 2014) as well as the record of mega dairy farms in the US (Burkholder et al., 2007; Donham et al., 2007; Gurian-Sherman, 2008; von Keyserlingk et al., 2013). Mega farms in the US are not uncommon: 60% of cattle are housed on this large-scale type of operations (NASS, 2013); the average herd size in mega farms is over 1,600 cows; and there are plenty of farms housing over 10,000 cows (Food & Water Watch, 2013), the largest example being a 36,000-cow operation located in Indiana (Carden, 2015). Having had a longer trajectory, images and documentation of American mega dairy farms inform the perceptions associated with large-scale farming in the European debate (Wasley, 2015b). Civil society organizations are thus concerned with the impact that mega farms have on the environment, animal welfare, the preservation of the landscape, and also the welfare of the farmers and farm labor (Anomaly, 2014; CIWF, 2015; Gies et al., 2015; Gies et al., 2007).

The mega farm debate encompasses several issues related to sustainability of dairying. Although some voices argue that mega farms do not necessarily have to compromise animal welfare and that the scale would actually allow for enough capital investment to secure additional technological controls of emissions and nutrient flows therefore minimizing environmental impact (Smeets, 2011), the debate has only effervesced amongst European societal groups as they witness the continuous trend towards larger herd sizes in dairy intersect with market opportunities and the removal of the milk quotas. For example the number of Dutch farms with 250 or more cows tripled between 2005 and 2015, going from 103 to 317 farms (Mons, 2013; NA, 2015a). In France the number of herds with at least sixty cows is growing steadily to the point where now half of the cow inventory is being raised in herds of 60 or more cows (Vergonjeanne, 2014). The same trend is seen in Germany where future predictions point to increasing number of farms with 300 cows or more (Lassen et al., 2015). A final illustration is the United Kingdom where the average herd size has almost doubled in the last two decades, going from 75 to 133 cows (AHDB Dairy, 2015a). Citizens are concerned that the prospects of supplying new export markets could serve as an additional incentive for further scaling up of dairy operations. Campaigns, petitions, and protests, one could argue, can be understood as proxy forms of the boundaries of the license to produce 'granted' by society.

When the sustainability of dairy is debated, some elements have and continue to be more frequently discussed than others. Until now the social dimension of dairy in Europe has received less attention compared to its environmental impact (e.g., Foster et al., 2007). However, there have been efforts to approach the sustainability of dairy in a more comprehensive way. A study on sustainability within Dutch dairy farming systems aimed to unpack the concept of sustainable dairy farming in operational terms. In the study, specific attributes related to farming activities and their impacts were discussed and ranked among experts and stakeholders from the sector. Attributes such as farmers' livelihoods (i.e., profitability and working conditions), food safety, animal health and welfare, landscape quality, water and soil heath, biodiversity, and indirect impacts on developing countries were found to be relevant for actors in the sector (Van Calker, 2005).[5] Additional studies about dairy discuss not only production or farming practices but also the impact of dairying from farm to fork (de Jong, 2013a). This can be taken as a sign of a widening of the debate around sustainable dairying as well as an attempt to move this more broad sustainability discussion from a discursive level to an operational one. The academic and societal debate at the European level has been incrementally evolving to not only cover key environmental linkages, but also to recognize the multidimensionality of sustainability, to include the relevant social dimensions of dairying. Perhaps a turning point is near as reports of the economic difficulties currently (at the time of writing) facing dairy farmers continue to gain media and societal attention.

To speak in more detail about the prioritization and agenda setting connected to the debate around dairying requires framing such description into a contextual reality. Different regions have specific geographies and sets of circumstances. What is discussed as global or supranational issues related to dairy translates not only into a context-specific sustainability discussion but also into differentiated responses as each setting entails a specific culture, agricultural expertise and potential, natural resources, and governance arrangements (Sutherland et al., 2015). However, there is something that emerges from mapping the different concerns and debates around dairy in Europe; we see the evolving discourse related to sustainability and future

[5] This particular study was then the basis of a sustainability program in the Dutch dairy sector (which will be reviewed in depth as one of the case studies in this project).

viability of dairy as well as the role of civil society as a key voice in demarcating the limits of the 'playing field.'

Dairy processors: influence and sustainability programs

In the midst of all these changes we can observe dairy processors developing sustainability policies and programs. These programs are based on a triple bottom line logic and aim to reduce the negative impacts associated with dairying. The choice of focusing on dairy processors was driven by the recognition of their influence on the dairy sector across and beyond the food chain. Before expanding on this, it should be clarified that the focus is on conventional dairy processors—companies whose operating principles do not rest on an explicit sustainability philosophy or set of values. As mentioned earlier, a handful of conventional dairy processors concentrate the majority of dairy output in most countries in Western Europe and in practice their policies have impact beyond their immediate connections in the supply chain. Their standards guide how milk is produced, how it is processed, what resources are employed and increasingly how all of this activity is reported to the public.

For the last 15 years, a growing number of food companies, including dairy processors, have started to produce reports on their environmental performance—usually heavily focused on energy and material efficiency. More recently food organizations have also started to report on indicators connected to their direct social and economic impact. Their commitments and goals towards sustainability are increasingly at the core of their business and communication strategies (de Jong, 2013b; Hartmann, 2011). This is an indication of engagement with societal concerns related to sustainability. However, despite the fact that year-on-year an increasing number of food companies report on their performance (Global Reporting Initiative, 2013), a recent analysis show that they are failing to engage and report on issues of transparency, labor conditions (including women and child labor), access and rights on land and water resources, greenhouse gas emissions (mostly indirect), climate adaptation and mitigation strategies, as well as biodiversity (Oxfam, 2016). It is argued that the much needed move to sustainable food systems can only happen if powerful actors take the lead, forcing the system to follow on a strategic reprioritizing transition (Clay, 2010; Lang, 2010). It is then crucial to better understand the actions of dairy processors and their relation to dairy regime changes.

Research aim and objectives

Dairy farming in Europe has developed into an important economic sector. It is now facing changes that open possibilities for expanding production, which until recently was capped. The sector has developed in such a way that most of the milk output goes through the hands of a small number of processors. These are key actors with strong influence on dairying related practices. Given the increased awareness about the impacts of dairying, questions about how the sector might evolve are more present than ever. Therefore, the aim of this study is to improve our understanding of changes in the dairy regime by providing an empirically driven and grounded reflection on the sustainability-related actions of dairy processors.

Motivation for the study

The motivation to carry out this study stems from the recognition that dairy is at a crossroads and at the time of writing it is safe to say that it enjoys a good reputation among civil society. That means that the general perception of dairying in Europe is acceptable. But given the removal of production quotas and the increasing demand for dairy, questions about the extent of this growth in production, and the implications of capturing a share of the global market need to be discussed. As Stirling (2014) argues, the challenge is *how* not *whether* we need to address sustainability concerns and transform our consumption and productions systems. Moreover, there are studies on dairying in Europe, however most focus on specific dairying practices such as farming and connections to environmental concerns. While these insights are valuable, this study responds to the wider societal and policy concerns about the future development of dairy. There are no empirical studies that investigate a range of sustainability challenges from a dairy processor perspective, which is a key outlook for a broader reflection on the governance and direction of the sector.

Before moving into how this objective was approached through research, it is important to make a note about the term *sustainability*. Thus far the terms *sustainable* and *sustainability* have appeared a couple of times to refer to a group of concerns related to the impact of the dairy sector on the environment and social systems. You might be asking, why frame this study around the concept of sustainability? One could discuss the impacts of dairy farming, related concerns, and implications vis-à-vis the future challenges for the sector without necessarily framing it under a sustainability umbrella. There are two points that are relevant to discuss here. First, this framing emerged from the early explorations of the topic via desktop research; when exploring if and so how dairy food processors were engaging with concerns related to their impact, all the top conventional European dairy processors articulated their engagement under the sustainability concept. Additionally, framing the challenges facing the dairy sector as sustainability challenges seemed productive not only to mirror the multidimensionality and complexity of the impacts that processors currently deal with but because it allows a discussion about the implications of these actors' (strategic) decisions.

As part of this study, I report on the perception and programs of conventional dairy processors regarding challenges for the sector, thus the term sustainability will be always pinned to the meaning and operationalization emerging on each specific case study. What I provide is a reflection on how the regime is changing as different trends unfold and future challenges emerge. For that I draw on the discussion by Leach and colleagues (2010) about sustainability. They argue that despite its narrow origins in ecology, the concept has come to serve as a boundary term between science and practice to discuss the linkages between the environment and socio-economic development. Even if some authors disregard the term due to the misappropriation and overuse on all sorts of 'sustainable' initiatives and commissions, which lack critical and serious commitment to sustainable development goals, in the last years the debate has refocused on how major issues such as water, land, climate, and biodiversity relate to the future viability of politically stable and healthy societies. This is where in a world of multiple and contested views about a desirable future, the sustainability agenda can serve the purpose of a platform for critical discussion and reflection on *what* is to be sustained and *how* (Leach et al., 2010).

Theoretical approach

The research objective required a theoretical approach that would allow me to discuss the changes and challenges faced by European dairy as well as the programs and perceptions of dairy food processors. Also, I needed a framing through which I could not only understand changes in the regime—that is, the established practices, rules, norms, and cognitive frames—but also discuss these changes in relation to sustainability challenges, with its respective emphasis on systems, and directionality of innovation (i.e., normativity). This brought me to explore different theoretical approaches and assess their relevance and usefulness for this study.

As part of this exploration, I reviewed the literature on social-ecological systems (SES), as well as business management, especially the work done around supply chains. SES frameworks have advanced the interdisciplinary study and modeling of coupled social-ecological systems. However, SES frameworks often conceptualize the social system in a level of aggregation that is not compatible with an in-depth exploration at the actor level, which is relevant in order to look at dairy processors. Also, the proxy for the social world can often rely heavily on rational decision making indicators (Binder et al., 2013). This study requires a more open approach; one where the social system can be mapped in recognition of its complexity and the larger context where it sits, but also a framework that allows an in-depth look at actors and their subjective views on the systems' development across time.

The literature on supply chain management was also explored in detail. The literature confirmed what I had perceived through my own experience. Having a business and marketing background, I had witnessed how in the last ten years the debate around sustainability within 'conventional' companies had moved from whether it would pay to be 'green,' to recognizing the benefits of eco-innovation and embracing the reduction of environmental externalities, to environmental codes increasingly becoming license to operate, to acknowledging that engaging with questions surrounding sustainable development is closely related to business viability. Just as the evolution of this debate, supply chain frameworks reflect a piecemeal thinking. At the start of this project the supply chain frameworks that described an explicit focus on sustainability, conceptualized it largely through 'green' or environmental principles. Additionally the literature on supply chain management was deemed to be theoretically weak (Seuring & Müller, 2008). Later, work on supply chains focused on having a wider sustainability approach even attempting to link it to knowledge and governance concepts (Peterson, 2009). While this is an important step, the conceptualization of the social is restricted to the traditional definition of stakeholders, which reduces the complexity of the supply chain linkages and the reach of the chain's impact. Most importantly, while 'sustainable' supply chain management frameworks are developing to be a comprehensive tool to address current questions faced by supply managers (Pagell & Wu, 2009), they fail to question the traditional metrics of performance and conceptualize sustainability as an add on. Having a framework that rests on these two assumptions proves limiting for this study.

Finally, I came to the literature on socio-technical transitions and more specifically the emerging work on sustainability transitions. For the last 15 years, transition studies, a field devoted to understanding the dynamics of societal change and transformation, has gained considerable scholarly and policy attention. The work done in the field of sustainability transitions aims to develop concepts and frameworks to discuss the way current established modes of meeting societal needs such as energy, food, water, transport, etc. change into more sustainable modes of operation. Studies in the field analyze the way industries or whole sectors operate in the light of sustainability challenges and goals. Conceptually this proves useful for this study as it provides the language to approach the questions posed about the dairy sector and the challenges it faces related to its social and environmental viability.

What are the core concepts and principles of transition studies? Transitions are defined as non-linear long-term processes of change where societal functions are fundamentally transformed (Geels, 2002; Grin et al., 2010; Rotmans et al., 2001). Transitions are conceptualized as having a socio-technical nature, meaning that change is explained as the co-evolution of technical and social innovation within a complex multi-actor system (Grin et al., 2010; Kemp et al., 2007). In order to study change it is key to understand that which is (relatively) static. Within the transitions literature, the analytical concept of *regime* supports the delineation of the existing dominant ways of doing and thinking; practices that are stable and well institutionalized (Geels, 2004). Smith and coauthors (2005) identify two general processes that lead to transitions: first, changes in selection pressures on the established regime, and second, the response to this pressures through the coordination of resources both from inside and outside the regime. Transition studies has a clear problem orientation and this focus translates in a multidisciplinary theoretical and methodological approach (Geels, 2005a; Geels & Schot, 2007; Grin et al., 2010). Scholars within the field of transition studies have increasingly dedicated their work to understanding transitions towards sustainable development. This problem-driven and normative orientation had already been adopted within transitions studies, producing frameworks intended not only for research but also for policy and governance purposes. However, seminal work is the 2010 volume by Grin, Rotmans, and Schot on *Transitions to Sustainable Development* where the authors comprehensively delineate an interdisciplinary theoretical perspective to help appraise the dynamics and governance of long-term transformational change (Grin et al., 2010). In 2012, Markard, Raven and Truffer offered an account of the theoretical approaches within what they identified as the emerging field of sustainability transitions. The authors also identified conceptual and methodological opportunities for the field, such as further developing analytical frameworks, advancing the empirical ground—namely, increasing the diversity of geographies and moving beyond the traditional focus on energy systems into other domains—as well as employing comparative study approaches (Markard et al., 2012).

The theoretical perspective described above is commonly referred to as transition theory, but just how relevant is this approach for food studies?[6] Lowe and coauthors (2008) argue that the development of sustainable agri-food systems hinges on mirroring the socio-technical nature of complex food chains by integrating insights from the natural and social sciences. Morrissey and colleagues (2013) argue that approaching change in agri-food systems through a transition lens allows the assessment of the current socio-technical system, supports the identification of pressures and challenges facing the system, informs the directionality of policies, and helps to more strictly evaluate innovations for sustainability. Finally, Hinrichs (2014) argues that a transition lens can prove valuable for food studies. The problem orientation and systems focus embedded in transitions analyses—albeit not entirely new to food studies—enables a more complete view on linkages, leverage points, and drivers across the system. Questions about institutional innovation and its interaction with stable arrangements become more accessible. Also, the future-orientation of transition studies builds on the sharp sensibility of food studies scholars about governance dynamics and contested historic and future visions; this can result in insightful input for policy efforts (Hinrichs, 2014). These are the theoretical assets that are particularly useful for this study. The dairy sector finds itself at a point where sustainability debates call for a reflection on current development trends and the directionality of emerging changes, a transition lens is a promising way to frame and generate such discussion.

[6] Although in the strict sense it is not one unified theory. Rather, the term is used to make reference to the most prominent conceptual frameworks and policy tools coming out of transition studies.

Research questions

By further relating the empirical departing point of this study and the processes of change as conceptualized in transition theory, the following general research question was articulated:

> How is the European dairy sector changing to ensure future viability, and how are dairy processors' sustainability programs a part of this change?

This research question was approached with the help of the following sub-questions:

1. How has the dairy sector developed since the post-war era?
2. What do actors in the dairy sector perceive to be sustainability challenges for the sector?
3. What challenges are sustainability programs of conventional dairy processors addressing and how?
4. How are sustainability programs from conventional dairy processors affecting the dairy sector?

Contributions of the study

This study aims to generate four key contributions. First, in answering the call of Markard and coauthors (2012) to advance the empirical ground by focusing on less technologically centered societal functions and make use of comparative study approaches, this study focuses on food through a multi-case research approach.[7] Secondly, most sustainability (transitions) work focuses on studying the development through which innovative niche alternatives emerge and mature. This study focuses not on what is new and upcoming but on the changes within dominant and established ways of doing things. Thirdly, not only is the regime the focus here but I hope to offer an empirically driven approach to studying it. This means that I provide a contextualized and nuanced understanding of dairy processors as influencers of the regime. They are conceptualized not as a monolithic unit but as a collection of actors with perceptions and ideas about dairying today and into the future. Finally, in recognizing the call for change towards sustainable food systems, and in this case dairy, this study tackles a challenge that is relevant across sectors: connecting past developments, current challenges, and present engagement with a discussion about future sector development. This contribution is connected to the study of sustainability transitions. Within this emerging field, much work has been done around understanding how change happens through models of past transitions. The current challenge for this field is to understand emerging transitions in light of sustainability goals (Turnheim et al., 2015) by gaining insight into, as

7 While the empirical scope is currently broadening, the field of transitions studies has traditionally focused on more technologically based systems. This has yielded a robust set of studies on energy transitions.

Darnhofer (2015) states, "the dynamics that fundamentally alter dominant practices, replacing the incumbent regime by realigning technical processes, social actors and mental frameworks"(p.21). This is the theoretical edge where this study sits and to which it contributes.

Structure of this thesis

This book is structured around seven chapters. In this first chapter I have introduced the empirical departing point of this study, its relevance, as well as how it has been framed and delineated as a scientific project. I discuss the theoretical underpinning and the research questions that have guided this study. The aims and the contributions that this research intends to deliver are also included in the last section of this chapter.

In chapter two, I expand on the theoretical framework chosen for this study by describing the emergence and latest developments in the field of transition theory with an emphasis on the literature on sustainability transitions. I discuss how fundamental change is theorized through the core concepts of the multi-level perspective, and how dairy processors can be conceptualized as key actors within the dairy regime. Moreover, the theoretical edges of the field are identified as part of the discussion about where this research is positioned and how our understanding of actors in the regime can be improved.

The methodological choices and strategies are presented in chapter three. I discuss the rational behind the study's case study design and selection of methods in relation to the research objectives and intended contributions. The process for data collection and analysis is reviewed as well as the strategy for analysis of results. On the last section I include considerations about generalization and limitations of the study, as well as ethical notes relevant to the process of research.

All research questions were explored through each and every case study. Chapters four, five, and six present the findings from the dairy sector in the Netherlands, Ireland, and the United Kingdom, respectively. The chapters have been structured around the same components. While the cases are completely coherent in themselves and can be read in isolation, they were written in sequence, thus occasionally, references from past cases are made which means that reading experience might be best if approached in sequence. For each, I first position dairying and the dairy sector as components of the country's economy and culture. This is followed by a detailed description of the development of the sector in the post-war era. This includes the introduction of milk production quotas as well as how the negative impacts of dairying have been debated in the last decades. The debate about the removal of quotas and the future challenges identified for the sector is also presented. This leads to the section on the development of responses by different actors in the sector including dairy processors. The focus then turns to the specific dairy processor under study—namely, CONO Kaasmakers, Glanbia Ingredients Ireland, and First Milk—and their engagement with sustainability issues. Specific emphasis is put on the development process and characteristics of their sustainability programs, as well as the trajectory of the programs thus far. The last section on these chapters includes an analysis of the individual case study through the lens of sustainability transitions.

In chapter seven I draw on the individual analysis of the cases to synthesize and answer the secondary research questions of this study. I then conclude by answering the main research question on the changes in the European dairy sector and the part that dairy processors' sustainability programs play as part of it. After presenting the research findings I reflect on the theoretical approach to this study and identify my contributions to the field of (sustainability) transition studies. I also expand on the methodological effectiveness of my approach, and aspects of generalizability and scope. The last section of chapter seven includes suggestions for further research.

Finally, I want to dedicate a few words to the title. *Sustaining Dairy* was chosen for its undefined nature. It gives no answers, and it hints to no specific paths or solutions. The intention is to make the reader wonder about the larger meaning and implications of this phrase and question *what* is to actually be sustained and *how*.

Transition theory as a lens to study dairy changes in Europe

2

Introduction

In this chapter I continue the discussion about how this research was theoretically approached by explaining which concepts were used, how, and the reasoning behind those choices. The next chapter will cover the methods through which the research questions were answered.

This project sits at a specific empirical and academic intersection. In the introduction I discussed the empirical starting point of this study. Addressing the question of how European dairy is changing in the face of evident sustainability challenges positions this study within the social and academic debates on sustainable food systems. Framing it in terms of regime changes—that is, changes in currently dominating practices, formal and informal rules, and cognitive frames—positions this research in the field of transition studies. In this section I will define the concepts that will be used throughout this study. In reviewing the conceptual framework the theoretical foundations of transition theory will be further discussed.

The multi-level perspective (MLP)

The core concepts of the multi-level perspective (MLP) are widely recognized within the community of scholars, policy makers, practitioners, and laypeople associated with transition theory. That is how much prominence the MLP has gained as an analytical model within transition theory, after work from Kemp, Schot, Rip, Geels, and Smith (Geels, 2006a; Grin, 2012; Markard et al., 2012). The MLP is fundamentally multidisciplinary; insights from evolutionary economics, science and technology studies, and structuration theory allow this model to recognize transitions as non-linear processes as well as identify how their different elements (broadly: social and technological) co-evolve (Grin et al., 2010). Transitions, according to this framework, occur through the interaction of changes happening at three analytical levels: niche, regime, and landscape. Niches refer to innovations whose radical logic hold path-breaking potential; socio-technical regimes are the rule sets embedded in established practices around existing (technological) arrangements; lastly, the landscape level refers to macro-level phenomena (e.g., environmental, material, social, and technological) that can be identified as the larger context in which transitions unfold. There is an increasing degree of stability and structuration along these levels (Geels, 2011; Grin et al., 2010). The MLP was articulated through the study of historical transitions; some examples of past studies include the transition in transport from horse carriages to automobiles (Geels, 2005a), the shift from propeller to turbojet technologies in aviation (Geels, 2006a), and new configurations in waste management and hygiene with the transition from cesspools to sewers (Geels, 2006b). Later elaborations and applications of the MLP focus on changes within the normative framework of sustainability.

This condensed introduction to transition theory and the MLP gives context for a more detailed exploration of the concepts. First, the terms ‘transition’ and ‘transformation’ have been used here in relation to changes in societal (sub)systems. Are these terms interchangeable? There are distinctions worth mentioning, especially in the light of a discussion about sustainability. The concept of transformation is broader in use and scope and has a longer history in literature. Within the literature on transformation, discussions about socio-technical change (e.g., energy systems) take place within debates on larger processes, such as demographic, economic, political and social change (Chappin & Ligtvoet, 2014). Within the literature on transitions, transformation serves as a concept to denote change that is radical in scope, a process through which the socio-technical system configuration changes to a significantly different one (Geels, 2010; Loorbach & Rotmans, 2006). As described by Turnheim and colleagues (2015) this refers to the emergence of “new actors, relationships, logics, norms and performance criteria” (p. 241). Geels and coauthors (2015) offer an analytical distinction (related to sustainable consumption and production research) between changes in technical products and purchasing behavior (reformist), transformations at the level of the socio-technical system and practices (reconfiguration) and transformations of the underlying economic and social deep structures (revolution). Under this distinction a reconfiguration perspective would argue for transitions in socio-technical regimes—that is, changes in technology, markets, institutions, and practices without the need for a major overhaul of deeper structures such as capitalism. While they offer this analytical perspective as a way to move beyond the reform vs. revolution dichotomy, Stirling (2014) draws a comparable distinction but emphasizes the plurality and distributive democracy of change within societies. He argues that societal transitions are a form of change that is more controlled (by those with vested interests) and technologically mediated, while transformations can be described as wider changes in social practices and technologies which result in politically chaotic yet more plural processes. Stirling argues that this distinction is mostly heuristic but the process of making such distinction, regardless of the specific terms, is an important exercise in governance. For this study, I draw from this discussion in two ways: First, I depart by conceptualizing transitions as fundamental changes in socio-technical systems and second I allow the data to inform how much of this distinction is reflected in the changes seen in the dairy sector. This allows me to work with a more open conceptualization of change and let any further specific distinction be empirically based.

Another key element of the multi-level perspective as a proposal for studying transitions is its conceptualization of how they come about; the three analytical levels serve to frame a socio-technical system and allow the study of related change dynamics. The levels refer to degrees of structuration and stability rather than hierarchy (Geels, 2011). The niche and landscape levels are derivatives of the regime as they are defined in relation to it. Let us start, then, by discussing the concept of socio-technical regimes. Why is it called *socio-technical*? This wording is the result of the evolution of the concept: the notion of *technological regime* was first introduced in 1977 by Nelson and Winter to describe the process through which a community of engineers would solve a problem and engage in continuous innovation. They noted that this process would follow certain stable cognitive patterns or ways of thinking about, amongst other things, what would constitute a problem and what knowledge could be used to address it. In 1982, Dosi added to this debate about technological change by introducing the concept of technological paradigm, which referred to a cognitive framework or outlook based on a given technology and the issues, related to that technology, that needed to be solved or further developed. Consequently, technological change would be predominantly determined by the paradigm itself and follow an incremental path, or trajectory (Dosi, 1982; Wiskerke & Van der Ploeg, 2004). Rip and Kemp (1998) drew insights from the social sciences view on technological change to build a more ample concept of technological regimes. They proposed technological regimes to be sets of rules or grammar at the core of practices, products, skills, and ways of doing; they argued that all of these are embedded in institutions and infrastructures (Rip & Kemp, 1998). While this broadened the scope of the technological regime concept, its ability to explain the bidirectional relationship between social phenomena and the emergence and continued existence of technological trajectories was still limited. The concept was then redrawn as *socio-technical regime* by Geels (2002) in order to draw attention to the selection environment. As Wiskerke (2003) argues unpacking the norms, rules, and expectations from the market, government and other interest groups allows a better understanding of the key role such actors play in defining the shape and contents of transitions. Geels (2004) further developed this definition; he proposed regime rules to be distinguished as cognitive (beliefs, goals, priorities, problem definitions, etc.), regulative (regulations, sanctions, laws, protocols, standards, etc.), and normative (values, norms, expectations, etc.). This distinction led to considering a larger set of social actors as part of the regime, such as policy makers, scientists, users, consumers, etc. as well as the linkages and dependencies that connect them. Geels (2005a) also described the socio-technical regime as categorized into several connected spheres: industry, markets, policy, technology, science, and culture. In summary, the regime refers to the existing dominant ways of doing and thinking; it is both the medium and outcome of human action (Giddens, 1984) and even if this implies certain dynamism, the regime is stable and well institutionalized.

The recognition of certain rules and ways of doing things as institutionalized practices within a regime brings us to a discussion about inertia, or rather, resistance to change. Regimes evolve from previous regimes following a reproduction logic. Regime innovations depend on previous ones, as they are assessed against their contribution to the regime's coherency or efficiency. Anything that does not align to this will be deemed irrelevant; the notion of path dependency captures this incremental approach to change (Wiskerke & Van der Ploeg, 2004). Another idea that explains the difficulty for regimes to deviate greatly from their trajectories is the phenomenon of lock-in. There are many aspects that ensure stability while creating a lock-in for the regime: David identified technical interrelatedness, economies of scale, and quasi-irreversibility as aspects that offer resistance to change (as cited in Berkhout, 2002). Additional to this is the weight that rules can have as they guide perceptions and practices; organizational capital (i.e., the value of the established trust and knowledge about the current network connections) can also contribute to regime stability (Geels, 2004). In short, regimes display high levels of stability and fundamental change hinges on breaking from current trajectories and lock-ins.

For this study, the concept of socio-technical regime (from here onwards referred to as *regime*) allows the delineation of the dominant ways of 'doing and thinking' about dairy—that is, the practices of production and consumption, not only the artifacts and infrastructure but also the current formal and informal rules as well as cognitive frames guiding the (future) reproduction of the regime. Wiskerke and van der Ploeg (2004) argue that regimes directly or indirectly prescribe farming practices. They impose a specific set of regulations related to targets, practices, calendarizations, controls and sanctions. For example, there is regulation on the nitrate concentration levels in water, rules on storage provisions, balanced fertilization, and periods when fertilizers are banned (nitrates directive 2010). The social networks and relations between food actors such as farmers, food processors, NGOs, government, certification bodies, retailers, and consumers are also discernable and in that way, the social side of the production and consumption of dairy. A detailed analysis will unfold throughout this thesis but a quick reflection on the ways that conventional dairy products move from farm to fork and the intensification trend in the sector prompt images of how technology, regulation, norms, natural cycles, and practices are interrelated, as well as the path dependency connected to the regime's institutionalization.

It follows from the recognition of regime stability that transitions do not come about easily. Studying past transitions has shed some light onto the ways in which regimes change. In essence, regimes are said to be challenged by internal pressures, landscape factors or niche developments (Van Amstel et al., 2012). Before moving into change dynamics let us review the other two analytical levels: niches and the socio-technical landscape.

Niches refer to the spaces where radical innovations emerge. Because of their nature, these novel practices often originate outside or on the edge of the regime (Grin et al., 2010). Niches offer novelties a space to grow by protecting them from the mainstream market selection and hindering regulation (Grin et al., 2010; Van Amstel et al., 2012). Kemp and colleagues (1998) identified three process that support niche growing and emergence: expectation management, networking, and learning. In order for niches to successfully develop, expectations about their potential should be shared with outside audiences and be as precise as possible. Another aspect is creating a diverse network of stakeholders who can tap into their resources to support niche development. Finally, learning processes refer to not only the knowledge and know-how related to the novelty but also to 'second-order' learning where people critically reflect on operating assumptions and limitations of current regimes. Following the same line of thought, Wiskerke and van der Ploeg (2004) emphasize that novelties can be seen as seeds of transition because they hold the potential to be better than existing practices (often being perceived as a critique of current regime performance). The use of the seeds metaphor, they suggest, is a useful one since novelties, just as seeds, require time for cultivation and nourishment, a supportive context (good soil for a good harvest) and the recognition that although there is potential, there is no certainty about the results. Smith and Raven (2012) depart from the notion of protected spaces and expanded the concept of protection. They suggest effective niche protection hinges on three properties: shielding (against mainstream selection pressures), nurturing (as described above by supporting processes of networking, learning and expectation management), and empowering (the competitiveness of the novelty enables increasingly widespread diffusion). More on the development of niches and their interaction with the regime will be reviewed as change dynamics are explored.

A short illustration of the concept of niche applied to food studies can be given by drawing from work conducted on organic food systems and alternative food networks. Smith (2007) uses the notion of niche to look at the UK organic food movement. This allows conceptualizing this new food practice as a novelty—namely, a way of thinking of, producing, and consuming food that differs from the mainstream routines. By framing the organic food movement as an alternative to the regime, one can better understand the developmental trajectory of the niche. This includes insights about niche performance (i.e., how does it perform if assessed against the mainstream logic?) as well as the impact and implications of the co-evolutionary relationship with the regime. Similarly, Roep and Wiskerke (2012) show through four cases of alternative food networks that the technical and institutional components of these novel practices challenge current regime configurations and furthermore that they are effectively (even if in modest scale) influencing the transformation of the food regime. By looking at these novelties and their corresponding niche development, they observed that the 'alternative' value of regional distinctiveness is becoming increasingly institutionalized into the existing food regime logic.

Finally, the socio-technical landscape is proposed as a way to capture the environment that influences regime and niche dynamics (Grin et al., 2010). The landscape refers to the material and social backdrop, including long-term macro-phenomena such as demographic and economic trends, cultural patterns, and social and political ideologies (Geels & Schot, 2007). While the metaphor of a landscape serves the purpose of conveying a sense of context and the timing of long-term environmental phenomena, it fails to communicate the more dynamic categories that also constitute the landscape. For a more nuanced understanding, van Driel and Schot (2005) emphasize that landscape components are determined by the unit of analysis and propose differentiating amongst landscape factors that do not change or change very slowly (e.g., soil formation or climate), factors that change in the long term (e.g., industrial revolution), and factors that change abruptly (e.g., wars, price peaks, etc.) (Van Driel & Schot, 2005). These diverse phenomena can be grouped into one category as they together form a background that is beyond the influence of actors, at least in the short term (Geels, 2011). This final note does not mean that landscape developments are voided of human agency; phenomena such as urbanization, globalization, and cultural revolutions occur, in fact, through the aggregation of human actions (Grin et al., 2010). The argument is that there is a level of structuration with its respective time lags that needs to be accounted for in transition analysis.

MLP and transition dynamics

According to the MLP, transitions do not come about easily, as regimes constitute stable configurations of rules, practices, technology, cognitive frames, and networks that determine the standard and most accepted way to fulfill societal needs. This does not mean that regimes remain static. Since they co-evolve with the societal functions they help fulfill, regimes represent core values and beliefs around practices and the best way to improve them (Smith et al., 2005). Regimes aim for reproduction rather than deviation from existing paths, that is, up until the point where they can no longer reproduce. This raises the question: If not easily, then how do transitions come about? There are two related points that need to be discussed before continuing. First, conceptualizations of the ways in which regimes change have come from ex-post studies of past transitions. Reflecting on how those insights inform and perform in the analysis of emerging transitions has been one of the key issues addressed by transition scholars, especially, in the last five years (e.g., Turnheim et al. 2015). The second point to discuss also relates to the shift within the literature from the study of past transitions to debates around present challenges and future changes, and is the distinction between historical and sustainability transitions. On the one hand, examples of past transitions such as the transition from horse carriages to automobiles or from propeller to turbojet are argued to have emerged mainly out of the entrepreneurial curiosity of actors trying to explore the commercial potential of new technologies. On the other hand, sustainability transitions are said to be driven by a normative goal, an idea of a ‘better’ way to fulfill societal functions (Geels, 2011). Although this distinction emerged to highlight the importance of governance in sustainability processes (Markard et al., 2012), it would be imprecise to associate normative drivers exclusively with transitions towards sustainability. Past transitions were also preceded and shaped by changes in norms and expectations as they emerged from the reflection of actors on how to best fulfill societal needs. As Darnhofer (2015) argues, there are normative elements in both historic and current transitions; it is the degree to which these are made explicit that is perhaps a better marker about these processes. In addition, sustainability transitions have arguably been informed by debates on renewability of resources and 'planetary boundaries' (Rockstrom et al., 2009) in a way that past transitions where not. Increasing information about the social and environmental impact of the ways in which societal needs are currently fulfilled are departing points for discussions on the likelihood and desirability of sustaining them. Emphasis on the governance of transitions is indeed essential as transitions towards sustainable futures are subject to contestation about what constitutes a desirable trajectory and means to achieve it; facilitating dialogue and collaboration amongst actors is therefore crucial (Geels, 2011; Grin et al., 2010; Markard et al., 2012; Smith et al., 2005).

Within this framework, transitions come about when processes happening at the niche, regime, and landscape levels co-evolve in such a way that leads to a new socio-technical configuration. Such processes refer to: landscape changes, which result in a different context and set of pressures on the regime and niche levels; regime destabilization or renewal; and degrees of structuration of niches (Geels, 2005b; Grin et al., 2010). These processes can emerge and align in different ways. Within the literature the concept of transition pathways emerged in order to propose different types of transition trajectories beyond the niche-based transition model (where transitions stem from increasingly mature niche practices) (Berkhout et al., 2004; Smith et al., 2005) and to emphasize the need to reflect the complex nature of transitions through differentiated processes (Geels & Schot, 2007). To this end, Berkhout and coauthors (2004) proposed to examine regime change by exploring two questions: whether the change is envisaged and coordinated from within the regime or whether it emerges unintentionally; and secondly, whether the response (from the regime) draws on internal resources or if these are only available externally. Geels and Schot (2007) question if coordination is a valuable axis for analysis as they argue transitions are never planned or coordinated from the outset. Instead, they describe a typology of transition pathways that suggests four different main patterns based on the timing and nature of changes across different levels of structuration:

› Transformation: refers to landscape change at a moment where niche innovations are not ready to emerge as a substitute for the regime; the regime responds by changing the direction of its development and innovation efforts.
› De-alignment and re-alignment: if there is significant and sudden change at the landscape level, regimes face major problems to respond leading to regime erosion and eventual de-alignment. If this takes place while there is no one niche innovation that is mature enough to emerge as a new regime then a

period where multiple niches compete and develop follows. Eventually certain niche practices gain dominance and the system realigns into a new regime.

› Technological substitution pathway: significant landscape change coincides with the existence of sufficiency developed niche innovations. As a result the niche innovations replace the regime.
› Reconfiguration pathway: the basic structure of the regime is eventually changed as a result of the incremental adoption of symbiotic niche innovations. First the niches provide solutions for local problems but eventually trigger larger regime changes.

Transition scholars emphasize that these patterns serve heuristic purposes; given that regimes are widely diverse in terms of structure and actors, transitions are likely to have their own story—that is, to emerge through unique complex paths of interconnected events (Smith, et al. 2005). Thinking about specific interactions and trajectories is useful input for subsequent activities designed to influence or support transitions (Van Amstel et al., 2012). This leads to a discussion about the analysis of sustainability transitions. The study of sustainability transitions implies a 'change of gears' in scholars and related practitioners as the focus moves from documenting past events to theorizing about the future: the implications about the past and present events as well as how to support or govern transitions to sustainable development. Turnheim and colleagues (2015) recognize that sustainability transitions are non-linear and context-specific; in discussing key challenges for governance of such processes, they argue that improved understanding of transition pathways can increase the visibility of intervention opportunities. Also the authors describe how transitions studies can contribute to this end with nuanced and contextualized descriptions of socio-technical change processes, which identify different actors and institutions along with changes in cognitive frames and rules.

How to best stimulate transitions has been an active line of debate. Elzen and co-authors (2012) argue that based on past studies concluding that transitions are too complex and long to be centrally managed, the most effective route would be to introduce small changes with potential of great effects. They maintain that emphasis needs to be placed on learning and experimentation with a focus on diversity of innovations. As part of this debate, two frameworks have gained policy and academic attention for addressing transformative innovation in the context of goal-oriented socio-technical change: transition management (TM) (Kemp et al., 2007; Loorbach & Rotmans, 2006,2010; Rotmans, 2005; Rotmans et al., 2001; Rotmans & Loorbach, 2009) and strategic niche management (SNM) (Kemp et al., 1998; Schot & Geels, 2008; Smith, 2007).

Despite their close origins, TM and SNM vary in focus, scope, and operationalization. Transition management focuses on change at the regime level—namely, the dominant configuration in societal systems. For this purpose TM is interested in how developments at all three analytical levels interact. Moreover, this governance approach promotes the use of experiments and visioning exercises to identify meta-visions of sustainable futures. The reflexive and periodical use of these tools creates a modular approach to the development of transition pathways (Grin et al., 2010; Loorbach & Rotmans, 2010). In 2001, transition management was introduced as an official policy tool in the fourth Dutch National Environmental Policy Plan (Smith & Kern, 2009). Additionally, it has been used in diverse projects at the regional, industry, and sector level. This shows the range of applications of this governance approach as well as the diversity of empirical cases that continues to feedback into the theoretical discussion about TM (for more on TM cases consult: Loorbach & Rotmans, 2010).

Strategic niche management is a research model and policy tool that focuses on bottom-up change processes at the niche level. It is therefore concerned mostly with how niche innovations interact with the regime level and how this interaction supports or limits niche development (Grin et al., 2010; Loorbach & Van Raak, 2006; Schot & Geels, 2008). Strategic niche management has inspired work on the dynamics of niche building and nurturing processes, allowing researchers to zoom into the developmental needs of niches and suggest what 'protective spaces' could provide or enable in such processes (Raven et al., 2010; Smith, Kern, et al., 2014; Smith & Raven, 2012). Innovation at the grassroots level, which focuses on niche development in the context of civil society initiatives, is concerned with the study and policy advice around community-based action for sustainability, its challenges, and opportunities for relevant diffusion (Seyfang & Haxeltine, 2012; Seyfang & Smith, 2007; Smith, Fressoli, et al., 2014). The focus of this line of work centers on the social innovation component of current transition processes. Studies on social entrepreneurship through the lens of strategic niche management (e.g., Witkamp, Raven, et al., 2011; Witkamp, Royakkers, et al., 2011) and more recent efforts by transition scholars to elaborate a theory on transformative social innovation add to that trend in signaling the recognition of the 'social' as a key element of innovation towards more sustainable futures.[8] These efforts generate insights that allow the exploration of transitions in which changes in technology are not the focal point; this enriches the transition theory toolbox as well as the analysis of transitions in food systems.

Hinrichs (2014) argues that work which emphasizes the *socio* in socio-technical is more compatible with the legacy of research stemming from food studies around the role of social participation and community innovations in food systems change (Hinrichs, 2014). Additional to the social and governance focus, a more malleable framework is required in order to allow for specificities of agri-food systems such as the biological component (i.e., the involvement of dead and living matter and the

8 See http://www.transitsocialinnovation.eu/ for more information.

corresponding metabolic cycles and unpredictability of an open system) and the wide diversity of farming styles to be meaningfully accounted for in analysis around novelties and agri-food transitions (Roep & Wiskerke, 2012; Wiskerke & Van der Ploeg, 2004).

Relevance of MLP as an heuristic device

Approaching this study through a transitions lens and using the multi-level perspective as heuristic tool allows me to organize and order the empirical input on the dairy sector into a workable framework. It enables a discussion in which conventional dairy processors can be conceptualized as regime actors. And in that light, the changes observed in and around these regime actors can be understood in terms of speed, directionality, coherence to existing norms and institutions, relation to more or less radical niches, and to landscape developments.

Beyond framing the regime, this study is concerned with questions related to the perceptions and responses of dairy food processors regarding sustainability challenges. This means that the implications of these perceptions and responses in relation to the future of the sector are of interest to this study (not with any aims of prediction but with the aim of better understanding and critically reflecting on this phenomenon). Is the MLP a relevant framework for this quest, can it move beyond historical transitions? A robust understanding of the past is a key component for reflecting on the future, so this temporal dichotomy might be more nuanced than what is being presented here. Still, for the purpose of explaining the theoretical choices made for this study, let us discuss how the MLP is able to facilitate reflection about unfolding transitions. The MLP has proved itself as a relevant framework for studying past transitions. It draws on process theory, which implies that transitions can be explained as sequences of events, including their timing and how these (series of) events interrelate (Geels & Schot, 2007; Grin et al., 2010). Narrative explanations are often used for their capacity to capture the complex interaction between agency and context in such sequences of events (Geels, 2011). Geels (2011) emphasizes the MLP's ability to promote a critical reflection on unfolding transitions. Given its focus on process and past events, it guides the researcher towards relevant questions. He argues that provided the researcher is knowledgeable about the empirical field and has a theoretical sensitivity, she will be able to distill interesting patterns and mechanisms (Geels, 2011). Also important, the MLP is an open framework. It allows for auxiliary theories and concepts to support the conceptualization of dynamic mechanisms. Why is this relevant? Unfolding sustainability transitions call, without a doubt, for a future orientation but one that is informed by and allows discussions about governance of transitions with the corresponding link to discussions on actors and agency (Smith et al., 2005; Stirling, 2014). The MLP responds to the challenge by offering an analytical perspective on innovation processes leading to transformation with a historically informed theory of wide change combined with an open problem oriented thinking (Smith et al., 2010).

Expanding the MLP

So far this chapter has covered the main features and relevance of a transitions perspective for this study. The MLP and the field of sustainability transitions have made valuable contributions to the study of change in the face of sustainability challenges despite being academically young. This also means that the field is in constant development, actively addressing critical feedback from authors outside of the field as well as building on insights derived from previous work within it.

This study focuses on regime actors and change in the agri-food domain, which is a relatively underexplored area. Why is the regime relatively understudied? It seems only logical that a lot of the work within sustainability transition focuses on niches and how to create protected spaces for experimentation to further niche development. After all, niches represent alternative values with often very clear and tangible promises for radical innovation and are often considered 'seeds of transition.' However, Smith and coauthors (2005) signaled early on that this bias could lead researchers to insufficiently investigate the transformative potential of incremental reforms in regimes (Smith et al., 2005). While regime studies are gaining increasing traction, mounting evidence of the need to change our ways, not only regarding food production and consumption but across the board, if we are to avoid undesirable futures (Garnett, 2008; Leach et al., 2012; Rockstrom et al., 2009), has clarified the need to investigate the role of regimes in sustainability transitions. The actor approach seems particularly relevant in a domain in which, as Darnhofer (2015) argues, sustainability transitions in agriculture might not be primarily technology-driven; rather, social innovation and changes in cognitive frames and norms from a wide range of stakeholders are likely to play and important enabling role.

Regime actors is a term regularly used in transition studies to refer to powerful collective actors (e.g., incumbent firms) that are enabled (and restricted) by the regime, have vested interests linked to its continuation, and actively resist fundamental change (Geels, 2014b). Avelino and Rotmans (2009) argue that dominant regimes, as networks of actors, control the functioning of the socio-technical system through their constitutive power to distribute resources towards safeguarding the status quo and defending its stability. This is why regime actors are often conceptualized as powerful. Speaking of regime actors is also a reaction to niche-focused studies where often the regime was imprecisely depicted as monolithic, reduced to an obstacle that needed to be conquered and in other cases, a unit (implicitly) credited with agency (Geels, 2011). Still, the notion of regime actors could benefit from further problematization; if we describe the regime as medium and outcome, as the set of dominant and established practices, formal and informal rules and cognitive frames, then referring to regime actors implies coherence and the capacity to control the regime. This obscures complexity within organizations or networks of actors as well as the fact that it is the practices that may align (or not) and to varying degrees to the established regime rules. Perhaps a more fruitful approach to discuss influence and power of certain individuals and networks over the regime is to draw from the notion of obligatory passage points (OPP) (Callon, 1986). These points of passage refer to nodes (conventions, rules, approaches and procedures) that are created in order to render certain actions mandatory and the actors controlling or facilitating them indispensable (Callon, 1986). This notion has been used to discuss innovation processes. For example, Rip (2012) described the infrastructure of electricity (generation, distribution, billing, etc.) as an obligatory passage point for energy suppliers. He argued that electricity is so engrained in our daily routines that any alternative faces strong barriers. Orssatto and Clegg (1999) discuss the entrenchment between automobile makers and the steel industry —a combination of mutual adaptation, know-how and sunken investments—as an obligatory passage point for innovation. They maintain that these points of passage filter any proposed innovation as "existing interests secure what is obligatory and what is not, or create new ones. The ways in which power relations are constituted depends on the reproduction of certain obligatory ways of doing things"(p. 274). The authors cite practices such as drawing the selection criteria for performance and evaluation, including the selection of technologies to minimize their environmental impact and the assessment procedure on corporate responsibility. Here the weight and power to create and control obligatory passage points is an illustration of how certain actors or networks can indeed influence the regime in order to secure their future viability. This is the basis under which the role of certain actors and networks is conceptualized in this study.

Within the transitions literature, there are valuable insights on the role and potential of incumbent firms; Callon's obligatory passage point concept allows me to complement and further specify these insights. Geels (2010) argues that incumbent firms in fields such as transport, energy, and agri-food possess certain assets, such as manufacturing expertise, research and development resources, distribution and service networks, as well as complementary technologies, which given their involvement in sustainability transitions might have significant accelerating power. However, Geels clarifies, the involvement of these firms hinges on significant reorientation which at present seems unlikely as the incentives, in terms of market gains or societal pressure, are not sufficient (Geels, 2010,2011). Westley and coauthors (2011) argue along similar lines, they posit that while the private sector is best placed to offer innovative technical responses to environmental problems, it is unlikely to actually do so unless wide institutional shifts encourage such reorientation.

This tension—identifying the accelerating transition potential of influential actors while remaining sober about the expectations for their expertise or assets to be put towards sustainability goals—has fueled calls for empirical research that zooms in into internal regime dynamics. Loorbach and Wijsman (2012) discuss the emerging trend of firms restructuring their business in terms of larger societal goals and how the majority of efforts from business center in efficiency gains and general improvement of current routines as opposed to (radical) transformation. They argue that firms can only have a leading role in sustainability transitions if they engage in structurally incorporating societal and environmental goals into the core of the business. Loorbach and Wijsman emphasize the need for research on the strategic practices of business to structurally societal functions to address environmental and social concerns. Finally, Markard and colleagues (2012) add that for the exploration of the roles of actors in transitions input from organizational and sociology scholars is essential.

Transition scholars are indeed responding to this call. Garud and Gehman (2012) looked into the cross-fertilization between transition and management studies to delineate the ways in which companies can engage with sustainability transitions ranging from adapting, influencing the regime shift or re-framing their own identities and capabilities. Loorbach and Wijsman (2012) looked into how businesses might enter into a new phase of corporate responsibility and proactively link their internal strategic development to sustainability transitions. More recent work builds on the MLP but extends it through complementary theories; Geels (2014a) offers an inter-disciplinary Triple Embeddedness Framework (TEF), which aims to better understand the bi-directional evolutionary relationship of firms in industries and their economic, political, cultural, and social environments. Penna and Geels (2015) further elaborate the TEF framework by discussing the co-evolution between climate change and strategic responses by the American car industry. Finally, and to discuss an actor focus in transition studies, Bosman and colleagues (2014) investigate the discursive framing of incumbent actors in the Dutch energy sector. Their findings point to tensions in current framings, which in turn could point to regime destabilization. Their approach shows a more granular look at regime dynamics as well as the methodological flexibility of the theory (as the study is based on discourse analysis). This shows recognition that regimes are not monolithic coherent entities; they consist of diverse actors who might face 'internal' dissent about future regime development (Geels, 2011).

Several areas of overlap can be identified between the latest regime literature and this work. However there is room for looking beyond the co-evolution of the dairy sector through an ex-post analysis and complement this with an exploration of the perceptions of dairy processors regarding the sustainability challenges they are facing. The aim is to tap into the MLP conceptual strengths and its malleability to be complemented by more actor-based understanding of transitions. My contribution is to explore an actor-based approach to study regime dynamics as well as research empirical domains that have been so far understudied such as food systems, and more specifically the dairy sector.

In the following chapter, this theoretical approach is translated into operational terms. A discussion on how the research questions were investigated through the concepts presented here is included.

Methodology

chap

3

Introduction

After having articulated the research questions that guide this study and expanded on its theoretical approach, in this chapter I explain how the research was conducted by describing the theoretical and practical rationale behind the methodological choices. This study was approached from an interpretivist paradigm. A case study strategy, based on qualitative methods, was used to answer the research questions posed in this study. In this chapter I also detail case study selection, data collection methods, and the analysis strategy used in this project.

While outlining this chapter I reflected on the importance of describing one's approach-—the decisions about the means and systems that were chosen and employed, not only in science where we have a tradition to do so, but in general. In this case, as a researcher, sharing the operationalization of a project with as much clarity as possible serves not only to comply with scientific standards of transparency and replicability but also to dialogue with those who are interested in what worked, what did not, and further considerations for related work. Why celebrate the methods chapter, you might ask, when it is something rather ordinary in our trade? Well, it seems especially relevant for two reasons. First, in a world where there is an overwhelming focus on the end product, on metrics, and on results, accounts about processes are seldom allowed the attention that is required to share with the level of detail necessary for meaningful reflection. Culturally the conversation is pivoting towards a greater acceptance of failure.[9] In the last 15 years we have seen authors of books, journals, blog posts, and conference talks expand on the value of uncovering failure and its role in creative and learning processes.[10] In practice, though, this is easier said than done. Negative results are not published as frequently as accounts of success. Recently however, it appears we are slowly moving beyond simple stories in which failure serves only as a temporary setback. Honest accounts and analysis of the messy middle hold key opportunities for unlocking learning and transformation processes (Brown, 2015). This is particularly relevant in work related to sustainable development where there are no charted pathways and lessons from similar efforts can reduce future unintended consequences. A quick illustration of this is the German Climate Dialogue project.[11] This initiative aims to encourage information exchange, capacity building and networking on municipal climate

[9] Here it should be clarified that my cultural milieu would be best described as a patchwork of both Northern Europe and North American cultural landscapes (Mexico included).

[10] These are only a handful of items to exemplify the trend: The 2001 Harvard Business Review The Failure Issue, the book Failing Forward by John Maxwell (2007), Sir Ken Robinson's 2006 TED talk Do schools kill creativity? And the 2008 commencement speech The Fringe Benefits of Failure by writer J.K. Rowling at Harvard University.

[11] Climate Dialogue is an initiative of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety.

protection. For this purpose, the project encourages reflection and mutual learning processes between key actors; these efforts have been implemented using the Fail Forward methodology, in which the emphasis is on honest evaluation of failures as a way to prevent them from inhibiting progress at later stages (Adelphi, 2013; Andreas, 2015; NA, 2015b).

The complexity that characterizes sustainability issues calls for problem-oriented and interdisciplinary approaches, as most problems cannot be divided without losing some sight of key feedback loops and context-relevant information (Brewer, 1999; Jantsch, 1972; Max-Neef, 2005; Pohl, 2008). Open and clear methodological accounts serve as stepping stones for relevant and effective interdisciplinary efforts as assumptions about phenomena and how to study them are articulated and made available. Regarding the operationalization of this project, the aim is to share the process as transparently as possible in order to contribute to a discussion about how to approach questions related to sustainability transitions and influential actors and networks in food systems, especially since this project is framed using the emerging theoretical framework of sustainability transitions.

Research design

The departing point for designing this project was the need to better understand the European dairy sector as it faces sustainability challenges. Within transition theory, Grin and colleagues (2010) argue that if one wishes to focus on particular events or local programs it is required to study the perceptions, aims, drivers, and interests of specific actors. From an actor's perspective, transitions are understood as the outcome of their interactions across (analytical) levels (Grin et al., 2010). Therefore, the focus is on influential organizations—namely, dairy food processors—and their perceptions and responses concerning sustainability challenges. After some concerns that the MLP was unfit for adequate analysis of actors and agency within transitions, Geels (2011) argued that while visually the MLP figure does not explicitly include actors, agency is fully incorporated as practices and pathways are enacted by individuals and groups. He refers to the analytical levels of the MLP as representations of increasing structuration of practices, which are, he stresses, constantly carried out by actors (Geels, 2011). Further, in this study I draw on the notion of obligatory passage points (OPP) to discuss the influence of actors on the regime. OPPs refer to nodes—namely, rules and practices—that are created and through their enactment they reify the actions and the actors controlling them as indispensable to the operation of the system (Callon, 1986).

The theoretical foundations of the MLP have additional implications for this project's research approach. The analysis of both long-term patterns as well as agency is enabled by the fact that the MLP draws from evolutionary theory with cross-overs to interpretivism via the sociological lens of science and technology studies (STS) and structuration theory (Geels, 2010,2011; Grin et al., 2010). This combination results in a framework in which evolutionary processes of variation-selection-retention are understood to happen within a multidimensional environment where selection is guided by markets and regulations as well as cultural and social expectations (Geels, 2010). In addition, evolutionary theory, STS and other sociological theories that the MLP draws from like structuration theory share ontological underpinnings. These ontologies assume actors that are diverse and creative while also embedded in regimes (they draw upon structures and in turn shape them) (Grin et al., 2010).

To explore the empirical and theoretical edge identified in this study, this research was approached from an interpretivist paradigm as the emphasis is on sense-making processes, multiple and socially constructed meanings and perceptions that people bring to phenomena (Lincoln et al., 2011). This assumes a cross-ontology based on interpretivism/constructivism with links to structuralism (Geels, 2010; Grin et al., 2010). From an interpretive constructionist point of view, what is important is how objects or events are viewed and the meaning that people attribute to them. Rubin and Rubin (2005) eloquently exemplify this: "It matters less whether a chair is 36 inches high and 47 years old than that one person perceives it as an antique and another views it as junk"(p.27).

Moreover, the study works from an epistemological approach based on process theory and narrative explanation. A theoretical approach with a focus on processes aligns with the MLP's attention to developments over time and it also supports the mapping of trajectories and unfolding contexts. Narratives, on the other hand, are useful in capturing complex interactions that detail the interplay of agency and changing context. Narrative explanations are not just 'stories.' Within the MLP, narratives are produced and structured around a contextual framework, which serves to provide a central theme to the explanation. Both process analysis and narrative explanations involve interpretation; from some research paradigms this approach could be deemed subjective and therefore 'weak' as it delivers no predictive power, however when it comes to complex phenomena such as transitions the aim is to increase the understanding of how these processes evolve (prediction is argued to be impossible). This research approach allows the space for sociological imagination—that is, insight about the relationship of events and society—to inform the analysis, which in turn is key in the emerging field of sustainability transitions (Grin et al., 2010; Mills, 2000).

Finally, this study is qualitative, which as mentioned before is aligned with the research aims and theoretical approach, as qualitative research emphasizes the socially constructed nature of reality and focuses on processes and meanings. A qualitative approach also allows for phenomena to be examined in their natural setting, as opposed to the lab (Denzin & Lincoln, 2011).

Case study design

To operationalize this approach a case study strategy was chosen. Transitions involve significant societal and structural change and, as it has been discussed, they are complex, non-linear processes that unfold over time. Case studies are suitable to answer 'how' or 'why' questions about social phenomena as they provide the space and framework for process-tracing (George & Bennett, 2005), context mapping, and exploration of patterns (Yin, 1994,2012)—all integral components of transition studies. Additionally, a case study approach is useful in research that deals with sustainability, first as it allows an explorative take on a contemporary phenomenon which is key in emerging fields of practice and research, and second as it allows a recognition for the whole; the complex nature of sustainability challenges, including contextual data informs the case study analysis and produces a robust analytical explanation. For research such as this one that deals with understudied themes and fields, a case study provides an opportunity for a thorough and flexible investigation of potentially relevant data that could be overlooked through other approaches (Kumar, 2011).

The study has a longitudinal approach. This means that while the fieldwork and major data collection stages happened in a discrete period of time, the reconstruction of how the dairy sector in each of the studied countries had developed in the post-war era, including the related societal and political debates, went on from the early stages of this project up until the writing of this thesis (more discussion of data collection included below). A general awareness of the long-term process of transitions, as well as a wish for this study to be informative and relevant for future studies in dairy, guided the research efforts.

Further, multiple case studies were chosen to allow for in-depth exploration and comparison. As part of George and Bennett's (2005) definition of a case study method, they argue that carrying out within-case analysis and cross-case comparisons is the strongest strategy for deriving insights within case study approaches. Yin (2009) argues that a multi-case study strategy is useful to identify specific and contextually relevant insights about regime dynamics, as well as shared relevant features across cases for analytical generalization.

Case study selection

The selection of cases was purposeful; the main idea in purposive sampling is that the researcher selects cases that in her judgment can best inform the research and help fulfill the aims of the study. This is particularly useful for research that explores understudied themes (Kumar, 2011). The selection was guided by a set of criteria; these were points that, in practice, served as direction when navigating the selection process, especially when feasibility, access, and relevance proved hard to align.

The first decision was to sample three case studies. This would allow an in-depth exploration of each case as well as a cross-case comparison, which was required given the research questions and available resources. Departing from the aim of studying the perceptions and responses of conventional dairy food processors concerning sustainability challenges, the process continued by narrowing the geographical scope. In the case of this study the geographical criteria was set to Europe. This would provide a degree of similarity and shared legal and market conditions, which in turn also contributes to identifying the specificities of each case study. Secondly, I looked for European countries where the role of agriculture and more specifically dairy was significant not only in terms of contribution to the national economy, but in its importance in cultural and national identities. The rationale behind this was to ensure that there would be a local public and perhaps an academic discussion about the role of dairy in that country. Further, cases had to be located in countries were the official language was English, Spanish, or French (as those are languages that I can conduct work in) or where the level of English of local potential interviewees was enough to express themselves sufficiently during an interview.[12]

After assessing EU-28 countries against these criteria the countries that remained in the selection were Ireland, France, the Netherlands, United Kingdom, Spain and Switzerland. Based on this, I conducted a desktop search for conventional dairy players, who had a prominent local or regional market presence (global was a plus).[13] Another selection criterion was a visible and tangible engagement regarding sustainability issues; this was understood as information, available offline or online, that showed the organization was working on efforts related to dairy sustainability. The requirement here was for organizations to have developed or be in the process of developing a sustainability program for their organizations. The working assumption underlying this criterion was that organizations that had decided to address and articulate a sustainability program had made an explicit choice to engage with concerns related to the sustainability of dairy and the relation to their business.

Through these criteria a list of dairy processors was generated. At this stage of the selection process I drew from the expertise of three food and dairy industry experts to gain insight regarding the relevance of these organizations and the likelihood

[12] The level of 'working English' of a given country was assessed through personal experience. Having lived in France, Sweden, and the Netherlands and having visited most European countries. I was able to judge the feasibility of conducting a case study in English in different countries. Access to translating services would have been too resource intensive for this study and would have reduced the number of researched cases.

[13] In this study, conventional dairy processors are defined as those whose origin or core values do not rest on an explicit sustainability philosophy or set of values.

that they would participate in the study.[14] All the experts had firsthand experience working with most organizations on the list. Based on the selection and the input from the dairy experts I approached several organizations about their interest and availability to participate on this project as a case study. After a couple of rounds of emails, two case studies were engaged, one in the Netherlands and one in France. Communication with other potential cases to sample as a third continued while initial talks with the Dutch and French cases started.

After several months, including a visit to Paris for a face-to-face meeting about the sustainability program as well as a discussion of potential fieldwork sites for the French case study, the organization decided to stop their engagement stating lack of time due to an increased internal workload. While understandable, this was a significant setback for the project as resources had already been invested in the case. Efforts to select the third and now an additional second case continued again with support from the food and dairy industry experts. The resulting selection, as you can see on table 3.1, was three conventional dairy processors located in the Netherlands, the United Kingdom, and Ireland. All case study organizations met the criteria mentioned above, which allowed an in-depth exploration of the research questions through a relevant study design. The three case studies will be further introduced in the respective chapters.

Table 3.1 Case studies

	Case Study One	Case Study Two	Case Study Three
Country	The Netherlands	Ireland	United Kingdom
Dairy Processor	CONO Kaasmakers	Glanbia Ingredients Ireland	First Milk
Sustainability Program	Caring Dairy	Open Source Sustainability and Quality Assurance Code	First things first

[14] The respective affiliations of the three experts are the Sustainable Agriculture Initiative (SAI), a platform dedicated to the coordination and support of pre-competitive sustainability programs in the food industry (the platform coordinates amongst others, a group on dairy); the Landbouw Economisch Instituut (LEI, Agricultural Economics Institute), an internationally renowned institute affiliated to Wageningen University that focuses on socio-economic analyses of agricultural sectors. Their work includes studies on competitiveness and sustainability of dairy farming in the Netherlands, Europe and globally. The third expert is an independent consultant with ample experience in sustainability programs in the Netherlands and Europe. Relevant experience includes a PhD on sustainability criteria in Dutch dairy farming systems through a modeling approach.

Case study operationalization

Once the case study organizations were selected the steps that followed were to determine a data collection, processing, and analysis strategy. Two key points are important to outline for data collection: What to ask from the case study and how to ask it. These are important steps as they determine the relevance of the data that is gathered, and in turn the findings.

A foundational step for data collection is the operationalization of the research questions. First, the questions required for the development of the dairy sector to be further defined. The key underlying concept here is the socio-technical regime. As discussed earlier, the regime refers to the dominant and stable practices and rules that guide its reproduction in a given context (Geels & Kemp, 2000). Geels (2004) proposes to distinguish rules based on three types: cognitive rules to refer to beliefs, goals, priorities, problem definitions, etc.; regulative rules to indicate regulations, sanctions, laws, protocols, and standards; and normative rules to discuss values, norms, and expectations. Therefore, the information gathered and used to describe the development of the dairy sector in each of the case study countries included structural and performance figures (e.g., number of dairy cows, number of farms, average milk yield per cow, herd size, etc.), mainstream production and processing practices, government and private policies, as well as significant events and key debates about the sector, all across the timeframe identified. Knowledge about the regime and the context in which it operates contributes to understanding the process through which actors draw from rules, norms, and structures to frame their actions and in turn shape them (Grin et al., 2010). A relevant note is that in this study, practices are defined as the aggregated industry practices of individual farmers and actors within the dairy processing organization; these are observed as combined results visible at the sector level (e.g., scaling up practices can be observed and measured through the growth in herd size and decrease in number of farms).[15]

Secondly, through sub-question number two I inquire about perceived sustainability challenges by the actors in the dairy sector. Sustainability challenges were understood to be challenges facing the dairy sector that were linked to economic, social, and environmental viability concerns relevant in that context. Underpinning this question are the notions of internal regime pressures, landscape factors, and the changing selection environment in which the regime operates. In alignment to the research paradigm that frames this study, the fact that different actors can perceive challenges differently is emphasized and different perspectives are used

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[15] There is an interesting academic discussion about the degree to which social practice theory and transition theory could enhance each other's theorizing power (e.g., Geels, 2010; Hargreaves et al., 2013). Here I make use of practices as defined in transition theory and since the study investigates the regime, some level of aggregation is implied.

to give space to contested outlooks. Operationally this means that the question was not circumscribed neither to a specific set of actors (e.g., farmers, sustainability managers, farmers' representatives, or NGO agents) nor to how challenges where articulated in one particular document such as a sustainability program. Instead, the information used to answer this question was input from actors related to the dairy sector—interviewees from the dairy processing organizations but also actors in related dairy organizations—as well as a public and private reports, sector-wide sustainability agendas, etc. (more detail will be provided below in the sampling section). The perceived sustainability challenges for the dairy sector are therefore recognized through what actors regarded, understood, or interpreted as future challenges facing dairy in their respective country. While one could draw from the scientific debate and enlist a series of relevant sustainability concerns for dairy in general, in this study the focus is on sustainability concerns that are germane to the context (i.e., the case study country and region) as certain issues or concerns are more present or acute in different contexts.

Sustainability programs were understood as explicit engagement of the dairy processors with issues related to the sustainability of dairy articulated in the format of a code or a program. This, as mentioned in the introduction, emerged from the initial exploration of the field of research; dairy processors articulate their engagement with future viability concerns through the development of sustainability programs. The conceptual basis to discuss how these programs are part of the changes in the dairy regime is the co-evolutionary nature of transitions. Operationally, there is no direct causality or statistical predictability but a debate about potential impacts and development trajectories for the sector.

Data collection

Data collection for this research was done using document analysis and semi-structured interviews. This study uses multiple qualitative methods to ensure the complexity of the cases is captured in the richness and thoroughness of the data collection (Yin, 2009). Additionally, the combination of the methods is used to enhance construct validity by contrasting and complementing data gathered through different methods. This means that all questions were answered by data gathered through both techniques. To answer some questions I relied more on data from interviews (e.g., perceived challenges) while for others, answers were based to a large extent on secondary data (e.g., development of the sector).

Document analysis

Secondary data were used to reconstruct the development of the dairy sector since the post-war era. The analysis of documents was useful to aid understanding about the context and history of the dairy sector in that country as well as how dairy processors presented themselves and communicated to external audiences.

The documents that were sampled for analysis were categorized as internal to the dairy processor (e.g., sustainability reports and codes, internal newsletters, organization's website, and social media accounts when available) and external (e.g., national and EU government documents, dairy industry reports, dairy related news, academic articles and earlier research reports, expert reports, documents and studies from non-governmental organizations, etc.). The sources were always verified for authenticity and when possible several sources were sampled to substantiate one claim in the study.

Secondary data require just as much examination and interpretation in order to draw meaning and understanding (Bowen, 2009). The researcher has to verify the validity and reliability of the sources (Kumar, 2011) and understand what to use documents for and what not to expect or ask from them. It is argued that documents are social facts and as such they are produced and used in socially mediated ways. This means that organizational reports or documents should not be taken as transparent reflections of intra firm routines or even decision making processes (Atkinson & Coffey, 2005). This invites the researcher to critically explore such data.

Semi-structured Interviews

One of the most effective ways to capture the individual's perception or point of view in qualitative research is through detailed interviews (the other method being observation, which was not applicable for this study). The assumption is that quantitative methods are farther removed from the actor's perspective as they rest on more remote and inferential methods and sources (Denzin & Lincoln, 2011). Semi-structured interviews offer the advantage of enabling the researcher to explore perceptions, understandings, and opinions of interviewees, which gives room for the respondent to expand and articulate his or her answer in detail (Gray, 2014; Rubin & Rubin, 2005).

For this study, semi-structured interviews provided a practical way to explore perceptions of challenges and responses by organizations in the dairy processing sector. I carried out 55 interviews. Interviews were structured around an interview guide (more detail below) and conducted as one-on-one conversations, except from one group interview and four interviews in which I received support from a third person to allow Dutch farmers and myself to express ourselves clearly. They lasted on average from 45 to 60 minutes with several lasting around 90 minutes. The audio from all interviews was recorded under the consent of the interviewees. The consent template is contained in Appendix 1.

For the interview technique I drew from the responsive interview method from Rubin and Rubin (2005), which is a form of semi-structured interview. In this method there is an added emphasis on active listening and adaptability. The interview is framed as an exchange, a relationship that even if temporary is meaningful. According to the authors, a responsive interviewer is an attentive listener who is able to be flexible and adaptive as the interview develops. This means that the interviewer adjusts the questions or explores certain topics based on what is being discussed, as opposed to what she thought before the interview. Finally, the responsive method argues that the interviewer's style, personality, and general approach matter (Rubin & Rubin, 2005). This was a useful departing point to reflect on myself as an interviewer and researcher as well as the implications for my data collection aims.

According to Fontana and Frey (2005), the way we present ourselves will determine how we are perceived by the respondents and in turn influence the success of the interview (and study). Further, this will affect the degree in which we establish rapport—namely, the extent to which the researcher can establish an empathetic relationship with the respondent in order to capture his or her perspective as opposed to imposing her own hypotheses or academic standpoint. In the case of semi-structured interviews where the key goal is to gain understanding, these factors are crucial (Fontana & Frey, 2005). Bailey (1987) argues that the answers provided by interviewees can be biased, amongst other reasons, if there is significant asymmetry (e.g., ethnicity, gender, age, socio-economic background, and education) between respondent and interviewer. Denzin (1989) suggests that dress code and manners are effective strategies to reduce this bias and create a conducive rapport. I employed two strategies based on these points in order to increase the likelihood of success of the interviews. Pre-interview, I would draw on secondary data to outline a general profile of the dairy sector in that case study country. Also I designed all interview introductions to provide all necessary information about myself and the project while highlighting the aspects I thought would most likely connect with the interviewee. Additionally, I would match the dress code of the respondents. A short illustration of this would be selecting a business dress code and highlighting my business and consumer marketing background when speaking to the sales manager of the dairy processing organization. In contrast, I would dress casually and highlight the interest in better understanding dairy farming as part of my study on dairy processing when talking to farmers. These pre-interview strategies seemed highly relevant in this case where beyond the initial interviewee/interviewer dichotomy, almost 90% of the interviewees were men of an approximate age of 50 years, all of them working in dairy and almost 50% farmers. I, on the other hand, was a 30-year old woman with an urban upbringing, a professional background in business and marketing, an academic training in sustainability science, and currently conducting an academic project. Furthermore in terms of cultural background, it was clear that even if communication went on smoothly and I was familiar with the most prominent local cultural markers, there were still differences across cultural backgrounds. The second strategy took place during interviews and it aimed at establishing alignment at the content level. Often interviewees would express their first answers in generic terms trying to avoid technical terms, industry lingo, as well as going into what they thought was too much detail. When this would occur, I would quickly make a short clarification question (e.g., are you referring to the Nitrates Directive?), this would enable me to show that I had the background knowledge (obtained through thorough pre-fieldwork preparation) to understand what they were referring to and that I was ready and looking for an in-depth exploration of the topic. I observed a genuine openness and interest in the conversation and on the questions of my research. This was visible both in the duration of the interviews, by the fact that people would candidly offer additional content (often very interesting although a bit removed from the aims of the interview), as well as additional resources and opportunities to explore the field further. Reflecting about the interviewing process beforehand and being responsive during interviews contributed to the quality of the interviews I conducted.

I made use of interview guides, which were designed to establish comparability across cases and to support a common structure for the interviews. The guides were useful in ensuring that the key areas of information were covered across interviewees and cases (Turner, 2010). Each guide was adjusted for every case and type of respondent to incorporate relevant context and actor differences; it could be described as having a master interview guide and creating customized guides for all interviews. For the design of the guides I made sure I was thoroughly informed on the specifics of the cases as suggested by Clifford (2010). As will be described in the following chapters, each organization had formulated similar yet distinct approaches to sustainability programs, they were at different stages of the process, and the dairy sector in that context had clear particularities. These differences merited adapted guiding questions. Finally, in order to operationalize the analytical concept of actors, I interviewed people from within the dairy processing organization as well as respondents who worked in the dairy sector but were not part of the dairy processing organization under study (e.g., dairy industry and dairy farmers organizations, non-government organizations, consultants, researchers, retailers, etc.). I will expand on this on the sampling section.

The interview guides designed for actors within the dairy processing organizations included key questions surrounding three main themes: development of and challenges for the dairy sector, responses from the dairy processor, and ideas about the future of dairy in their country. After having done the introductions, I would guide the interview along two questions about the dairy sector in that country; first a request to describe the development of the sector in the last decades, the idea of starting off with this question was to create some context for the question that would follow: What are the challenges that the dairy sector (in that country) faces? Then I would move to questions related to the dairy processor and their response to these challenges by asking, what are the challenges for the dairy processor? And how are you responding to these challenges? Afterwards, the conversation would go into depth on the topic of the responses developed by the organization (e.g., How did the response emerge? Why a sustainability program? What is sustainable

dairy? What are the main elements of the program? What is the approach to the program in terms of development, implementation, and evaluation? What do you think of the program?). Finally, the conversation would be guided towards questions related to the future (e.g., how do you think the sector will evolve in the future?).
The interview guides designed for actors in the dairy sector but outside the dairy processing organization revolved around similar themes: Development of and challenges for the dairy sector, themes of the sustainability debate in the sector, definition of sustainable dairy, role of dairy processors in addressing sector challenges, thoughts about sustainability programs coming from dairy processors, thoughts on the future development of the dairy sector. In all 55 interviews, after I had no further questions I would offer the respondent the opportunity to add anything they wanted to share. The purpose was to offer additional space to express any supplementary points germane to their perspective on the issues of the conversation.

In all cases the person that I had primary contact with was the sustainability manager of each case study dairy processing organization. I used this frequent contact to validate through an insider's perspective the clarity of the interview guide. Although the questions did not include any technical terms and definitions such as *sustainable* would emerge from the respondent, this step is advisable. Fontana and Frey (2005) argue that informants can serve as key sources for translation, clarification on jargon, and insight into relevant cultural aspects.

Lastly, the interviews for the Irish and the UK cases were conducted in discrete periods of time; for each case I was able to spend two weeks in the respective country during the summer of 2013. I conducted interviews and visited processing plants, farms, government offices, industry associations, etc. Since I live in the Netherlands I could afford more flexibility for the Dutch case data collection in terms of how logistically condensed it needed to be. Given that the Dutch case was the first that was involved as a case study, fieldwork started in early 2012 and continue throughout the summer. An additional round of interviews was conducted in the summer of 2013 (this was related to maternity leave of the sustainability manager). Finally, follow up conversations (via Skype or email) were carried out in 2015 and 2016 in order to ensure the data were updated accordingly.

Sampling strategy
As with case study selection, the sampling for respondents was purposive. Silverman (2005) points out that purposive and theoretical sampling are often used interchangeably as the purpose behind sampling choices relates to their theoretical relevance. Bryman (2003) argues that this is the case as qualitative research follows a theoretical logic as opposed to a statistical one. For the sampling of respondents this meant that the selection was theoretically inspired by the regime as analytical level of the MLP. While sustainability transitions as an emerging academic field has

been remarkably productive in the last years (Geels, 2015; Markard et al., 2012) empirical work has had the tendency to focus on either the micro dynamics of niche or the macro dynamics of transition processes. As discussed in the previous chapter, the regime concept is sometimes used imprecisely to refer to whole systems to the extent that agency is misattributed to them (Geels, 2011). Furthermore, studies that set out to look at actors within transition arenas often look at firms and label them as regime actors (Farla et al., 2012), which implies a view of organizations as monolithic and internally coherent (Smith et al., 2005). Conceptualizing organizations as monolithic obscures analyses of agency and strategy in internal organizational dynamics. In order to unpack the concept of actors in operational terms, this study takes a more granular sociological approach. Studying incumbent actors (i.e., dairy food processors) by only looking at their official strategic and communications material (which are the result of careful consideration and curated by public relations experts) would imply assuming intra-firm coherence. This study moves beyond the firm level to explore the activities and perceptions that are behind the firms' actions and can be accessed via individual respondents. Just as dairy processors are not seen as monolithic entities, the study does acknowledge that incumbent firms draw from established rules and norms that reproduce the regime. In that, and as Geels (2011) argues, the firms' internal dynamics are part of the empirical quest as opposed to working assumptions.

Drawing from the academic debate on ways to conceptualize the regime, I decided to operationalize the concept by capturing two main perspectives: First, that of internal actors within the dairy processing organization. The sampling of internal actors was intended to reflect the different arms or functions of the organization (e.g., sustainability manager, sales manager, farm representatives, farmers, strategic projects director, manufacturing manager, etc.).[16] Second, I captured the perspective of the external constellation of individuals, external in that they are not part of the dairy processing organization but they are part of its ecosystem (e.g., retailers, researchers, consultants, industry representatives, farmers' representatives, etc.). Table 3.2 shows the number of interviews per case study. The full list detailing the interviewees' affiliations is contained in Appendix 2.

Table 3.2 Number of interviews per case study

Case Study The Netherlands		Case Study Ireland		Case Study United Kingdom	
Internal actors	External actors	Internal actors	External actors	Internal actors	External actors
10	17	10	4	7	7

[16] Farmers were considered as internal actors as all case studies were dairy processing entities organized as cooperatives.

The idea behind this purposive sampling was to understand the organization's dynamics by contrasting and complementing internal perspectives with external points of view. This strategy, together with a thorough document analysis (detailed below) about the history of the dairy sector in that country, was a source of data and method triangulation, which refers to the increased validity of results based on the corroboration of information through the use of different data sources and collection methods (Miles et al., 2013).

In practical terms and for all three cases, internal actors within the dairy processing organization were contacted through the respective sustainability managers. This means that sustainability managers played a gatekeeper role. The implication of this is that the degree of access was mediated. For the most part this mediation granted me access to a diverse range of perspectives, as is reflected on the interviews. For the cases in Ireland and the United Kingdom, the support of the sustainability manager was instrumental for data access. For external actors, the sampling, contact, and organization of interviews was done directly by me (except in Ireland where I received support by the sustainability manager with contacting and coordinating some of the interviews).

Miles and coauthors (2013) argue that even if no statistical representation is expected from qualitative explorative studies, numbers should not be completely disregarded. They claim that numbers and counting are often associated with quality, even if only subconsciously. They invite qualitative researchers to reflect about the fact that sometimes we count and while frequencies might help support a claim there are instances in which this is not the case (Miles et al., 2013). I took the authors' invitation to reflect about numbers for this case. According to the study design, saturation was approached more in terms of breath of perspectives and deepness of interviews as opposed to number of any given type of actors that were interviewed. The dairy processor's perspective was approached through the collection and accumulation of perspectives of internal actors. This is because practically, there is only one of each type of actor: One sustainability manager, one operations manager, one sales manager, one retailers' representative, etc. For the actors such as farmers, who as mentioned before are internal actors in all case studies, saturation about their perspective was sought via multiple interviews. Concerning frequencies, no statistics were drawn from the interviews, but the responses were indeed weighed based on how often something was mentioned.

Data processing and analysis

Processing of primary data started by producing short fieldwork summaries. Later it consisted in doing verbatim transcription of all interviews. I avoided taking extensive notes during interviews. The reason behind this choice is that in my experience taking notes reduces my focus on what the interviewee is saying, additionally it can distract the respondent and most importantly bias his or her answers (i.e., if the person correlates what is being discussed to the amount of notes that are being produced). The verbatim style of transcription requires attention to detail and is extremely time demanding. In my case, deciding for verbatim transcription, and in addition doing it myself, ensured protection of confidentiality and gave me the chance to review in detail the information coming from the interviews before analysis. Completing the verbatim transcripts allowed me to conduct the analysis of both primary and secondary data in their written form.

The method chosen for the analysis was content analysis as defined by Spencer and colleagues (2013), who describe it as allowing the analysis of both the content and context of documents with the aim to identify themes. Within this method there is attention for how themes are presented or dealt with as well as their prevalence. The analytic strategy—which is aligned with process theory and narrative explanation—was case description. Descriptions of each of the cases across time—in which the sector in general as well as the dairy processor in particular were included—enabled for all relevant data to be meaningfully reported and analyzed. The interpretation of findings from the cases was inspired by a replication logic. According to Yin (2012) this cross-case synthesis approach helps to raise the question if the findings from the small set of cases point to any broader conclusion.

Based on this analytical strategy, the process of data condensation was done case by case. The coding process took place in several stages. Interview transcripts, which altogether amounted to over 300 pages of text, were coded using Atlas.ti. The use of computer assisted analysis of qualitative data offered clear benefits. The main one is that it allowed me to be systematic and rigorous throughout the coding process as it allows for an easy overview of the process. It was a practical way to handle such large amounts of data and it reduced biases by having the option to produce counts of certain themes or answers (Silverman, 2005). Secondary data analysis was managed through Endnote and rigorously analyzed by 'hand' using the highlighting and comment tools on Acrobat Pro.

First the transcripts were reviewed to identify information about the main themes coming from the research questions: rules (norms, regulations, and cognitive frames), practices, and context related information. Following the analysis method, the theoretical foundations and research questions provided an initial frame for what to look for but themes were also allowed to emerge from the data. The general themes allowed me to flag information throughout the interview transcripts and make sure I was systematically selecting relevant data. Secondly, the answers were reviewed carefully to understand the key meanings people expressed in their answers. The coding process involved significant iteration in order to reflect on how codes emerging in the subsequent documents had any impact on the coding of the ones reviewed earlier. The software (Atlas.ti) facilitated this, as I was able to generate a code list and identify potential overlap between codes. Overlapping codes were merged whenever it made the coding more coherent and kept separate when the nuance of the two or more codes was meaningful for the results. For this study I conducted a partial second round of coding where I randomly sampled 30% of the transcripts and re-coded them. After coding all transcripts for each case I ran a quick review process of all codes generated for the three cases. Again this was to ensure that codes were consistent, avoiding unnecessarily repetitiveness across cases in order to allow comparability.

Robustness of design

In order to assess the quality of the research design, Yin (2009) argues that validity and reliability need to be ensured. Other authors argue that for qualitative studies quality can be best discussed if these criteria—stemming from quantitative studies—are redrawn as trustworthiness and authenticity (Guba & Lincoln, 1994; Kumar, 2011). At the core of all of these concepts is the idea that what was measured has been substantiated, is reflective of the phenomenon under study, and that the interpretation of results has been done through a transparent process through which the path towards conclusions is deemed reasonable by others (Lewis et al., 2013).

For this study in particular, validity is ensured through a clear operationalization of the concepts, which provides clarity as to what is being measured and how. Secondly, triangulation of sources is used to guarantee that data from interviews are contrasted against data from secondary sources and vice versa. As part of the assessment of validity, Yin (2009) includes internal validity to refer to research that seeks to establish causal relationships. Given that this is a study approached through the less of transition theory—with its corresponding assumptions on complexity and co-evolutionary change dynamics, as opposed to direct causality—the aim of establishing causality is outside of its scope and strictly speaking this criterion does not apply to the assessment of quality. Transition theory however, does recognize the co-evolutionary dynamic in regime reproduction, which includes a degree of mutual influence. While strict measures of causality are not relevant for this study, there is consideration for revealing potential points of influence between actions from dairy processors and the regime.

Another factor included in the assessment of the research design is the degree to which findings of case studies can be generalized. The ability of case studies to produce empirical or theoretical generalizations is often contested. From strict constructivist arguments to the concerns of those who favor quantitatively substantiated claims, case studies seem to be received with some distrust (Flyvbjerg, 2006; Lewis et al., 2013). This study aims for analytical relevance if not absolute generalizability. It aims to provide a clear exploration of how dairy has evolved in these European countries and how dairy processors are approaching their engagement with sustainability issues.

Following Flyvbjerg (2006), while developing these cases studies I placed substantial emphasis in the value of thick narratives. Flyvbjerg explains that while some see thick complex narratives as a liability and a hindrance to neat synthesis or scientific propositions, he argues they play a fundamental role in social science research. It is precisely the contextual details, nuances, and diversity that are building blocks to expertise and analytical value. I applied this logic into the reporting of the cases, which as you will see focuses on presenting the complex and multifaceted co-evolution of the dairy sector before submitting it to the lens of transition theory. This choice seems particularly relevant given the longitudinal nature of transition studies. Especially within dairy where the development of sustainability programs is at a relatively early stage, the value of presenting a description so rich in detail extend beyond the present analysis and can serve as input for future studies.

A final criterion is the reliability of findings. Even on qualitative research methods texts reliability is usually described—by drawing on the natural science experimental method—as the ability to repeat a study and obtain the same results. For this study, ensuring reliability in that traditional sense is not applicable given that the study was carried out within a particular time frame. During this period the regulatory framework for European dairy, amongst other variables and actors, changed significantly. It would be therefore impossible to reproduce those conditions and conduct this study. Hardy and coauthors (2004) argue that within qualitative research where content analysis was employed "results are reliable to the degree that they are understandable and plausible to others" (p. 21). In order to do that I used the same approach to all cases, maintaining consistency in data collection, processing, and analysis. In addition I detailed the research process in the present chapter and have kept all data used for this study electronically organized and store should any other researcher need to verify it.

Ethical considerations

I approached this research with the intention of gaining a better understanding of dairy processors' responses to sustainability challenges. Engaging dairy processors proved very challenging. Establishing trust was a key step as access to relevant data hinged on interviewees feeling reassured that I was going to store and treat all information with discretion and use it only for academic purposes.

I introduced my research aims clearly and obtained consent from all interviewees involved before carrying out interviews. I explained the ways in which data were going to be used and stored. I also described that a certain degree of anonymity would be maintained. Given the sector and the specifics of the cases, trying to create anonymity would compromise the quality of the findings, as it would imply hiding key information. Therefore the names of all the organizations are included but the names and roles of interviewees were made anonymous. All interviewees agreed to their involvement.

Interviews, seen as exchanges—namely, asking respondents to engage with me in a conversation and dedicate their time (not only for the interview per se but also in some cases in traveling to the place of the interview) was difficult. My initial approach was to inquire if I could assist on any ongoing or ad hoc process where my time and input would be of use. Unfortunately, there was no opportunity to engage in any process of the sort. Case study descriptions where shared with all sustainability managers as an opportunity to feedback on the accuracy of program descriptions (e.g., the exact number of farmers participating in certain schemes). No further editing control was granted.

The next three chapters set out the findings of each of the three case studies. In chapter four I present the first case study: the dairy sector in the Netherlands. That chapter is followed by the case studies exploring the dairy sectors in Ireland and the United Kingdom respectively.

The dairy sector in the Netherlands

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Introduction

The Netherlands has a total area of 41,500 km², out of which 18% is water (World Bank, 2015b) and 54% of land is dedicated to agriculture. Despite its small size, the Netherlands is the third largest exporter of food products in the world; fellow top exporter countries include the United Sates, Brazil, Germany, and France (FAO, 2015a). To put this information into perspective, one could 'fit' the Netherlands almost 9 times into the surface area of Germany, 13 times into France, 205 times into Brazil, and 236 times into the United States. Although an imprecise exercise, these calculations can serve as an illustration of the productivity and value that is obtained out of every square meter dedicated to Dutch agriculture.

Dutch dairy is no exception; it is a highly productive sector, and a key contributor to the Dutch economy (NZO et al., 2015). The sector employs 60,000 people (NZO, 2016a) and has a strong export orientation. After the United States, The Netherlands is the largest agricultural exporter in the world. In 2015, the export of milk and dairy products amounted to 7.2 billion euros—almost 10% of the total agricultural exports (CBS, 2016). In terms of export markets, 45% of Dutch dairy goes to countries within the EU—where top buyers are Germany, France, and Belgium—and 20% is exported outside the EU to key costumers such as China, Saudi Arabia, and the United States. Finally, 35% of Dutch dairy is consumed domestically (NZO, 2016a). Dairy products are well rooted in (food) culture and the local traditional landscape (Boogaard, 2009).

Structure of chapter

Following and documenting emerging transitions requires not only a sensibility for process tracing but also the ability to create an accessible narrative of what has been studied. The case study chapters on this book were written with the aim of providing an account that is clear yet maintains the complexity inherent to co-evolutionary processes. Complexity is often tackled by creating categories and separating different data elements; here however, proceeding through a strict compartmentalization strategy—for example, separating debates about the viability of dairy from related responses—would take away from the richness of the data and their interlinked nature. Another challenge for the structure of these cases is that they combine both narrow and broad perspectives. In other words, documenting the dairy regime evolution requires a broad scope so that practices, perceptions, and general developments related to different actors or constellations thereof (e.g., dairy processors, civil society, industry platforms, government bodies, etc.) can be sufficiently captured. On the other hand, an in-depth exploration of processors as key influencers of regime change requires zooming in to the micro dynamics of the case study dairy organizations. Taking these factors into consideration, the organizing principle of this and the following case study chapters is *time*. Each case study introduces a timeline where the development of the sector is described chronologically. You will find that overarching themes related to intensification of farming, efficiency and productivity, price and farm economics, environmental issues, and animal welfare, amongst others, were used in the descriptions, but within those there is also attention to time and the sequential unfolding of sustainability debates and responses from different actors. After presenting that thematic timeline of the development of the sector, I zoom in into CONO Kaasmakers, the dairy processing organization that was researched for this case study; here too time is used to describe the development of their sustainability engagement. By drawing on all the previous sections, the chapter concludes with an analysis of how the Dutch dairy sector is changing given the sustainability challenges connected to its future viability.

To reconstruct the development of the sector in the decades after WWII until today I analyzed media, government, and industry reports, academic literature, as well as the data coming from the interviews conducted for this study. The overview presented here reflects the key events or factors that shaped the sector according to the analysis. For the Dutch case in particular I gathered diverse insights as the result of an extensive interview process with actors connected to the sector.

Post-war development of the Dutch dairy sector

A key word to describe the development of Dutch dairy in the post-war era is *intensification*. Within the European landscape Dutch dairy farms stand out for their production rates. For example, the Netherlands produces nearly 13 tons of milk per hectare, which is the highest in Europe.[17] If compared to export competing countries this production rate is more than double than that of Germany and three times that of France. One could ask now: what is the model behind such a productive farming system? On average, an intensive farming model implies increasing costs because of the additional feed required. The costs per 100 kg of Dutch milk are for example higher than those in Ireland, the United Kingdom, and Poland but they are still relatively low and actually lower than production costs in Germany, France, and Denmark. This speaks to the efficiency with which milk is produced in Dutch farms (LEI, 2013).

How did this intensification unfold? During the post-war era, agriculture and food supply were fundamental points in the reconstruction agenda. In the Netherlands, Sicco Mansholt became Minister of Agriculture, Fishery and Food Distribution in 1945 (European Commission, undated). Mansholt's main goal was to modernize Dutch farming; he quickly established a policy framework based on "regulated prices, stimulation of structural development and investments by subsidizing land

[17] This calculation is based on 1.2 million hectares of land dedicated to dairy—28% of the surface area of the Netherlands consists of grassland and maize growing (ZuivelNL, 2015a).

Table 4.1 Timeline of key events in the Dutch dairy sector

Year	Event
1945	End of WWII
1957	Treaty of Rome
1950s	Recovery of agricultural sectors
1960s	**Modernization and specialization of dairy farming (CAP)**
1970s	Surplus production of milk in Europe
1970s	Increased visibility of water pollution
1978	Ben & Jerry's is founded in Vermont
1980	**Development of national quality schemes starts**
1984	**Introduction of EU milk production quotas**
1991	**EU Nitrates Directive**
1997	**Keten Kwaliteit Melk (Quality Milk Chain)**
1998	Dioxin is found in milk
1999	Koeien & Kansen project starts (Cows and Opportunities)
1999	The Beemster polder receives status of UNESCO World Heritage
2001	Foot and mouth disease outbreak
2001	Ben & Jerry's is acquired by Unilever
2002	Partij van de Dieren (Party for the Animals) is formed
2002	**CONO introduces grazing premium**
2002	Ben & Jerry's starts producing ice-cream in Europe
2003	The Sustainable Milk Initiative Launched in Europe is set up; the project team is formed
2004	Dioxin is found in milk again
2004	MRSA found in Dutch patient
2004	The SMILE pilot project starts with 12 participants
2005	Manifesto Koe zoekt wei (Cow looking for a meadow)
2005	Initial planning of mega farm Nieuw Gemengd Bedrijf
2006	**Derogation (Nitrates Directive) is obtained**
2006	Pilot farmers visit Ben & Jerry's in Vermont
2006	Milk trader Hoogwegt announces a stop in their milk trading business
2007	**Stichting Weidegang (Grazing Foundation) is created**
2007	Beter Leven Label is launched
2007	**FrieslandCampina introduces grazing premium and Weidemelk logo**
2007	**CONO adopts the Caring Dairy program from Unilever**
2008	Natuur & Milieu demonstration outside of FrieslandCampina
2008	Memorandum of understanding regarding the monitoring of antibiotic use on animals
2008	**Development of policy on antibiotics in farm animals starts**
2008	Partij van de Dieren organizes an anti-mega farm protest in North Brabant
2008	**CONO scales up Caring Dairy. Participation premium is €0.50 per 100 kg of milk**
2008	The Duurzame Zuivelketen (Sustainable Dairy Chain) Initiative is launched
2009	**Extension of derogation (Nitrates Directive)**
2009	Koe-Kompas (a Caring Dairy tool) is launched
2009	The US based sustainability program is renamed Caring Dairy US
2009	Introduction of the Uitvoeringsagenda Duurzame Veehouderij (UDV, Implementation Agenda for Sustainable Livestock)
2010	Manifesto Pleidooi voor een duurzame veehouderij: Einde aan de georganiseerde onverantwoordelijkheid (Plea For Sustainable Livestock: The end of the organized irresponsibility)
2010	Kringloop-Kompas (a Caring Dairy tool) is launched

2011	**FrieslandCampina develops Foqus Planet program**
2011	DOCKaas starts discussion rounds about sustainability program
2012	**Weidemelk logo becomes available for other dairy processors**
2012	**Convenant Weidegang (Grazing Covenant)**
2012	Adoption of KoeKompas by Partico Group
2012	**Renewed Caring Dairy is launched**
2013	**Farmers commit to using the Kringloopwijzer (Annual Nutrient Cycle Assessment)**
2013	Phosphate limits are established per animal farming sector
2013	Horsemeat scandal
2013	**Renewed Caring Dairy is operational**
2013	**Sustainability programs by DOC Kaas, Rouveen, Bel Leerdammer, and Vreugdenhil**
2014	Dairy phosphate limits are surpassed
2014	WHO describes antimicrobial resistance as a global problem
2014	**Review and redesign of FrieslandCampina's Foqus Planet**
2015	Milieudefensie sends ultimatum about grazing covenant
2015	**End of EU milk production quotas**
2015	Phosphate limits are surpassed by all animal farm sectors
2015	Announcement of phosphate rights policy
2015	**Weidemelk logo available for non-Dutch milk products**
2015	**FrieslandCampina raises grazing premium and identifies partial and full grazing**
2015	**FrieslandCampina focuses on measurability and performance in Foqus Planet**
2015	**Minimum performance requirements are part of the Global Caring Dairy program**
2016	**Beter Leven Label for dairy is introduced**
2016	Milieudefensie steps out of grazing covenant
2016	EU rejects phosphate rights proposal
2016	Development of phosphate reduction plan for 2017
2016	Phosphate reduction plan submitted to the Dutch Ministry of Economic Affairs
2016	**Dutch parliament approves revised phosphate rights policy**
2017	**Implementation of Global Caring Dairy starts**
2017	**CONO's grazing premium doubles to €2 per 100 kg of milk**
2017	**Phosphate reduction plan starts**

bold key rule-related changes in sector
blue key rule-related changes by processor

consolidation, creation of a security fund for farm loans and the establishment of a system of price control for farm land and rents"(Frouws & Tatenhove, 1993, p. 222). Further, investments in the system of agricultural research, education, and extension stimulated and reinforced scale enlargement and the intensification of farming (Grin et al., 2010). Within the policy world, there was little disagreement regarding the goal of developing Dutch agriculture into a competitive, export-orientated, and modern—namely technically advanced—sector (Frouws & Tatenhove, 1993).

Between the 1960s and 1980s, there was an influx of, among other technologies, the milking machine, the tractor, cooling and transport technologies, maize feeding, the mechanization of roughage production, and the modernization of the housing system, all of which reinforced the increased mechanization of farming. These developments led to continuous production growth. When in 1984 EU regulation on milk production quotas was introduced, the dynamic of growth and expansion that had characterized the sector changed: farmers turned the focus to cost reduction and labor productivity instead (Van Horne & Prins, 2002).

This new focus on efficiency underpinned the development in the decades that followed. Between 1984 and 2014, the milk produced per cow increased by 50%—that is, the annual yield per cow went from over 5,300 to 8,000 kg (CBS, 2015c; ZuivelNL, 2015a). In parallel to the increase of milk yield per cow, the total number of cows declined, which follows logically given that cows were producing more milk and there was a cap on how much milk could be produced per farm and per country. Farm numbers also decreased significantly, from 60,000 to 17,500, however even if the total number of cows was dropping, cows per farm more than doubled from 40 to 90 on average (NZO, 2016a). These figures illustrate the drive for efficiency and labor productivity, which were supported by developments in breeding techniques and preferences as well as the introduction of milking robots. For decades, artificial insemination has allowed farmers to manage cattle reproduction in a systematic and geographically independent way. Farmers can use semen from around the world to ensure that the breeding process yields increasingly productive cows. Additionally, milking robots allowed not only the benefits of machine milking (less teat infections and lesions) but also significant labor savings (Butler et al., 2012; Van Horne & Prins, 2002). Finally, consolidation has also been a strategy for increased efficiency and scale economies both in dairy farming and processing (Gardebroek et al., 2010). In the Netherlands, even under quotas scale enlargement was possible by trading them, especially after 1990 when the quota was more easily detached from land (Oskam & Speijers, 1992), the number of farms with 250 or more dairy cows has gone from 45 to more than 300 in the last 15 years (CBS, 2015a; Gies et al., 2015).

The introduction of the quota was therefore a real game changer; it was the event that was identified as most influential to the development of the sector by actors interviewed for this study.

> *I think one very important thing that was in 1984 was the super levy system and, why is that important? Because every dairy farmer got a quota [farmers were told] 'you are not allowed to produce more,' so you could say that the total production was also limited. That was very important and I'll come back to that, because in 2015 the milk quotas will end so that means that the limits that we have had are going to end. Maybe the environment becomes more limiting, that is important. (CO11)*

Regarding financial performance, Dutch dairy farmers have experienced high price fluctuations over the last decade. The sector enjoyed a stable increase in price between the late 1970s and late 1980s. That was followed by a period of relative stability during the 1990s until the early 2000s when the price started to fall (European Milk Market Observatory, 2016). This was argued to be have been caused mainly by the reforms to the common agricultural policy. The reforms signaled the start of a period where market support would be dismantled only to give way to market forces as key determinants in prices (ZuivelNL, 2004,2006). The average milk price for the Netherlands behaved much as the European average: a period of decreasing prices between 2001 and 2006 was followed by a quick shift—in 2007 raw milk prices reached a historic peak.[18] Quickly after, in 2009 the price crashed reaching unseen levels. The economic crisis had affected the dairy sector and weak demand met relatively good supply, which caused the prices to decrease further (ZuivelNL, 2010). What followed was a price recovery marked by fluctuation, after a peak year in 2014 the price decreased again during 2015 and the first half of 2016 (ZuivelNL, 2016). It must be noted that while farm income is highly correlated to price, direct payments and increased scale have allowed farmers to weather the volatility of prices to some extent (European Commission, 2011; Jongeneel et al., 2010). The main development over the last decades is the shift from a relatively stable price situation to a new normal where farmers need to buffer periods of high volatility in price and changes in feed costs (Beldman et al., 2014; ZuivelNL, 2015b).

Post-quota future

Interviewees reported that the abolition of the milk quotas was just as disruptive as the introduction of the quotas was in years prior. As discussed on chapter one the prospects of increasing global demand as well as the role of European dairy in supplying it were also very much part of the debate in the Netherlands. From the interviews with actors from the dairy sector, which were carried out previous to the abolition of quotas, it was possible to identify some common expectations regarding growth as well as opportunities and challenges attached to it.

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[18] To be precise, there is no average milk price calculation that is based on the paid prices of all dairy processors operating in the Netherlands. The average price calculation that is used on this international comparison is that of Dutch dairy processors: FrieslandCampina and, more recently, also the average price paid by DOC Kaas.

Several key actors in the sector, including farmer representation, discussed growth after the removal of the quotas as an opportunity to capture additional share of international markets.

> *We have been very much in favor of the abolishment of the dairy quota for a long time. Also because in Holland we have a potential to produce more milk [. . .]. [Farmers] are all waiting for the quota price to go down and the whole system to stop in 2015 so they need young cows to expand their herd. [. . .] We are very much in favor of producing within the boundaries of society and the environment, welfare, etc. [We are in favor] of producing what you can, there shouldn't be a limit on a country or region or Europe on the amount of milk that you produce because as I said, the numbers speak for themselves, the world will ask for more and if we don't produce it others will produce it, then why not let us produce it? (CO15)*

> *The Dutch dairy sector is part of a global system because we export 20% of our production to countries outside Europe and 40% to other countries within the EU so we are very much export oriented. We are in a position to supply global growing demand, the growth is of 2% per year, 2.5% according to some, especially in Asia because the population is increasing and also the wealth and there are only a few places of the world that can deliver, these are: New Zealand, North Western Europe and North America. [. . .] We want to do that as sustainable as possible, our greenhouse gas production per kilogram of production is quite low, lower than many parts of the world, so why not produce it here? That is the idea. (CO5)*

All interviewees mentioned the environmental impact and societal acceptance as conditions to growth; some however had more sober views about post-quota growth, particularly regarding how regulations might create a limit to production as well as the likelihood of securing a sufficiently high price for the added milk volume.

> *I don't believe in a big increase of milk production due to the legislation from the European Commission on manure use, manure pollution and also animal welfare. There is space in the Netherlands to have some more cows, perhaps 10 to 15% but not more. (C06)*

> *I think the milk production will grow up to 20% and that is a threat for sustainable development, but I think that the government as well as the dairy sector will prohibit that farmers are not sustainable. And how are they going to do it? Well, that I'm not sure yet. But there will be growth. One way or another there will be a connection made between*

the production of milk and the land you have under your milk and that will guarantee more or less that you don't get too far away from sustainable farming. (C014)

Milk production in the Netherlands will grow. In the EU there is not a big growth in demand, if we get more supply, because we are not the only ones that say we are going to produce more milk: Ireland says 'we are going for 50% more milk,' the UK [and] most of North Western Europe. So, we will get more milk in the European market. If people ask me about the dairy market, I always say, well the prospects are good but you should not think about the prospects at world level but think about the prospects for your milk [. . .]. For example the German market is very important for us and there is very strong competition; prices are going down in the German market and the European market is not so favorable at all. Most people were positive about the future because in general demand grows, but I'm not so optimistic because I look at our most important market, the German market. During the last five years there has been very good prices so the farmers are very optimistic and that's why everyone wants to grow. (CO11)

Interviewees identify and voice a key tension—the incompatibility between the overriding logic of production growth and the limits, both cultural and natural, placed by the locality in which the dairy sector is embedded.

Sustainability debate and emerging responses

We now enter the discussion of how the societal and political debate about the social and environmental impact, future viability and potential growth of Dutch dairy unfolded as well as the public and industry responses. Again themes and time continue to be the structuring tenets for this account. Before diving in, it is pertinent to provide a short overview of the key processors that constitute the Dutch dairy processing industry. They play a key role in the development and implementation of industry-led quality and sustainability programs. I will make reference to some of them through this chapter. FrieslandCampina is the largest dairy processor in the Netherlands and the sixth largest in the world (Canadian Dairy Information Centre, 2015b). They have a base membership of 19,000 dairy farmers in the Netherlands, Belgium and Germany. Around 70% of their members are located in the Netherlands and FrieslandCampina process approximately 75% of Dutch milk (Boer, 2015; IFCN, 2012). Other processors (in decreasing order according to volume of processed milk) are DOC Kaas, Bel Leerdammer, Vreugdenhil, Cono Kaasmakers (the object of this case study), Arla Foods Nederland, and Rouveen (IFCN, 2012).

How did the debate emerge? As we discussed previously, the sector was on an intensification path, and the production quota was not the only operational frontier; food quality and the impact of dairying on the environment, including animals, water, soil and air, gained increased attention within debates around the development of the sector (Van Horne & Prins, 2002; Vellinga et al., 2011).

Quality control schemes

After issues related to milk quality started to emerge the sector began to address them through quality schemes. Quality schemes are tools through which standards and goals for the sector have been set and managed. In the early 1980s a national quality system developed from the need to maintain milking machines and address related issues like udder health. The Dutch farmers union, the governmental extension service, and the milking machine manufacturers agreed on a system that would ensure milk quality through periodic testing done by trained technicians at a yearly standardized price per farm. All Dutch farmers quickly adopted this scheme. In parallel international ISO standards were developed on the subject and were also integrated into the Dutch system (de Koning & Huijsmans, 2001).

In 1997, the voluntary quality scheme—Keten Kwaliteit Melk (KKM, Quality Milk Chain)—was introduced by dairy farmers and the dairy industry. A couple of years later it became mandatory for all farmers who wanted to deliver milk to a dairy processor. It complied with EU and national regulations, and it had an emphasis on public health, food safety, animal health and welfare through six modules: medicinal drugs, animal health and welfare, feed and water, milk production and storage, cleaning and disinfection, and environment and waste products (Noordhuizen & Metz, 2005). I will discuss additional and more recent approaches to quality and sustainability later in the chapter, but to illustrate the evolution of this particular scheme, the KKM handbook released in 2015 includes an increasing emphasis on traceability as well as a dedicated module on sustainable dairy farming (de Koning & Huijsmans, 2001; NA, 2015c).

Nutrient management

One thread within the general sustainability debate is the impact of the rapid intensification of Dutch agriculture on nutrient flows and the quality of the soil and groundwater. How did the debate about post-quota growth within environmental limits start? The environmental movement in Europe had increasingly gained momentum through the 1960s and 1970s (Weber & Soderstrom, 2011). Regarding dairy, its impact became increasingly apparent and concerns related to nitrate and phosphorus leaching were visible in academic work already in the 1970s and 1980s (Starmans & van der Hoek, 2007). From the mid-1980s the mounting evidence of the contribution of dairy farming, especially in regions in the East and South of the Netherlands, to the decrease in water quality was recognized as a critical problem both from the scientific and political communities (Oenema et al., 1998; Vellinga et al., 2011). As a member of the EU, the legislative response to the environmental impacts of agriculture in the Netherlands has been largely influenced by the development of pertaining policy at the EU level.

The development of the EU's environmental policy framework, and most importantly the integration of environmental and agricultural policy has been incremental. The first Community Environmental Action Program was approved in 1973 (EEA, 2011). The program was the first actual environmental policy as previous regulations were rather ad hoc and incidental to the main economic goals of the EU. As such, one of its merits rested on having articulated a set of guiding principles, which included emphasis on prevention, the decision that polluters have to bear the costs of prevention and elimination of pollution, and the principle that environmental action has to take place at the most pertinent level (Hildebrand, 1992). As the subsequent Environmental Action Programs were formulated environmental issues gained more public and political weight. In the mid-1980s there was a shift within the EU's policy perspective from separately dealing with agricultural policy (which until then had mostly focused on the intensification of farming) and environmental policy (which had predominantly focused on industry and urban pollution) to the recognition that to gain effectiveness environmental policy needed to be integrated into sectoral policies, including agriculture (Scheierling, 1996; Thomas & Bax, 1995). Within this increasingly institutionalized framework, agricultural water pollution issues were addressed by the Nitrates Directive, which was passed in 1991. This was the first policy that had a direct influence in farming practices (Williams, 1994).

The Nitrates Directive was among the first to address pollution and improvement of water quality at the supranational level by imposing limits to animal manure use (European Commission, 2010). In the early 1990s, it was decided that the nutrient surplus at farm level indicator would be used in the Netherlands to record nitrogen (N) and phosphate (P) flows; an annual farm report denominated MINAS (MINeral Accounting System) assessed N and P surpluses. The calculation was tailored to soil and crop variety and any excess flows resulted in penalties. MINAS offered farmers freedom to take whatever measures they considered pertinent. This regulation promoted an aim rather than prescribing specific measures, it was therefore well received. However, the European Commission stated that this approach indirectly allowed over-the-limit mineral application rates in Dutch farms and penalties were not high enough when levels were surpassed. Consequently, in 2003, the European Court of Justice declared that the Action Program, under which MINAS was nested, was at odds with the Nitrates Directive (Schröder & Neeteson, 2008). The Netherlands then negotiated a derogation from the Nitrates Directive. Derogations are agreements under which Member States are allowed to deviate from an obligation but only when they comply with specific conditions. This derogation consisted of allowing farmers to apply 250 kg of nitrogen from manure instead of 170 kg if they were able to comply with certain conditions.[19]

Another point that was negotiated between the Netherlands and the EU was the agreement to keep total manure levels, meaning the sum of all animal farming sectors, to that of 2002. For phosphate that translated into a ceiling of 172.9 million kilos (ZLTO, 2016). The derogation was originally for the period between 2006 and 2009 but it was extended until 2013 (Zwart et al., 2011). A second derogation was granted through the 5th Action Program Nitrates Directive for the period of 2014-2017 (Gemmeke, 2013). Derogations require a monitoring network as well as the submission of annual reports (Zwart et al., 2011).

As a practical response to the nutrient policy debate the program Koeien & Kansen: Pioniers duurzame melkveehouderij (Cows and Opportunities: Pioneers in sustainable dairy) was launched in 1999. The program has as primary aim the testing and documenting of anticipated environmental measures on the field. The program is a collaboration between researchers from Wageningen UR and its affiliated institutes, the Rijksinstituut voor Volksgezondheid en Milieu (RIVM, National Institute for Public Health and the Environment), and 16 farmers from around the country. The participating farms vary according to type of soil, management, size, and other key characteristics. The focus of the program is to investigate what sustainable and socially accepted dairy farming practices look like at field level. Through pilot implementation exercises farmers are able to experience the impact of such measures on the farm (e.g., changes in costs, technological requirements, etc.) as well as provide evidence of the effectiveness of the proposed legislation (Koeien & Kansen, 2016; Teenstra, 2000). More recently the Kringloopwijzer (Annual Nutrient Cycle Assessment) was developed under the coordination of Koeien & Kansen. The tool was designed to help farmers identify their mineral cycles on farm and provide a better insight into their environmental performance, by mapping for example their ammonia emissions and nitrogen and phosphate surpluses (de Haan, 2012).

As it happened with other debates on the impacts of dairying, the prospect of the milk quota abolition highlighted the challenges connected to increased manure and nutrient management.

> *[The abolition of quotas] means that there is no limitation on the number of animals in the Netherlands. If the dairy industry, but also the feed industry and the industry as a total, the whole chain, if it doesn't pick up or take up this issue well and take care of the manure and the environmental issues from this industry in a good way, then the government will come*

[19] For more information on the conditions that apply to Dutch farmers under this derogation visit: https://mijn.rvo.nl/derogatie

> *up with new regulations on the number of animals. I think that the coming two years will be a big challenge and also a chance for the dairy industry. It is challenging, and it raises questions: Can they take responsibility? Can they implement sustainability on dairy farms? Can they take full responsibility of the amount of manure produced and can't be used on arable farms, on pasture? Or does the government need to come up in two years' time with new legislation to handle the environmental issues of the dairy and animal husbandry? We are in the point of the transition I think. (CO4)*

> *We have now a milk quota system until 2015 in Europe and all economic analyses have indicated that once that system is gone there is a potential for growth in the Netherlands for milk production, but if we want to grow and if we want the government or the society to allow us to grow, we need to prove that we can do that within environmental limits, so that is one other driver for sustainable development. (CO5)*

At the beginning of 2013, the Dutch State Secretary of the Ministry of Economic Affairs, Sharon Dijksma articulated her concern over manure in the light of the expected post-quota growth, indicating that the government would be ready to do a policy intervention on the topic of livestock volume in case the industry failed to show clear resolve on the issue (Vermaas, 2013a). Some months later, dairy farmers committed to using the Kringloopwijzer (Annual Nutrient Cycle Assessment) as part of their efforts to manage manure efficiently; they also forecasted sufficient capacity to deal with surplus manure, which, according to the sector, would make future government policy intervention unnecessary (Vermaas, 2013b). In July of that same year, the livestock sector, represented by the Dutch farmers' organization, the dairy, meat, and feed industries, as well as the primary and intermediary sectors, published a strategy document entitled *Fixed Rates Towards 2020*. In the preface the signatories stated: "We are pleased that the government has given us the opportunity to show what we are capable of" (author's translation).[20] As part of this plan the shared national phosphate ceiling was split by animal sector in order to avoid competition between them, for dairy the agreed ceiling was of 84.9 million kilos (NA, 2013a). Producing beyond the agreed ceilings appeared to be a critical point. It would effectively mean breaching the conditions of the derogation, which would put its status in great danger. The consequences of losing the derogation would imply losses of around 200 million euros for the sector (ZLTO, 2016).

While the total phosphate production in 2014 was under the national ceiling, it was only so by a slim margin and for the dairy sector, a critical point had been reached

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[20] Original text: We zijn blij dat het kabinet ons de mogelijkheid heeft geboden zelf te laten zien waartoe we in staat zijn.

as it exceeded its sector-specific ceiling of 84.9 million kilo by more than one million kilograms. This was linked to the rapid herd growth that happened as farmers prepared for a post-quota future as well as the insufficient reduction of phosphate in feed (Esselink, 2015). The following year, 2015, the total phosphate surpassed the national ceiling for the first time since 2010 by more than three million kilos due to herd growth in all sectors. Additionally, the dairy ceiling was surpassed again by almost eight million kilos (Smit, 2016). These events triggered two key measures: first the Order in Council on Land-based Dairy (in Dutch: melkveewet), and second the phosphate rights (Kooie, 2016).

The Order in Council on Land-based Dairy aims to limit the extent to which farms can expand without having sufficient land to process the extra phosphate (i.e., intensive landless dairy farming). Depending on the amount of phosphate surplus there is a requirement to have a share of it processed outside the farmland (Dijksma, 2015).[21] The other key measure came in July of 2015 when the debate about a potential intervention from the government for livestock volume materialized with an announcement on phosphate rights policy (Vermaas, 2015). Less than a year later, a first version of the policy was communicated. In this first version, the policy outlined how rights were to be granted based on the number of dairy cattle held on July 2nd, 2015 (which was when the policy was announced) and the general standard phosphate excretion per cow. Extensive dairy farms that are not contributing to the phosphate surplus problem were to be compensated with additional phosphate rights. This first proposal included tradeable rights, however transactions were to decrease their value by 10%. The rights based on the 2015 herd size are too plentiful to prevent the sector from going over the phosphate ceiling. Consequently the policy called for a four percent reduction of total herd size between 2017 and 2018 (Van Dam, 2016).

Phosphate rights have been extensively debated (Braakman, 2016) and some farmers have protested these measures; in the last five years they have invested heavily in larger barns that are friendlier to animals and the environment, but they are now unable to pay the additional rights to acquire the cows needed to make their operations financially viable (Redactie Foodlog, 2016). Some critical arguments about phosphate rights revolved around the possibility that the policy would be used not only to negotiate the continuation of derogation but also to ask for an increased national phosphate ceiling. Environmental organizations expressed concern that this would severely deteriorate water quality (Vermaas, 2016c). Dairy is a top manure producer in livestock agriculture (CBS, 2015c) and water quality is already not on target; monitoring results carried out by the Dutch water authorities

[21] Dairy farmers with a phosphate surplus of 20 to 50 kilograms per hectare must have enough land to process at least 25% of the surplus within their farm. In the case of intensive dairy farms at least 50% of a surplus greater than 50 kilograms per hectare must be managed within the land of that farm.

revealed that half the samples of agriculture-specific water failed to comply with the standards set out in the Water Framework Directive (Klein & Rozemeijer, 2015). Another concern was that by making rights tradeable, the already intensive large farmers would be in a better financial position to acquire further rights (Natuur & Milieu, 2016).

Concerns over an easy continuation of derogation or an increased national phosphate ceiling were appeased when in October of 2016 the European Commission rejected the Dutch proposal on phosphate rights based on the fact that it clashed with European rules on state aid (European Commission, 2016a).[22] The reaction from the Dutch dairy sector was to quickly develop a phosphate reduction plan for 2017. ZuivelNL (Dairy Netherlands), the organization representing the dairy supply chain, explains that the plan aims to reduce phosphate levels by 8.2 million kilograms in order to safeguard the derogation for 2017, give a better footing for the negotiations of the 2018–2022 derogation and ease the introduction of phosphate rights in January of 2018. The plan includes measures to reduce phosphate through the feed track, a scheme rewarding those who stop farming, and an additional arrangement under which farmers are driven to reduce their herd size to 4% below their July 2015 level or receive a cut on their milk payment (corresponding to a 90% discount on the milk price over surplus volume). Farmers that did not have a phosphate surplus in 2015 are exempted from reducing their livestock level. Similarly, farmers who have 4% fewer cows in 2017 compared to 2015 are exempted from these schemes and rewarded with a premium (ZuivelNL et al., 2016). In December 22nd of 2016 the phosphate reduction plan was submitted to the ministry of economic affairs for its approval as a universally binding agreement for the whole dairy sector (Vermaas, 2016b).

After the rejection by the European Commission, the policy on phosphate rights was revised. The amount of phosphate rights will now correspond to the phosphate ceiling. The rights were approved by the Dutch parliament in early December of 2016 and are to be introduced in January of 2018 if derogation is successfully secured (Vermaas, 2016a).[23]

This debate illustrates the challenge of setting limits in the face of potential expansion and market opportunities. It also shows the governance challenges around the future development of the dairy sector, as one of the interviewees put it a couple of years prior to the removal of the quotas:

[22] Phosphate rights are regarded as state aid and for the European Commission it is not permissible to negotiate and trade phosphate rights within the period when the Netherlands exceeds the manure production ceiling. Phosphate rights can be negotiable only after the phosphate level has been brought under the limit (European Commission, 2016a).

[23] This section on phosphate rights was updated in early January of 2017.

The government says, 'industry, if you want, we do not need to have new legislation on the number of animals but then you have to take full responsibility.' And I'm sure the dairy industry is aware of this responsibility. I think they have put in a lot of actions and action programs. [. . .] The individual responsibility is different from the sectoral responsibility and the responsibility in the short term is different from the responsibility in the long term. On the long term it's important that all the dairy farmers work on sustainability, that they work on these nutrient issues. On the short term the dairy farmer wants to grow, increase the size of this farm and [is thinking] 'if I can keep twice as many cows next year than this year then I have the production capacity and my neighbors have to take care of the environment.' So the sectoral and the individual responsibilities and activities, and also the long term and the short term clash and that is normally the government who handles this clash, these different scale levels and I'm not sure if the industry can also handle this on a good way. (CO4)

As we can see, nutrient management has been a key topic for the sector for the last 30 years. The main rules on this matter are EU and national regulations. While the industry is involved and some efforts for self-regulation are put forward, the need for oversight and top down coordination to ensure the reduction of phosphate and the sustainable management of nutrients is primarily met by the government.

Safeguarding animal welfare

Another thread of the sustainability debate has been about the effects that increasing herd sizes have on the health and welfare of animals. In the Netherlands several events shocked the animal farming world. In 1997 the Dutch pig industry went through a 14-month crisis due to the outbreak of swine fever. The epidemic severely affected 400 farms and the transmission of the virus caused the loss of almost 10 million pigs (Stegeman et al., 1999; Termeer & Van der Peet, 2009). In 2001, the foot-and-mouth outbreak in the United Kingdom had devastating consequences for the sector and the actors connected to it; around 10 million animals were killed across the UK (Keeling et al., 2001; Mort et al., 2005). In the Netherlands the foot and mouth disease caused the loss of approximately 260,000 animals. This was the area most severely affected after the UK (Bouma et al., 2003). Other critical events such as the occurrence of bovine spongiform encephalopathy (also known as mad cow disease) not only affected the UK but other countries, even if on smaller scale, like the Netherlands (Brown et al., 2001). Further, dioxin related incidents contributed to concerns about the safety of food including dairy products. In 1998, an important occurrence happened when Dutch and German milk samples had abnormally high dioxin levels. This was the result of feed that contained contaminated citrus peel imported from Brazil. The following year in Belgium the sector faced a critical case of high levels of dioxin in eggs, poultry and pork meat, which lead to increasing control measures and monitoring. In 2004, after a routine milk test high levels of dioxin were detected in milk from a Dutch farm. The source was contaminated potato peels, which were used in feed. The incident was small in scale but it reignited concerns about the ability of food supply chains to deliver safe products (Lascano et al., 2011). E.Coli and the extensive use of antibiotics were other sources of concern feeding into the debate regarding animal husbandry (Noordhuizen & Metz, 2005). Food scandals and outbreaks seemed to pull the curtain on the vulnerabilities of animal farming systems especially in terms of food safety and animal health; through these incidents the increasing complexity of food supply chains started to be revealed to the eyes of those outside the sector. The most recent experience for European consumers is the horsemeat scandal of 2013, which was debated widely in the Netherlands as one of the actors involved was a Dutch meat trader (BBC News, 2015c). Although not a safety crisis, the horsemeat scandal spoke of just how complex food chains have become as well as the lack of transparency about the origin, rearing and processing of food related practices. There has been a significant loss of trust in all food organizations involved (Bánáti, 2014; Czinkota et al., 2014) and Dutch consumers' perceptions of animal welfare in intensive animal farming is generally negative (Te Velde et al., 2002).

> *In the Netherlands there is a big sentiment for animal welfare [. . .] so that field of sustainability is pretty much covered, Dutch people will never put that in the shadow. Because of the fact that we have a lot of farmers in the Netherlands, not only for the cows but also for pigs, or chickens, etc. and people live close to each other. Even if people go to live in the city more and more, well, the fields or the farms are not really apart from the city. People do not completely know how everything works because they live in the city but they have an opinion about it and that has put animal welfare high on the agenda. (CO13)*

A response directly addressing animal welfare concerns related to the food industry came in 2007: The Beter Leven keurmerk (Better Life label) was introduced by the Dutch animal protection organization Dierenbescherming (Dierenbescherming, 2016b). This organization has been operating since 1894 and is the largest animal protection organization in the Netherlands (Postcodeloterij, 2016). The Beter Leven label rests on a three-star ranking system; the number of stars is positively correlated to animal health and welfare. The aim is to encourage consumers to opt for less but better animal products. It also engages businesses by offering a gradual approach to more animal friendly practices. The label is currently available for laying hens, broilers, pigs, beef cattle, calves, and rabbits. By 2015, over 1,000 farms and 260 food processing organizations had adopted the label principles (Dierenbescherming, 2015a); this includes retailers like Lidl that in 2013 adopted the system in order to improve the standards for their private label pork products and in 2015 migrated their entire meat product offer to products with at least one Beter Leven star (Dierenbescherming, 2015b; NA, 2013b). In terms of dairy products, concerns about the prospect of post-quota increase in scale of farming, as well as the decrease in grazing practices, drove Dierenbescherming to develop the criteria for the Beter Leven dairy label in 2016 (Dierenbescherming, 2016a).

Grazing

With the growing scale of dairy farming, the debate around grazing has funneled concerns related to animal health and welfare, as well as the impacts on traditional rural landscapes. Grazing is positively associated with animal health and welfare as it allows cows to display their natural behavior (Krohn et al., 1992; Regula et al., 2004); in addition, the image of a landscape where cows are grazing is highly appreciated by Dutch society (Vellinga et al., 2011). To further contextualize this debate, the Netherlands has had a political party that focuses on animal rights and welfare since 2002. Partij voor de Dieren (PvdD, the Party for the Animals) holds representation both nationally as well as at the European Parliament (Partij voor de Dieren, 2015). In the Netherlands the percentage of cows grazing has dropped from 95% to 69% between 1990 and 2014, although it must be noted that the rate of change has slowed in the last 10 years (CBS, 2015b; Vellinga et al., 2011).[24] While looking at the intensification of dairy in the Netherlands, Van Apeldoorn and colleagues (2013) found that higher milk production (derived from higher yields per cow and an increase in number of cows per farm) was significantly associated with changes in the landscape such as larger fields, fewer hedgerows and a decrease in the number of grazing days. But how are herd size and grazing related? Dutch farmers identify grazing as very challenging for large herds. Allowing larger herds to graze implies more complex operations. In farms equipped with milking robots—machines to which cows go to voluntarily get milked—the distance that cows have to cover can affect milking frequency; if cows have to transit longer stretches to get to the robot it is likely that they will get milked less often.[25] Even when the milking process can be successfully managed, accurate monitoring of the herd's diet, especially for high yielding cows, can be hard to achieve if they are grazing freely. The potential impact on labor productivity is another reason why farmers are driven to more indoor-based systems (Vellinga et al., 2011). The relation between herd size and frequency of grazing in the Netherlands can be observed through the data on actual practices; we see that of all farms with 40 or fewer cows, 94% of them graze their animals, while this rate goes to 84% for farms of herd sizes between 40 to 80 cows. When it comes to the largest farms, with 160 cows or more, then only 49% allow their herds to graze (CBS, 2015b).

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[24] The percentages refer to the proportion of lactating dairy cows that had some form of grazing. The Centraal Bureau voor de Statistiek does not discriminate in terms of minimum number of days or hours of grazing.

[25] It is unclear as to how this affects milking yield or animal welfare.

> *Grazing is an interesting conversation and a big discussion also within the sector. If it's always better for the cow is unclear but in general it's good for the animal to walk on the grass. People appreciate grazing so it's important for the acceptance of the dairy sector within society. (CO14)*

In 2002, CONO was the first dairy processor in the Netherlands to introduce a price premium of €0.50 per 100 kg of milk to stimulate their farmers to allow cows to graze as much as possible. This decision however was driven by concerns about the quality of milk and therefore of their cheese. On their website at the time and under the heading 'cows in the field, healthier cheese,' CONO cited a study carried out by Nizo Food Research, Wageningen University and its affiliated Institute on Livestock Research that confirmed a range of health supporting features of grassfed milk.[26] CONO motivated their decision to pay a grazing premium as a strategy to help create an optimal healthy cheese (CONO, 2002). While the grazing premium was new for the sector, the relationship between feeding system, milk composition, and cheese characteristics had been well documented with studies showing a positive relationship between pasture-based feed and milk quality (Christian et al., 1999; Elgersma et al., 2006; Romanzin et al., 2013). It was therefore not entirely unexpected to create an incentive around the practice especially for a processor that specializes in high-quality cheese products. Additionally the decision to support grazing practices is also related to the cost structure of operations, as it is the most inexpensive feed system (given that farmers have access to it, which in the Netherlands around 95% of dairy farmers do. CO15). The measure was celebrated by animal rights organizations (NA, 2002) and given the increasing consumer preference for pasture-based dairy products (Descalzo et al., 2012) and the general appreciation for animal welfare programs, it also connected with consumer demand and the societal debate in general. Not long after, in 2004, CONO featured a commentary from Dutch historian Maarten van Rossem on their website. The historian's text on cows grazing in the fields as part of the national heritage was used as an additional argument for CONO's support for grazing (CONO, 2004).[27]

The debate about grazing continued to develop. In 2005 Dierenbescherming, Natuur en Milieu, Milieudefensie, and Natuurmonumenten, a group of authoritative NGOs in the field of nature preservation and animal welfare, presented a manifesto entitled 'Koe zoekt wei' (Cow looking for a meadow) in which they expressed their concern for the decrease of grazing and called for a compensation to farmers whose cows grazed outside (Dierenbescherming et al., 2005). The manifesto was mainly directed to the Nederlandse Zuivel Organisatie (NZO, Dutch dairy processors association) as well as retailers through the Centraal Bureau Levensmiddelenhandel

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[26] To be clear, I refer to the archived version of the www.cono.nl website as it appeared online in November of 2002.

[27] I refer to the archived version of the www.cono.nl website as it appeared on January 2004.

(CBL, Dutch food retail association) and urged them to stop the price war on milk. As follow up and to show the support from consumers, 45,000 statements were presented to CBL to show consumers' willingness to pay more for milk that came from cows that were grazing (Radar, 2006; Trouw, 2006).

Another side of the grazing debate was the growing amount of soy needed for feeding. Soy is a key ingredient in animal feed and the intensification of dairy (and more indoor feeding) have driven an increase in soy demand. Growth in soy demand started to drive deforestation in soy-producing areas such as Brazil (Gerber et al., 2013; Steinfeld et al., 2006). Although the use of animal feed is low in Dutch dairy farming (approximately 10% of a cow's daily diet) (NZO, 2016b), several campaigns from Dutch NGOs pointed to the linkages between its use and the intensification trend in dairy farming. The NGO Natuur en Milieu demonstrated outside the premises of FrieslandCampina in 2008 advocating for responsible sourcing (CO4). This prompted a commitment to modify sourcing practices in order to avoid buying soy from newly deforested areas (FrieslandCampina, 2008). Later on, the use of soy certified by the Round Table on Responsible Soy (RTRS) standard became one of the sector-wide goals (DZK, 2010).

In 2007 Stichting Weidegang (Foundation for Grazing) was established by the Natuurmonumenten organization (nature conservation), the Centraal Bureau Levensmiddelenhandel (CBL, Dutch Food Retail Association), and Friesland Foods (a predecessor of FrieslandCampina) (CBL, undated; Faber, 2007). It was created to improve the visibility of cows in the Dutch landscape by supporting the grazing of cows. This platform focuses on knowledge dissemination through courses, lectures, and by providing farmers with one-on-one advice on grazing. Stichting Weidegang is now supported by additional parties including NGOs, dairy processors and farmers' organizations (PPP Agro Advies, 2014; Stichting Weidegang, 2015a).[28] Also in 2007, FrieslandCampina introduced the Weidemelklogo (Grassfed milk logo). This logo was used on products that were made with grassfed milk in order to support grazing (this included a small price premium for farmers of €0.05 per 100 kg of milk) and highlight to trade partners and consumers the practices behind those

[28] Stichting Weidegang is an initiative of NGOs Natuurmonumenten (nature conservation) and Dierenbescherming (animal protection); dairy processors FrieslandCampina, CONO Kaasmakers, and Rouveen; Centraal Bureau Levensmiddelenhandel (CBL, Dutch Food Retail Association); and farmers organizations Nederlands Agrarisch Jongeren Kontakt (NAJK, Young Dutch Farmers Organization), Nederlandse Melkveehouders Vakbond (NMV, Dutch Dairy Farmers Organization), and Land- en Tuinbouw Organisatie Nederland (LTO, Dutch Farmers Organization). Stichting Weidegang is funded by ZuivelNL which is a members organization representing the dairy chain, currently is constituted by primary production (LTO, NMV) and Nederlandse Zuivel Organisatie (NZO, Dutch dairy processors association).

products.[29] In 2012 the Weidemelklogo was transferred to Stichting Weidegang. With this transfer the logo was available for use to other Dutch dairy producers and retailers for their private label products whenever they complied with the grazing requirements. Finally, in late 2015 the logo became available for non-Dutch dairy products. The participating supermarkets requested this change to allow the use of the logo on products that come from outside the Netherlands and comply with the grazing requirements (Boerenbusiness, 2015; Stichting Weidegang, 2015c).

> *[Grazing is a] major issue in the sector right now. [There is] also a lot of debating within the farmers. Some do not agree [with grazing]; they say that their animals are healthier; they are more efficient and have less nutrient losses than their neighbor who is grazing his cows. From a technical point of view it is a complex issue but if you see it from the point of view of society, it's very clear. Otherwise the big risk is that you get in the same discussion as the pig farming, and the pig farming has a very bad reputation and it's almost so bad that you cannot repair it at least within the traditional sector.[30] Dairy farming has quite a positive image and we should now be aware that we don't lose that image. (CO14)*

The summer of 2012 saw a peak within the grazing debate. Convenant Weidegang (a covenant on grazing) was signed by 50 parties in the dairy chain. The covenant reiterated key points for the sector: Cows are characteristic of the Dutch landscape and grazing supports the welfare of cows by allowing them to display their natural behavior. The agreement aims to keep grazing at 2012 levels (i.e., 81.2% of farms practice grazing) by financially supporting farmers who graze, providing technical advice, and offering general support for this practice from the position of each of the signatories. The group of signatories included dairy farmers' organizations, dairy processors, retailers, NGOs, representatives from the government, education, and science, feed suppliers, banks, veterinarians, and breeding service representatives (DZK, 2012a). In 2012 the grazing premium was raised or introduced by all major dairy processors, which created a reward for farmers who keep cows outside. CONO Kaasmakers commemorated ten years of having a price premium for grazing. They announced that to maintain their levels of grazing—which at the time were of 90% compared to the national rate of 70%—their premium was going to be raised to €1 per 100 kg of milk (Boerenbusiness, 2012). Other dairy processors like Bel Leerdammer, DOC Kaas, Vreugdenhil, and Rouveen introduced or reinforced their

[29] Milk is considered to be grassfed when it comes from cows that graze at least 6 hours a day for a minimum of 120 days per year.

[30] The interviewee is referring to the fact that compared to dairy, the pubic perception about pig and poultry farming sectors is rather negative. The number of scandals and the degree of intensification of these sectors has raised questions about animal health and welfare, as well as food safety (Boogaard, 2009).

grazing policies in various ways (Stichting Weidegang, 2012). FrieslandCampina also furthered its reward system for grazing and in recent years has taken a series of steps in this respect. First, in 2012 they increased their payment from €0.05 to €0.50 per 100 kg of milk. In addition, they created a scheme for partial grazing which was designed for farmers who do not fulfill the grazing requirements but do graze at least a quarter of the farm's herd for a minimum of 120 days. Partial grazing was remunerated with a premium of €0.125 per 100 kg of milk. In 2015, they announced that to further encourage farmers it would raise the grazing premium to €1 euro per 100 kg of milk and the partial grazing premium to €0.46. FrieslandCampina also decided to partially finance this increase by retaining €0.35 per 100kg of milk from every dairy farm; in this way member farmers who do not put their cows out to graze are said to contribute to maintaining grazing practices (FrieslandCampina, 2015a).

In 2013, after what had been a somewhat buzzing year in the grazing debate, some flags were raised. Dierenbescherming—an NGO with a focus on animal protection and a signatory of the agreement—expressed its concern about the voluntary nature of the arrangement, arguing that the intensification trend in Dutch dairy farming was moving at such pace that only a mandatory grazing regulation would be able to counter the declining trend (Van der Linde, 2013). That same year, a report titled Grazing in North Western Europe from the Landbouw Economisch Instituut (LEI, Agricultural Economics Institute affiliated to Wageningen UR) indicated that by 2025 grazing rates could be substantively lower under a scenario of no intervention (i.e., no private or public policies) (Reijs et al., 2013).

> *In the Netherlands [grazing] is very important because people want to see the cows walking outside; it's part of our cultural heritage and natural environment. (CO12)*

By 2015, the effectiveness of the covenant—namely, the state and trends in grazing—became the focus of the debate. The LEI presented an evaluation report assessing the progress against the sustainability goals set out for the sector (more on these sector-wide goals later in the chapter); regarding grazing, the assessment concluded that despite efforts to encourage its practice through the foundation on grazing and the collective commitment as well as actions of signatories of the covenant, the declining trend had not yet been reversed. The goal of reaching and maintaining the rate of 2012 had not been achieved (Stichting Weidegang, 2015b). It should be noted that by 2015, three years after its launch, the number of signatories of the covenant changed to 66. This includes an exit by supermarket chain JUMBO from the agreement, as well as the addition of the Nederlandse Melkveehouders Valkbond (NMV, Dutch dairy farmers' organization), the Nederlands Agrarisch Jongeren Kontakt (NAJK, Young Dutch farmers organization), and additional dairy processors and dairy industry suppliers (Stichting Weidegang, 2015b).

In December of 2015, Milieudefensie another environmental NGO signatory of the covenant issued a statement to express its disappointment with the progress. The NGO stated its low confidence that the goals of the covenant could be achieved without any further measures and launched an ultimatum (Milieudefensie, 2015). The dairy sector's immediate response focused on the overall percentage of farms applying grazing, which albeit still under 2012 levels, had increased from 77.8% in 2014 to 78.3% in 2015 (DZK, 2015a).

This seeming increase did not appease concerns. First, the percentage of farms that apply grazing is less telling as an indicator than the total number of cows grazing. As was mentioned before, farms with larger herds tend to apply grazing less often than farms with smaller herds. Therefore the percentage of cows grazing is significantly lower than the percentage of farms engaged in the practice. Further, a closer look revealed that the percentage of farms practicing full grazing (6 hrs. per day and 120 days per year) had actually decreased, while the reason why grazing in total had risen was the result of an increase of partial grazing (DZK, 2015a). On its ultimatum, Milieudefensie conditioned its participation to the achievement, by July 1st, 2016, of several conditions linked to an increase in the rate of grazing in general and specifically engaging farms with permanent indoor housing, increased grazing premium for farmers, a commitment from retailers (specifically Dutch market leaders: JUMBO and Albert Heijn) to increasing their offer of grassfed products, as well as the abolition of the quantum supplement (kwantumtoeslag in Dutch) which is a price supplement paid by dairy processors to farmers based on quantity produced (FrieslandCampina, 2016) as it is argued that this supplement drives intensification and favors already large farms (Milieudefensie, 2015; NieuwsGrazer, 2016).

By July 2016 Milieudefensie communicated that it was stepping out of the grazing covenant citing that after four years there were fewer, not more, cows grazing and the trend seemed poised to continue. They added that the industry and government had failed to sufficiently support the goals of the covenant especially within the discussion of phosphate rights, which in practice will require faster and more precise manure management thus potentially driving indoor housing. The NGO reiterated that grazing, which is a feature of dairy farming that is of great significance to society, should be supported by creating a legal, as opposed to voluntary, framework and ensuring a fair price for farmers (Milieudefensie, 2016). As seen with the overlapping debate on phosphate, the evolution of the grazing discussion illustrates an evolving dialogue between the dairy sector and a wide range of stakeholders and the setting of contested operating limits.

Reduction of antibiotic use and resistance towards mega farms

Other interrelated debates are that of antibiotic use and the development of mega farms (megastallen in Dutch). The intensification of farming, with its focus on crossbreeding and increase in productivity, led to an escalation in antibiotic use in farm animals, including dairy cows. This practice is problematic as these chemicals can leak into the environment and affect terrestrial and aquatic organisms (Watanabe et al., 2008). Additionally, the widespread use of antibiotics compromises public health through the rise of antimicrobial resistance (AMR) (Groot & van't Hooft, 2016). Edith Schippers, the Dutch minister of health, welfare and sport, described antimicrobial resistance as "a global problem on par with, if not more serious than, nuclear security, international terrorism and climate change" (The Alliance to Save Our Antibiotics, 2015, p. 19). The World Health Organization also characterized AMR as a serious public health concern; in their 2014 report on the topic, Dr. Fukuda, assistant director-general of health security, emphasized the urgency of the problem by stating that "a post-antibiotic era -in which common infections and minor injuries can kill- far from being an apocalyptic fantasy, is instead a very real possibility for the 21st century" (WHO, 2014a, p. IX).

While not necessarily new, within Dutch dairy, this debate has gathered significant public attention in the last 13 years. In 2004, MRSA (Methicillin-Resistant Staphylococcus Aureus) was found in a Dutch patient, the child of a pig farmer.[31] This investigation uncovered the relation between antimicrobial resistance and exposure to pigs and it also demonstrated animal-to-human as well as human-to-human transmission (Voss et al., 2005). Further studies confirmed the exposure to calves also carried the risk of contracting MRSA. The risk for patients exposed to pigs and calves is actually 1,000 times higher than that of the general population in the Netherlands (Van Rijen et al., 2008).[32] Additional occurrences of ESBL-producing bacteria in the Dutch poultry chain (Leverstein-van Hall et al., 2011) continued to fuel medical, public and political concern.[33]

> *You also have the discussion about the use of antibiotics and we have to reduce it by 50% in the next years. I think that these are good trends because otherwise we lose our license to exist. (CO6)*

As a response, in 2008, the ministry of agriculture, nature and fisheries, the ministry of public health, the veterinary association of the Netherlands as well as animal sector representatives signed a memorandum of understanding in which they expressed

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[31] On later inspection the parents of the child, a 6-month-old girl, were found to be MRSA positive too. Subsequent cases included pig farmers in other regions as well as veterinary staff.

[32] To put this information into perspective, in the year 2000, the MRSA rate in patients admitted to Dutch hospitals was 0.03% and the patient group most at risk was those who had been transferred from foreign hospitals. For this group the carriage rate was close to 5%, which was 150 times higher than the carriage rate for the general population in the country.

[33] These bacteria are able to produce an enzyme that breaks down and renders ineffective commonly used antibiotics such as penicillin and cephalosporins. The most common ESBL-producing bacteria are some types of strains E-coli and Klebsiella peumoniae.

their commitment to increasing the monitoring of antibiotic use in the cattle, pig, and poultry sectors and developing strategies to reduce its use (Kuipers et al., 2016). In the period between 2008 and 2011 the policy on antibiotic use was further articulated. The reduction targets were set (with a 2009 baseline) at 20% less use by 2011, 50% by 2013, and 70% less by 2015. The approach for this public-private partnership rested on increased transparency of use per herd and veterinarian, as well as clear performance accountability for farmers and veterinary staff (Ministry of Economic Affairs, 2014). Kuipers et al. (2016), who conducted an eight-year study on antibiotic use in dairy herds in the Netherlands, describe the use trend by differentiating three periods: Between 2005 and 2007 there was an increase in use which coincided with little public debate about the consequences of antibiotic use in farm animals; the period between 2007 and 2010 was characterized by an emerging public conversation and problem awareness as well as the stabilization of antibiotic use in farms; finally between 2010 and 2012 there was a decrease in antibiotic use which aligns with increasing societal concerns. The authors argue that a combination of restrictive use policies as well as pressure from the public debate seem to have been effective in reducing antibiotic use. Best practices in cow management and improving herd conditions are argued to be key factors in further reducing antibiotic use and achieving responsible practices in farm animals. By 2015 the use of antibiotics in animal farming has been reduced by almost 60% (Autoriteit Diergeneesmiddelen, 2016), which includes a sharp decrease of more than 90% in third and fourth generation antibiotics (cephalosporin) (Ministry of Economic Affairs, 2014).

Finally, there is also a debate about mega farms. Mega farms in the Netherlands have been a debated topic for the last two decades and societal opposition against mega farms (in all animal sectors) has been substantial. For example, in 2008, the Party for the Animals (Partij voor de Dieren, PvdD) organized a protest in the province of North Brabant through which 33,000 citizens signed the document entitled 'Megastallen-Nee' (No Mega Farms) (Milieudefensie, 2011). Similar protests occurred in other provinces of the Netherlands and against particular projects such as the Nieuw Gemengd Bedrijf (New Mixed Company), a mixed mega farm designed to house 35,000 pigs and 1.2 million chickens in the province of Limburg. This mega farm faced stark opposition from citizens starting in the initial planning stages more than ten years ago until the final building permits were granted in 2015 (Eindhovens Dagblad, 2015; Horlings & Hinssen, 2014).

Another illustration of the anti-mega farm sentiment came in 2010 when more than 100 academic professors drafted the manifesto Pleidooi voor een duurzame veehouderij: Einde aan de georganiseerde onverantwoordelijkheid (Plea For Sustainable Livestock: The end of the organized irresponsibility) where they urged the government to take action in the development trend towards mega farms in the livestock sector. The document was later signed by 250 more professors, 520 scientists, 17,000 citizens, and more than 700 other actors such as companies, farmers, and NGOs (NA, 2010). As with other debates, the one on mega farms came center stage as the quota abolition neared. A study published in February of 2015 (just two months before the removal of the quotas) identified a growing trend in all animal farming sectors: The number of mega farms had almost tripled between 2005 and 2013. In the case of dairy, the number of farms with herd sizes of 250 and above went from 103 to 317 in that period (Gies et al., 2015). The growth in dairy herd size was ascribed to the prospects of growth related to the quota removal (Remie, 2015). Some civil society organizations argued that the end of the production cap would drive more indoor housing (and thus less grazing) and heavily compromise animal welfare (Redactie Foodlog, 2014).

While the dairy sector enjoys a relatively good reputation, the prospects of unchecked post-quota growth heighten public concerns about the future of dairy. Thus, if we put together the threads spun so far we can see different building blocks forming a broader more comprehensive debate about the current state and future sustainability of dairy.

> *In the nineties, we started with environmental aspects so it was all about the environment. It was about the processes so concerns were about energy efficiency because of the higher energy prices, about using water more efficiently, about waste and so on [. . .]. The nineties were spent on those kinds of issues, focused on the processing part. Then in 2004 to 2005 we were more aware about the expectations of the society [. . .] so we had a lot of discussions for example with Greenpeace, also with other NGOs about our role in society. From that time we were looking more outside, from the outside in, and not only inside. (C07)*

The sector recognizes that beyond their legal obligations and internal performance metrics there is a license to operate granted by society. In the previous sections we have seen a withdrawal of dairy-related market and price policies in parallel to an increase in environmental parameters as well as the introduction of animal welfare standards. This has been driven by the increasingly prominent norms and expectations on animal health and welfare, human health (through food safety and the safe use of antibiotics in agriculture), as well as the preservation of natural resources and the cultural landscape. In fact in a study on the sustainability of dairy as a socio-cultural concept, Boogaard et al. (2008) found that, beyond the production of food, Dutch citizens attach a series of values to dairy farming. Out of this value mapping came aspects such as animal health and welfare, nature preservation (i.e., wildlife around, and diversity on farm), landscape aesthetics and calmness, environmental friendliness (e.g., waste water treatment), farming culture (i.e., family farm, lifestyle, cozy ambiance[34]) and the role of farming in national culture; these hold significant value for Dutch society.

Before we move on to further describing the responses coming from the sector as well as individual dairy processors, it is important to note that the threads of the sustainability debate that have been described here are not the *only* ones; what is important for this case is that these are certainly *relevant* lines of the debate under study.[35]

Integrated responses from the sector and dairy processors' sustainability programs

So far I have described some responses from the dairy sector as well as specific programs from individual processors (e.g., on grazing). Now I will continue with what are the more integrated sustainability responses since these make for an important part of how the sector has developed in the last years. I will use a chronological approach to describe the co-evolution of individual processors' programs, farm sustainability management tools, and the development of a sector-wide sustainability agenda.

In 2007, Caring Dairy the program developed and piloted in the Netherlands by Ben & Jerry's was adopted by CONO when the processor became the milk provider for their European production (Heida, 2007). The program was labeled a pioneer in the sector:

> *Fifteen years ago it was just nothing happening and then it came with Ben & Jerry's and the Caring Dairy program in CONO, that gave a boost, an impulse [. . .]. I'm sure CONO with the Caring Dairy program is far ahead at the moment. (CO4)*
>
> *As far as the industry goes, CONO is a front-runner because they had to develop something when they started working with Ben & Jerry's. (C14)*

The Caring Dairy program was developed, four years prior to being adopted by CONO, in close collaboration with farmers and other supply chain actors, which was a first for the sector. The core aims as it was developed were to secure (more) sustainable dairy production and to produce guidelines for sector-wide sustainable dairy farming practices. The emphasis was, and still is, on continuous improvement

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[34] In Dutch: gezelligheid.

[35] Topics such as biodiversity, GMOs and feed, as well as climate change are debated and you will see them featured in processors' policies but these discussions were relatively less prominent during the debate mapping done for this study.

around core indicators (i.e., animal welfare, energy and climate, biodiversity, social and human capital, farm financials, soil health, soil loss, nutrients, water, local economy, and pest management). Participating farmers work iteratively with baseline measurements of key metrics and the development of improvement plans. Another central element of the program is the workshop offer to farmers which includes experts on each of the program's topics discussing relevant issues (Van Calker et al., 2005). After the Caring Dairy program was adopted by CONO it went from a participation base of 11 farmers to almost 500 CONO farmers after scaling up the program (CO8). A price premium (independent from the grazing premium CONO has offered its farmers since 2002) was attached to the participation on the program. Finally, the tools developed within and for the Caring Dairy program such as the Koe Kompas (Cow Compass) and other management and measurement instruments have been made available for the entire sector.

Regarding sector-wide developments, in July of 2008 the Duurzame Zuivelketen (DZK, Sustainable Dairy Chain) was introduced. The DZK is the sustainability platform for the dairy sector; it is a joint initiative of the Land- en Tuinbouw Organisatie Nederland (LTO, Dutch Farmers' Organization) and the Nederlandse Zuivel Organisatie (NZO, Dutch Dairy Processors Association). NZO member companies process 98% of all Dutch milk and 70% of Dutch dairy farmers are represented by LTO Netherlands. The DZK falls under ZuivelNL (Dairy Netherlands), the organization representing the dairy supply chain (DZK, 2016b). Finally the DZK is a member of the Dairy Sustainability Framework, an initiative to develop a global framework for a holistic approach to sustainability (NA, 2016a). The platform facilitates the articulation of sustainability goals, yearly reviews on sector-level progress, as well as knowledge sharing about available management and measurement tools. A review of their yearly reports, between 2009 and 2015, shows several developments:

› Key themes, and the goals nested under them, have become increasingly specific. For example the initial themes of energy and climate, animal welfare, and landscape and environment have evolved to be the current four themes of development towards climate neutrality, continuous improvement in livestock health and welfare, preservation of grazing, and protecting biodiversity and the environment. Additionally, the further detailing of goals can be illustrated by the sector's objectives regarding manure, fertilizer, phosphate and ammonia. What started as general statements about the need for the sector to keep working on their reduction in early years became fully articulated goals described in the 2014 yearly review report on respecting the phosphate ceiling and achieving a five-thousand-ton decrease of ammonia by 2020. This is not an entirely unexpected development for several reasons: The DZK was the first sustainability platform within the livestock sector, the sustainability debate continues to evolve, monitoring of progress requires reflection on measurable variables, and also because the platform reviews its goals periodically (DZK, 2010,2015b,2016a).

- The debate around dairy is reflected in the evolution (and wording of) themes and general framing of goals. A clear example of this is how the grazing debate is first mentioned as a relevant factor under the animal welfare heading in the 2009 report (DZK, 2010); later the goal of maintaining current grazing is articulated in 2011 (DZK, 2012b) and this is followed up by treating grazing as a separate theme with a specific goal (achieving 2012 grazing levels) from 2014 onwards (DZK, 2014a). Additionally, as the debate around post-quota growth gained increased attention in the public debate so it did on the platform's reports. The 2011 report introduction reads "The Dutch Dairy Association and LTO Netherlands find that a number of structural changes in the dairy sector (such as scaling, growth of milk production per cow and abolition of milk quotas) call for action in the field of sustainability" (author's translation) (DZK, 2012b).[36]

- As part of the periodic review of sector goals, some have been revised to a lower level of ambition. In terms of energy, the initial goal was to produce energy neutral by 2020 and reduce greenhouse gas emissions by 30% compared to 1990 (DZK, 2011). In 2014 this goal was reformulated to 20% reduction of greenhouse gases compared to 1990. The performance of the sector on this theme, however, was positively assessed by the Landbouw Economisch Instituut (LEI, Agricultural Economics Institute) in 2015.

The DZK specific goals for the Dutch dairy sector are stated (at the time of writing) as follows:

1. Development towards climate neutrality
   - Specific goals towards 2020: 20% reduction in greenhouse gasses; 16% sustainable energy production in the dairy chain; 2% yearly improvement on energy efficiency.
2. Continuous improvement in livestock health and welfare
   - Lowering antibiotic resistance through antibiotic use that is in line with the Netherlands' Veterinary Medicines Authority standards.
   - Six-month increase in the average lifespan of cows
   - Development of animal welfare monitoring system and setting of goals by 2017.

[36] Original text: De Nederlandse Zuivelorganisatie en LTO Nederland vinden dat een aantal structurele ontwikkelingen in de zuivelsector (zoals schaalvergroting, groei van melkproductie per koe en afschaffing van het melkquotum) vragen om stappen op het gebied van duurzaamheid.

3. Preservation of grazing
    › Maintaining grazing levels at 2012 rate (i.e., 81.2% of farms practice some form of grazing), at their 2012 distribution of 73.6% full grazing and 7.6% other form of grazing as much as possible.
4. Protecting biodiversity and the environment
    › 100% use of responsible soy (i.e., RTRS or similar) by 2015.
    › Maintain phosphate and ammonia levels within the environmental standards.
    › No net reduction of biodiversity and development of monitoring system and goals by 2017.

(DZK, 2014a,2016a)

The DZK has played a key role in articulating sector-wide goals, showcasing individual dairy processor's approaches and programs, tools, and special recognitions (e.g., when a dairy processor receives an award for its performance in certain area). It has also become a focal point for sector-wide sustainability information, which facilitates access to such content.

A development connected to all livestock sectors was the introduction of the Uitvoeringsagenda Duurzame Veehouderij (UDV, Implementation Agenda for Sustainable Livestock) in 2009. The UDV emerged as a follow up to the 2008 document from the then minister of agriculture on the future on livestock farming, which emphasized the need to ensure the sustainability of the sector in the next 15 years. As a partnership between chain actors, civil society and the government, the UDV has delineated several priority areas of work that are considered at the core of a sustainable sector. The UDV reports annually to the Dutch Parliament on progress made on the platform's six priority areas (these are system innovations, welfare and health, social integration, energy, environment and climate, market and entrepreneurship, and responsible consumers). It also reports on progress by individual livestock chains (i.e., dairy, pork, and poultry) as well as on aspects connected to livestock farming (such as animal housing, antibiotic use, minerals and manure, soy, and sustainable food for consumers) (Uitvoeringsagenda Duurzame Veehouderij, 2015). Given that the platform focuses on sustainability issues that pertain to all animal sectors, it has the potential to facilitate collaboration across them; the degree to which collaboration has materialized is, however, still embryonic. Cross-sectoral action currently occurs more often at the networking level; the UDV platform serves as a meeting point for the different actors related to livestock and creates the space for them to be informed about the initiatives, approaches and results happening in other livestock sectors (CO27).

It was not too long after the industry and farmers identified the sector-wide sustainability ambitions for the DZK that other processors besides CONO started to develop sustainability programs of their own. As introduced earlier, FrieslandCampina

(FC) is the top dairy processor in the Netherlands, as it processes around 75% of Dutch milk (IFCN, 2012) and has approximately 13,500 member farmers.[37] It is then, for the purpose of this study, relevant to review how their sustainability agenda and program evolved in the last five years. Given its position within the sector it is perhaps not surprising that in 2009 FC stated that they were committed to working towards the wide-sector sustainability goals of DZK. From then on, sustainability started to emerge as a key topic in the strategy and annual reports of the organization. In 2010, the dairy processor had adopted the further specified DZK goals as its own and included their sustainability agenda as a key component of their new business strategy: Route2020 (DZK, 2011; FrieslandCampina, 2011). It was in 2011, when FrieslandCampina developed a farm sustainability program in collaboration with farmers called Foqus Planet. In order to have a single integrated approach to manage quality, food safety, and sustainability, the Foqus Planet program was integrated into their existing quality system (Foqus). A central component of the program at this stage was to offer farmers several options for knowledge exchange on energy, animal health, or grazing via workshops, visits to model farms, and on their online platform (FrieslandCampina, 2012). Also, it was around this time when FC increased its grazing premium, which was part of their Foqus Planet measures (DZK, 2012b). After having introduced their program, the year that followed FrieslandCampina focused on the implementation of Foqus Planet, which included a performance-based reward system. The implementation of the program was done through a step-by-step approach, with energy as a first area of focus.

> *Step by step, for example, we started with energy efficiency at farm level. The first step is that farmers are obliged to have an energy audit to see what improvements they can make. The next step can be for instance in over two years that we ask the farmers to have a two percent energy improvement per year [. . .] they have to prove that they improve the energy. Next step can be that we ask the farmers, 'well, if you want to have more cows you have to do it climate neutral, you have to do it with a manure digester,' for instance. That is a step by step approach. (CO7)*

At this point in time, FC developed an energy scan tool, which was made available not only to their member farmers but also to other dairy processors, which allowed not only a better insight into energy consumption on the farm but also visibility about how the farm compares to other farms with similar business models (DZK, 2013). By 2013, the energy scan had been completed by 2000 farmers, almost 1,300 members had attended 150 workshops on various farm sustainability topics, and two pilot schemes were conducted. On the first one, two groups of farmers piloted the Koe Kompas (Cow Compass); an animal health tool developed by farmers and animal health experts within the Caring Dairy program. Following the

[37] The author's estimation of the share of Dutch FrieslandCampina farmers.

pilot, FC decided to add it to the Foqus Planet next to their existing animal health monitoring system. The second pilot scheme included the use of the Kringloopwijzer (Annual Nutrient Cycle Assessment) by 120 farmers. In order to encourage its use, FrieslandCampina decided to also add this tool to Foqus Planet. Additionally it stated that as of 2015 the use of the Kringloopwijzer would be mandatory for all farms with manure surplus (FrieslandCampina, 2014b). After having introduced and rolled out their sustainability program, FC decided to make 2014 the year of its evaluation and redesign. The key output of this process was as described in their year report, a move from awareness raising and initial implementation to measureable and remunerated performance:

> *The firming-up of the goals related to sustainable dairy farming: animal health and welfare, biodiversity and the environment and, finally, climate and energy. The results, in the form of indicators, have been made very clearly measurable. In this way we have moved from a system with which we stimulate sustainability efforts (in the first three years of Foqus Planet, 2012 to 2014) to a system with which, in the coming three years, we will financially reward sustainability results (from 2015 to 2017) (FrieslandCampina, 2015b).*

The reviewed Foqus Planet includes four themes: Farm, cow, feed, and milk, and three parts: basic requirements (hygiene, milk quality and safety and animal health and welfare), outdoor grazing, and sustainable development (six indicators on animal health and welfare, biodiversity and environment, and climate and energy). After complying with the basic requirements farmers can choose a focus area amongst the sustainability themes. The rewards are given based on performance (as opposed to effort) and financed by initially withholding €0.25 per 100 kg of milk delivered. Another action was to include an increment on the grazing premium in order to further support the practice; this was also partially financed by retaining €0.35 per 100 kg of milk. During 2014, FC in collaboration with World Wildlife Fund (WWF) and the Rabobank initiated a project to develop a biodiversity monitoring system for the sector (DZK, 2015b; FrieslandCampina, 2015a). In 2015, measurability and performance-based rewards were further emphasized, especially since some of the performance levels had lowered due to the post-quota herd increase. In terms of implementation, more than half of the member farmers were working with the energy scan tool. In the future, the program, which until now allows farmers to choose a focus area, will encourage approaching several sustainability themes simultaneously (FrieslandCampina, 2015b).

Due to the size and influence of FrieslandCampina, the priorities and approaches to reducing the impact of their activities have a direct relation to the priorities and results of the Dutch dairy sector. In the past years we have seen the inclusion of sustainability into their strategic language and part of their quality scheme as well as an incremental emphasis on measurable results stimulated by the partial conditioning of milk price and financial rewards.

As for other dairy processors the development of sustainability programs beyond isolated measures or, for example, their pledge in the grazing covenant, followed closely. DOC Kaas took the first steps in 2011 when it started discussion rounds about their sustainability engagement with participation of 90 member farmers. Similarly other processors kick started internal discussions about how to best address the impacts of dairy farming. The Koe Kompas was shared with and piloted by processors of the Partico Group—Bel Leerdammer, DOC Kaas, Vreugdenhil, Rouveen, and Hochwald (DZK, 2012b)—and by 2012 these processors had adopted it as a tool for their animal health management (DZK, 2013).[38] In 2013, several dairy processors developed sustainability programs, which were in turn aligned with the sector's goals and priorities; the programs also included a knowledge component (most often in the shape of workshops). Some examples are DOC Kaas' MELKKompas (Milk Compass), Rouveen's Gewoon Duurzaam (Simply Sustainable), Bel Leerdammer' Smiles for the Planet, and Vreugdenhil's Sustainabiltiy Program (Bel Group, 2016; DZK, 2014b). The emphasis shift from awareness raising to measurable results in 2014 was not exclusive to FC; other processors introduced adjustments and increased emphasis on performance (DZK, 2015b). When it comes to the engagement of Dutch dairy processors with sustainability challenges, the influence of CONO, with a strong element of knowledge sharing and integrated tools, as well as the performance focus of FrieslandCampina, can be found also on the approach of processors in the Dutch dairy sector.

In what follows we zoom in into the Dutch dairy processor CONO, specifically into how it articulated its sustainability program in the last 10 years. It is important to note that as we review this and the other case studies (and the respective dairy processors) we will see differences is how their engagement with dairy-related issues is articulated. In practical terms this means that some dairy processors have chosen certain headings under which they communicate their sustainability actions (from their farming and dairy sourcing policies, to energy use on plant sites, transport, waste, and product design, etc.). For each case study I will give an overview of how the sustainability engagement of the dairy processor is articulated, before moving into what is core to this study: the development and approach of their farming related sustainability programs.

[38] The Partico Group is an association of middle-size and small dairy processors established to collaborate on a range of issues—for example, efficient raw milk collection. The members include: CONO Kaasmakers, DOC Kaas, Rouveen Kaasspecialiteiten, Bel Leerdammer, Hochwald Nederland B.V, Nemelco, and Lyempf. Together they handle 25% of the milk produced by the sector.

CONO Kaasmakers

CONO is a co-operative with origins dating back to 1901. In the early stages it was formed as the result of various mergers of small dairy co-operatives in the province of North Holland. Later on, it merged with other cheese factories in the region, including one (De Tijd) located in the Beemster polder and another (Neerlandia) based in Stompetoren. In 1991 CONO joined forces with a dairy co-operative in Ommen, in the eastern province of Overijssel (CONO, undated). The core activity of CONO is cheese production; they specialize in traditional Dutch cheese, for which they received the commemoration of 'Royal Supplier' in 2001.[39] The cheese is sold under the well-known brand 'Beemster.' They also supply milk to Ben & Jerry's and Nestlé, and process whey (a byproduct of cheese production) into powder for sale to a range of other businesses including animal feed. They operate in three locations: Beemster (where the head office and main production facilities are located), Ommen, and Stompetoren (CONO, 2016c).

It is relevant to know that the Beemster polder received the status of UNESCO World Heritage site in 1999 for its value as a cultural landscape. The polder is located in the province of North Holland and was created in the early 17th century by draining the Beemster Lake. The area is over 7,000 hectares and is the oldest polder in the Netherlands. UNESCO recognized Beemster as an exceptional example of land reclamation for its size (a remarkable undertaking at the time), for the classical and Renaissance planning used to design its internal geometric land demarcation pattern, as well as the fact that the integrity of its initial spatial characteristics has been respected over the past centuries. It contains four villages but the Beemster polder consists mainly of agricultural land. It was originally intended for cereal production but it gradually became a mix of pastureland for dairy farming, greenhouse horticulture, fruit and bulb growing (ICOMOS, 1998; UNESCO, 2016). CONO member farmers are not located exclusively in the polder but, as mentioned earlier, their main cheese processing facilities are.

Currently, CONO has 460 member farmers. Internally the governance structure is laid out as follows: The Board of Directors, composed of nine member farmers, determines the company's policies. The Supervisory Board, constituted by six member farmers and two external auditors oversees the work of the Board of Directors and offers them input. There is also a Youth Board, which provides advice for both Boards and consists of twelve member farmers under the age of 35. In addition, CONO's farm business and transport manager, sustainability manager, and twelve member farmers constitute a sounding board for the Board of Directors and the Supervisory Board. Finally, given the importance that feed has on the quality and taste of the cheese as well as on cow health and welfare, within CONO there is

[39] In Dutch the title is Bij Koninklijke Beschikking Hofleverancier (CONO, 2001).

a Forage Committee which is in charge of monitoring the quality of feed that is used on the cows and any relevant developments on that field that might significantly impact those relevant variables. The two managing directors oversee the day-to-day affairs of the co-operative. Being a co-operative, member farmers have the opportunity to input into the co-operative's policy related decision during the bi-annual general assemblies. Also, all member farmers are eligible to be elected board members (CONO, 2016c).

CONO's sustainability program: Caring Dairy

There are mentions about CONO's programs interspersed on this chapter: I talked about their grazing policy (which started in 2002) and briefly mentioned the basics of the sustainability program (Caring Dairy) they adopted from Unilever five years later. The purpose was to place these developments on the timeline of the sector's evolution in the last decades. Now the following section aims to understand the sustainability program Caring Dairy as part of the engagement of CONO. Here, we go in depth in how the program emerged, how it was designed, developed and implemented, the challenges related to these stages, as well as the program's performance thus far.

The beginning: why and how

The Caring Dairy program started in 2003 as an initiative by ice cream maker Ben & Jerry's to increase the sustainability of dairy production on their supplying farms in the Netherlands and to contribute to their goal of developing and promoting standards for sustainable dairy practices (Ben & Jerry's, 2004; Van Calker et al., 2005).[40] If you are familiar with Ben & Jerry's you probably know them as a high-quality American ice cream brand. Although it currently has presence in over 30 countries, Ben & Jerry's was indeed founded in Vermont in 1978 (Unilever, 2016). In 2002, as part of its global growth strategy they started producing ice cream in a Unilever factory in Europe, more specifically in Hellendorn, the Netherlands (Ben & Jerry's, 2003,2004; Edmondson, 2014). Why in a Unilever factory, you might ask? Ben & Jerry's has been a subsidiary of Unilever since the ice cream maker agreed to be acquired by Unilever in 2001.[41] Ben & Jerry's is well known as a socially responsible business; it was founded on a three-part mission to produce top-quality ice cream while respecting the environment; manage for sustained financial growth, creating

[40] In 2003 the program was launched under the name of Sustainable Milk Initiative Launched in Europe (SMILE). It was renamed Caring Dairy in 2005.

[41] As a fully owned subsidiary, Ben & Jerry's financial and operational matters are in the hands of Unilever. However as part of the acquisition deal it was agreed that Ben & Jerry's would have an independent board of directors whose members would elect their own successors. The board, it was agreed, would exist in perpetuity. An additional provision grants legal power to the board in order to protect the social mission of the company, this means that the board can actually sue Unilever (at Unilever's expense) if the multinational breaks the conditions of the agreement (Page & Katz, 2012).

positive economic impact for their stakeholders and employees; and do business for social impact, improving the quality of life locally, nationally and internationally (Ben & Jerry's, 1997). Part of the operationalization of their mission has been to employ a "values-led" sourcing strategy for the ingredients and materials used in their production; some examples include ice cream containers made out of unbleached paper, non-GMO ingredients, and the transition (between 2010 and 2014) to Fairtrade certified ingredients for all of their products (Ben & Jerry's, 2016c; Edmondson, 2014).[42] Regarding their engagement with dairy farming issues, Ben & Jerry's was an early opponent of the use of bovine growth hormone (rBGH) and in 1995 paid a premium to ensure their milk and cream would be rBGH-free (Dennis et al., 1998). Also, they have been working on sustainable dairy farming programs with their partner supplier St. Alban's Co-operative Creamery in Vermont since 1999. I will go back to Ben & Jerry's Vermont-based sustainable dairy program later on when we review how their European program evolved.

After the production of Ben & Jerry's kick-started in the Netherlands in 2003 there was a need to operationalize the social mission of the brand in Europe. Although the Dutch dairy standards were higher than in the US (for example in the Netherlands the use of rBGH is illegal) there was still the need to create a sourcing strategy that reflected the philosophy of the brand, especially for the most important ingredient—dairy. Other specific insights that served as departing points for the program were the economic pressure faced by farmers and the environmental issues connected to dairy farming (CO10). While for other ingredients Ben & Jerry's chose the existing certification FairTrade, for dairy the choice to develop their own program in Europe was explained as follows:

> *It was a very logical step to start with setting up a sustainable dairy farming program and we consciously chose not to go organic because that would be the easiest way, to buy organic milk and that is it. For Unilever, organic is not the solution, organic is not going to feed the world, it is not mainstream and more over if you look at the full lifecycle impact of organic dairy farming compared with integrated sustainable dairy farming, it is higher. Of course you can discuss that, but for Unilever there was not something out there in the market that would do the trick apart from organic and that was not an option so we decided to set up our own program. [Developing your own program] of course is something that you do as a last instance because it is so labor intensive and also if you do so then you have to communicate it and make it credible so it took quite a long time. (CO10)*

[42] The total amount purchased of the five key commodities (cocoa, vanilla, banana, sugar & coffee) is 100% Fairtrade certified. There are certain nuts, spices, and fruits that are still not available as Fairtrade certified ingredients or do not comply with Ben & Jerry's specifications.

Once the decision was made to develop a sustainability dairy code, the initiative started with a project team formed between chain partners: Unilever's Sustainable Agriculture group and Ben & Jerry's, Hellendorn ice cream factory, Hoogwegt which was the supplier of milk at the time, a supplying farmer, an organic farmer (not supplier but invited to offer input from an organic farming perspective), as well as representation from scoop shops. Additionally, Wageningen University and its affiliated institute on Agricultural Economics LEI served as knowledge partners for the project team. The project also attained funding from the Keten Kwaliteit Melk (KKM), the Dutch quality assurance scheme for dairy. Finally, a group of stakeholders: Feed suppliers, veterinarians, service and input providers, societal organizations (NGOs), among other actors were involved as external advisors (Van Calker et al., 2005; CO8).

The first step was to review Unilever's Sustainable Agriculture Code and adapt it to dairy. Unilever had developed the code after their work on sustainable agricultural practices for their key crops (i.e., tea, palm oil, tomatoes, peas, and spinach) (Van Calker et al., 2005), and it was presented as a synthesis of good farming practices applicable to all raw materials (Unilever, 2010). The one element that was added to the adapted code was animal welfare, resulting in 11 key indicators (i.e., energy and climate, biodiversity, social and human capital, farm financials, soil health, soil loss, nutrients, water, local economy, pest management, and animal welfare) which in turn were grouped under the headings of 'happy cow,' 'happy farmer' and 'happy planet' (CO1, CO8, CO10).[43] The second step was to develop thematic workshops linking the indicators to farm management practices (CO1). The program rested on a continuous improvement philosophy and had a bottom-up approach. This approach underpinned both the program development with numerous discussions on metrics, practices, principles, etc. (CO8), as well as the process for the implementation at the farm level, which is designed to recognize and incorporate specific circumstances (e.g., soil type, weather, land availability) and priorities of the individual dairy farmer (Van Calker et al., 2005). In late 2004, after having defined the basics of the program, 12 farmers were invited to participate in a pilot. These were farmers who at the time where delivering to milk trader Hoogwegt. The selection was based on logistics and the only requirement was that farmers applied grazing.

> *If I think about it [now], they were a group of average farmers; they were not real front-runners. Maybe one of them but [for] the rest, there were some good farmers but also quite average farmers. It was quite a good test then. They were not some special farmers, motivated to work with sustainability. [. . .] Because of the good relation with the buyer they*

[43] Ben & Jerry's co-founder Jerry Greenfield's saying 'if it's not fun why do it?' had translated into a core value for the brand. This language was a way to align the Caring Dairy program to the Ben & Jerry's philosophy.

initially participated. The topic happened to be sustainability but that was it. (CO1)

The 12 farmers were located on the same region and clustered geographically into three groups. Farmers who were participating on the pilot did not get any premium or financial remuneration but were invited on the promise of gaining further insight into their farm operations and access to expert advice on how to improve their efficiency and productivity (CO8).

It was really interesting to see that the initial pilot farmers might have been quite critical in the sense that they were open enough to participate but they were critical of what this could bring them. (CO10)

Of course the farmers were debating why they shouldn't get a premium. We waited a few weeks and then they said, 'We will start participating in that process because we believe this is the direction for the future [. . .]. Although we won't get a premium at this moment, probably in the future we will get a premium and besides that it will be better for our farms as well.' (CO8)

Towards the end of 2004, the first round of data collection started with visits to the 12 farms. Data were collected on the farm's background and performance indicators such as nutrients, energy use, and financial results. At this point one farmer withdrew from the program, as he did not feel comfortable with the requirements for information sharing (CO8). After completing the baseline measurement on the remaining 11 pilot farms, the data were analyzed and assessed and served as key input for the first round of workshops resulting in farm improvement plans. The plans covered both the long-term strategy, which reflected the specific farm situation, ambitions, and competences of the farmer, as well as indicator-specific plans which consisted of a tactical improvement approach for Caring Dairy indicators, based on the latest developments on the field and the farm-based assessment (Van Calker et al., 2005). The next stages consisted of implementation and a cycle of measuring, assessment, and recalibration of plans as well as a continuation of the thematic workshops. It was around this time that interviewees described the initial hesitation of the pilot farmers to have dissipated:

In 2005 we organized these 10 workshops and then I think although the farmers in the beginning were a bit maybe hesitating [and thinking] 'let's wait and see.' I think that from 2005 onwards they were really enthusiastic about the whole approach and they were really becoming Caring Dairy or Ben & Jerry's ambassadors. (CO8)

> *After a year or so they were quite excited because they experienced that this was really helping them economically; because this was helping them better understand their own complex farming practices and the interactions between the different areas, (it was) helping them to make more efficient decisions and also helping them become economically more sustainable. (CO10)*

In 2006, it was decided within Ben & Jerry's that rewarding participation to the Caring Dairy program would strengthen the program's value for brand building purposes. That year the choice was made to use the budget allocated as annual premium (approximately €1000 euros per participant) to organize an exchange trip for the participating Dutch farmers to visit the Ben & Jerry's ice cream factory as well as meet its supplying farmers from the St. Albans Co-operative Creamery in Vermont. This was reported to have furthered farmer's commitment to, and ownership of the program (CO8, CO10).

Not too long after the exchange trip, in November of 2006, Hoogwegt—the milk buyer supplying to Unilever at the time— announced that by May 2007 it was going to stop its raw milk buying activities as part of a strategic redefinition of their operations. The decision included the arrangement for supplying farmers (which included the Caring Dairy pilot farmers) to sign up with dairy co-operative DOC Kaas (NoorderlandMelk, 2015). This event threatened the continuation of the Caring Dairy program. The profile of DOC Kaas (focused on low-cost production of cheese) did not match the profile of the program or of the farmers (CO19, CO1). This posed a first challenge: the possibility that the 11 pilot farmers could sign up with different milk processors, effectively dismantling the program (CO8). Production volumes were increasing and the need to ensure that Caring Dairy milk was used in the production of Ben & Jerry's ice cream triggered a search for another dairy processor who would be interested in adopting and further expanding the Caring Dairy program as well as taking in the pilot farmers (CO1, CO8).

Pilot farmers together with Unilever's Sustainability Manager actively discussed this possibility with several Dutch dairy processors. Interest in adopting the program was low; at the time the topic of sustainability was only emerging and some processors thought it was something to be addressed by the farmers' union. There was also hesitation to adopt a program that had been developed externally (CO1), as well as to engage with a multinational such as Unilever (CO8). In 2007, CONO, who at the time was looking to move beyond their grazing policy and make a next step in their sustainability engagement, invited the sustainability manager of Unilever to give a talk about Caring Dairy. CONO had not been considered as part of the scouting efforts by the Caring Dairy farmers because it was located in the North of the country, which was too far from Hellendorn, where Ben & Jerry's ice cream is produced. However during this session it was clarified that while most CONO farmers are indeed located in the north there was a group of around 80 member farmers located in the east, nearby the Hellendorn factory (CO1, CO8, CO10). The negotiations unfolded quickly and it was agreed that CONO would become Ben & Jerry's sole dairy supplier for Europe and it would adopt and scale up the Caring Dairy program (Ben & Jerry's, 2008). They also offered membership to the 11 pilot farmers (only 8 accepted it), which was exceptional. Over the previous decade CONO had not recruited any new members.

The co-operative faced increasing milk volume, which was more than what was needed for the production of Beemster cheese. In fact CONO was selling the surplus milk on the spot market (CO8). The agreement with Unilever was beneficial for all parties: it gave CONO a program they could implement as a next step in their sustainability engagement, and with the prospects of increasing ice cream production it also provided an additional high-value outlet for their surplus milk. For Unilever, it provided continuity to their investment on a dairy sourcing strategy that was more aligned to the Ben & Jerry's brand values as well as brand-building efforts in Europe.

Once CONO adopted the program, the process of scaling up to the then almost 500 members started. One of the project leaders from the Caring Dairy development team was hired by CONO as sustainability manager with the key task of guiding the scaling up process (CO10). During the agreement it had been decided to keep participation voluntary, at the same time the aim was to start communicating about Caring Dairy to the consumer by 2009, which required a participation rate of at least 90%. In order to achieve such a rate it was decided to reward participation with a premium equivalent to the one CONO was already giving for grazing (i.e., a yearly payment of €0.50 per 100 kg of milk). Participating farmers were required to attend three workshops a year, draft and implement improvement plans, and conduct an annual monitoring of sustainability on their farms (CO8). Caring Dairy offered over 130 workshops in 2008 on different topics related to sustainable practices and the rate of participation had reached 93% (Ben & Jerry's, 2009). In 2009, the implementation of the program continued with 160 thematic workshops and a participation rate of 94% (equivalent to 450 farmers) (Ben & Jerry's, 2010). Additionally, that year sustainability initiatives related to factory performance, transport, and feed were carried out. For feed, an investment program started in order to support the production of sustainable soy in developing countries. While having a segregated input of sustainable soy was at the time too costly the aim was to spur further demand.

> *On the basis of, let's say, green certificates [we can] claim that we at least invest in the production of sustainable soy. And when more companies do that, then we can start importing the soy because then the cost of importing that segregated soy will be cheaper. (CO8)*

In 2009 a top priority was to professionalize the monitoring of key indicators. Later that year the Koe-Kompas, a tool focused on measuring animal health and welfare was launched and in December of 2010 the Kringloop-Kompas (a tool similar to the Annual Nutrient Cycle Assessment) followed. This tool was designed to measure and manage the environmental impact of farming; the tool covers not only nutrient cycles and management but includes climate, biodiversity, soil, water, and air quality (CO3). These compasses are the practical translations of the themes 'happy cow' and 'happy planet.' The development of a farmer compass, a translation of the theme 'happy farmer' was discussed for some time; there were doubts within the Caring Dairy management team as to how necessary and relevant this could be given the diversity of farmers (CO2). By 2011, 130 CONO farmers and their veterinarians employed the Cow Compass to manage cow health and wellbeing. Additionally, CONO's logistic partners conducted a pilot project to test the use of the tool (DZK, 2011).[44] This was followed by increasing voluntary adoption of the compass outside of CONO (DZK, 2012b).

Harmonization and moving towards targets

By 2012, several years had passed since CONO had adopted and further implemented the Caring Dairy program. The Cow and Life Cycle compasses had been developed and there was a high rate of participation. Farmer study groups are not necessarily new in the Netherlands. However, the learning component of the program was especially appreciated: all CONO farmers interviewed for this study had a positive opinion about the program's thematic workshops. According to these farmers the Caring Dairy workshops created access to experts and a safe space to share more information on farm performance.

> *CONO has been doing workshops at farms and allowing farmers to show what they are doing and compare, so that has created a very open atmosphere to share numbers, methods, practices, etc. In that way CONO farmers are sharing more, and are becoming more of a community. (C18)*

Because farmers selected what workshops to attend some argue that there was a selection bias—farmers attend workshops they like and not necessarily workshops about themes they find difficult (C20). Still, when a farmer was asked if the program was contributing to the learning exchange process or if this type of activity would happen anyway, the interviewee confirmed that the program did incentivize farmers' participation as it gave "the opportunity to get speakers and experts and CONO gets them and pays for that" (CO23).

It was at this stage that efforts to take the Caring Dairy program to its next phase started. For CONO there was a need to move from facilitating learning processes

[44] Dairy processors from the Partico Group

(through workshops) to establishing specific performance targets as well as ways to stimulate farmers to act towards those goals.

> *Until now Caring Dairy has always been focusing on continuous improvement so we facilitate the learning process, we organize workshops, we have these compasses which is giving the farmer certain results of the situation on the farm [. . .]. Now we are going to set the new strategy that will be focused on: What are our specific goals? And how can we stimulate the farmers even more to improve, but then towards specific goals. (CO2)*

Making more concrete goals and designing a reward system for farm performance was not only part of the logical progression of a program that was a first in the sector. By then, most Dutch dairy processors had engaged with sustainability (e.g., by now FrieslandCampina had launched its sustainability program). A very concrete push towards renewing the Caring Dairy program and its commitments was the fact that while comparing the performance results of Caring Dairy farms to national averages, no significant difference was found (CO20). This increased the pressure to maintain a leading position on grazing and on other sustainability indicators.

At the same time, Ben & Jerry's USA took action to unify the Dutch Caring Dairy program and the Vermont program into global standards for Caring Dairy. This had been on the agenda for Ben & Jerry's USA for a while, seeing that the dairy suppliers for their largest production sites—namely, St. Alban's Co-operative Creamery for Vermont and CONO for Hellendorn—had programs that while rooted in the same brand philosophy had taken somewhat different paths in terms of operationalization. While the goal was not to achieve absolute content uniformity, as that would not recognize relevant local issues, regulation, and market circumstances, the aim was to harmonize monitoring of results and facilitate reporting (Ben & Jerry's, 2009,2012). Additionally, creating global standards would facilitate further expansion of the program to other current supplier farms as well as future new ones (Ben & Jerry's, 2015).[45] What were the main differences between the two programs? The Vermont program, developed under the name Dairy Stewardship Alliance Project and renamed in 2009 Caring Dairy US, consists of an online self-assessment tool where the farmer can evaluate farm operations against 12 indicators (the 11 Caring Dairy sustainability indicators plus one called Farm Metrics which consists of measuring the monetary impacts of implemented changes). The program also supports the development of improvement plans and Vermont farmers receive a premium for participation (Ben & Jerry's, 2010,2016a). As mentioned earlier, for CONO farmers the indicators had been condensed into themes and compasses were developed

[45] While the main production sites are Vermont (USA) and Hellendorn (NL), a small share of the total Ben & Jerry's volume is produced in Ontario (Canada), Missouri (USA) and Nevada (USA).

to facilitate monitoring (CO20). For the 'happy cow' theme assessment farmers use the Cow compass; the Life Cycle compass measures performance related to the 'happy planet' theme. Finally, although there is no Farmer compass, three Caring Dairy indicators (i.e., social and human capital, farm financials, and local economy) are assessed to measure progress under the 'happy farmer' theme (CONO & Ben & Jerry's, 2015). Additionally, there are other differences in the monitoring. While the Dutch program focused on results, the Vermont program targeted management practices.

> *In Vermont they use this assessment and this assessment focuses a lot on the practices and our compasses focus more on the results. So for example, looking at soil and minerals, if you look at a planet compass from CONO it shows how much nitrogen surplus, phosphate, CO_2, so GHG emissions, energy, so very much the technical details. And what they ask in the technical assessment of Ben & Jerry's (US) they ask: in which moment of the year do you apply your manure to prevent nitrogen leakages to the water? So that focuses more on the management practices than in the end result. (CO20)*

The harmonization efforts between Ben & Jerry's and CONO were part of the redefinition process that CONO had embarked on. In the fall of 2012 a renewed Dutch Caring Dairy program was launched to CONO member farmers. The key points of this redefined program included:

- A bonus reward for results above a set minimum performance threshold on some compass metrics. These were: phosphate use, nitrogen surplus on farm, (no) use of third-generation antibiotics, and compliance with grazing.
- A two-year thematic workshop track. Workshops would explore one theme with the guidance of an expert (or more if needed) and with a fixed group of farmers for the duration of the trajectory.
- And, as part of the global Caring Dairy harmonization process, the new Dutch program included an extended annual questionnaire. This incorporated questions about management practices (that were tailored to the Dutch context).

Participation in the renewed version of the program was also voluntary. A group of member farmers (approximately 30) was very critical of the renewed program and rejected it (Van der Horst, 2012; CO18). They conducted a parallel assembly to revise the program and give feedback to the program management (CO20). The point of highest contention was the performance bonus. The bonus was introduced to stimulate performance and lay the ground for a future move towards minimum performance requirements. The established targets were the result of intense consultation with experts and internal stakeholders as they anticipated future legislation. Some farmers found the rewarded performance levels too restrictive.

> *The problem was that there were minimum requirements and that was very restrictive. The EU manure law is good enough; CONO shouldn't go any further than the nitrate directives [. . .]. [Also] third and fourth generation antibiotics where not allowed and I was against it because that means that if the cows get sick then I have to let them die because you cannot use these antibiotics and I question, is this sustainable? If I have to let a cow die? And the antibiotic regulation does allow their use. [. . .] Sustainability for CONO is about the group and that the group should move into a certain direction. We have to accept that some farmers are lagging behind a little bit [. . .] if they are lagging behind there is no use to punish them but you should try to stimulate them so it should be more like an education program. (CO21)*

After additional consultation with the farmers the decision was made to remove the bonus for performance from the proposed renewed version of the Dutch Caring Dairy program and instead connect the bonus to participation to the two-year workshop trajectory. In this way the program was closer to its previous version except for the revised learning component.

Although the topic of motivation (to participate) had been considered throughout the different development stages of the Dutch Caring Dairy and especially with regards to this renewed version, there was increased attention after the farmer's reaction to it. I also discussed the motivation to participate, which was, according to the involved interviewees, mostly connected to receiving a price premium. I also inquired about the voluntary aspect of it which based on the input from interviewees is aligned with the philosophy of a co-operative.

> *Most farmers take part [in the Caring Dairy program] because of the premium but they don't realize that if they use the stuff they learn in their farms then can get much more money than just the premium. Sometimes they don't see that. They (CONO) need a premium to have all those people be part of it. (CO25)*

> *It's different for everyone. The farmer I used to work with would say, 'Oh my, what do they want now?, What do I have to do now?, Do I have to follow workshops?' Whereas I get excited about it, and for everyone [it] is different. I know a lot of farms that do it for the money; you cannot change that. It doesn't matter what kind of program you build there will always be farmers that won't like it. (CO23)*

> *If we are able to keep a good price for the milk I think then more farmers can be enthusiastic for sustainability. I think that when you pay attention [to] the subject you have to get money back for your milk. But if the price is the same as the average then people are demotivated because what you ask of them is difficult and then you don't get any reward [. . .] and if there is no money from the consumers then sustainability goes to a lower level. (CO19)*

> *You cannot make it mandatory because it's a co-operative. Even if there are farmers that do not comply now with the rules, maybe their grandfathers were the founders of the co-operative. With the co-operative model you can only stimulate you cannot enforce and if 96% is participating then it's a good score. (CO21)*

In 2013, 255 farmers (out of a total of around 475) chose to participate in the renewed version of Dutch program, which required answering the extended annual questionnaire. While it was the third year for Vermont farmers, for Dutch farmers it was the first time the annual monitoring included practice-oriented (as opposed to result-oriented) questions. This was also subject to some negative comments given its length and nature of some of the questions.

> *Some farmers think, well if I do this or that, later on Ben & Jerry's is going to hold me accountable for my answers from last year or something. And that threatens your freedom to choose whatever in your own job. You have this job to make the decisions yourself and this kind of questionnaire makes that harder because it makes you think about what you answer and how it might be used. (CO25)*

The questionnaire was not removed; it is a required component of the global Caring Dairy program.[46] In their 2015 social and environmental assessment report, Ben & Jerry's describes the increase in the number of participating CONO farmers—from 340 in 2014 to 415 in 2015.[47] In addition, in the report it is stated that in 2015 the performance of participating farms was consistent with previous years in which the highest scoring indicators were Animal Husbandry, Farm Financials and Impact on Local Economy, while the lowest were Social and Human Capital, Pest Management, and Biodiversity. Based on several years of data (2012–2014) the authors report average farm scores "leveled off, dropping less than a point in most sections," as well as other emerging patterns. "The longer farmers participated in Caring Dairy, the higher they scored. The one exception to this trend was Biodiversity" (Ben &

[46] Access to the questionnaire was not granted to the researcher.

[47] The social and environmental assessment reports (SEAR) are available on the USA website of Ben & Jerry's.

Jerry's, 2016c, Retrieved 2016). In the report there is no distinction or qualification as to how much these data represent the Dutch supplier farms. Therefore it is assumed that the results reflect the scores of all—American and Dutch—farms because there is only one report issued by Ben & Jerry's in which details about the now global Caring Dairy program are discussed.

Finally, Ben & Jerry's USA dedicated a significant part of 2015 to the revision of the global Caring Dairy program. The new iteration, according to their 2015 annual report, includes higher operating standards and an increased premium for participating farmers. The revised global version, rolled out in 2016, introduced a tiered system of performance. Farmers are to be ranked based on a set of standards and best practices and rewarded as they ascend through the three levels: basic, silver, and gold. Under the revised global Caring Dairy, farmers are validated by a third party to ensure standards are being met. In 2016 the requirement to remain in the program will be to comply with the requirements specified for the basic level (Ben & Jerry's, 2016b).

Through the harmonization and revision of the global Caring Dairy program, its European management was also modified. In the Netherlands the program is no longer managed by CONO but is now centrally coordinated by Ben & Jerry's and Unilever through a European Caring Dairy Program Coordinator based also in the Netherlands (CO8). This facilitates the collaboration with other dairy suppliers in the country and the rolling out of the Caring Dairy program to other suppliers besides CONO. FrieslandCampina started supplying yogurt for the Ben & Jerry's Greek Style Frozen Yoghurt since 2014. Over 30 FrieslandCampina farmers signed up to participate in the Caring Dairy program (FrieslandCampina, 2014a).

Despite the changes within the Ben & Jerry's management CONO continues to articulate its farm sustainability engagement as Caring Dairy. And while the farmers' program was the first step, the range of initiatives has increased since.

> *Farmers are not the only ones who should worry about sustainability, also within our company . . . How do you address certain employees' issues, for example, or transport of cheese to the supermarket? Whatever, you name it! We are trying to put the scope a bit broader but everything started with the Caring Dairy program for the farmers. (CO2)*

On their recently revamped website (at the time of writing) their initiatives are nested under the heading 'Aware.' Here, they provide information on: greenest cheese dairy (their new and improved processing facility), pasturing, Caring Dairy, and sustainable partners. This last heading refers to their collaboration with farmers, suppliers, customers and societal organizations (CONO, 2016a). CONO continues its efforts to stay at the front of sustainability policy in dairy processing. In the summer of 2016 CONO announced that starting in 2017 it would double its grazing premium to €2 per 100kg of milk for every member farmer that complied with the Weidegang standards of grazing. The current percentage of farmers with cows grazing outside for CONO is 92%, which is significantly higher than the national average of less than 70% (CONO, 2016d; DZK, 2015a). This decision, argued the general director of CONO, shows that it is a priority for the co-operative to maintain the cows grazing out in the fields, and "with this grazing premium of 2 cents [per kilo] we show that we remain at the forefront of sustainability and animal welfare in Dutch dairy"(CONO, 2016b).

Finally, the Caring Dairy program is widely recognized as being a frontrunner in the Netherlands, in terms of the program's impact to the sector, the program is credited to have kick-started the move of other dairy processors to engage with sustainability. At the farm level, the key aspect that was mentioned by actors involved was a more robust understanding of sustainable dairy and a changed mindset about farming development.

> *One thing is that because we have had this program for already some years, in our discussions with farmers we can actually talk about what they think about something, is it sustainable or not? And it's not a strange word anymore. And I don't think you can do that in all different dairy co-operatives. (CO20)*

> *The Caring Dairy program cannot be seen in the farm. Really it can be seen in the farmer. The mindset of the farmer is different. [. . .] When the farmer is faced with choices in the farming he will think more about sustainability. From building a new barn or something like that. Then you want to be more sustainable so you would build a barn that gives more room for the cow and it's good for 10 or 15 years. I think that this is the best difference. Other farmers would more likely go for low cost when building a barn so it's the mindset that makes the difference. A Caring Dairy farmer looks at his cows differently because he is sensitized to when is the cow happy and he looks at the behaviour. And that is the difference vs. an average farmer in Holland. (CO19)*

While the rate of grazing amongst CONO farmers is considerably higher than the national average, other results at farm level are harder to discern and assess. Most external stakeholders viewed the Caring Dairy program as leading in the sector; all recognized it as pioneering. Internally, and as quoted above, the largest impact of the program is said to express itself in better understanding of what sustainability entails. The information on farm performance included on Ben & Jerry's official report is shared at a very aggregated level and the availability of more detailed data was restricted for this study therefore a more granular look at farm performance change over the years was not included. Nonetheless, in the next section I will analyze and discuss the case of the Dutch dairy sector including the effect of CONO's engagement with farm sustainability issues on the wider dairy regime.

Analysis: development, change and dairy processors

In this chapter I presented the case study by describing the development of the Dutch dairy sector since WWII, the emergence of the societal debate on issues surrounding dairy production, the national and supranational responses implemented by private and public actors, as well as the development of sustainability programs, specifically the Caring Dairy program as implemented by CONO Kaasmakers. Using the concept of transition theory I will analyze these events and debates to discuss how the Dutch dairy regime is changing given the sustainability challenges connected to its future viability.

A description and discussion about how the Dutch dairy regime is changing needs to be underpinned by a definition of what the Dutch dairy regime is conceptualized to be. I described the concept in detail in chapter two; at its simplest, regimes are stable sets of dominant rules and practices around technological arrangements (Geels, 2002). The rules can be distinguished as regulative (e.g., laws, regulations, protocols, standards, sanctions, etc.), cognitive (e.g., beliefs, goals, priorities, problem definitions, etc.), and normative (e.g., values, norms, expectations, etc.) (Geels, 2004). When using these concepts one can identify dominant rules and practices in dairy as well as networks and actors that play a role in their reproduction. The first question guiding this study—how has the dairy sector developed since the post-war era?—has been answered with a detailed account of its development. I will draw on this description to outline what emerges as the Dutch dairy regime. Afterwards I will to discuss the pressures that have affected the regime in the decades since WWII and how the regime has changed as a result.

Rules and the delineation of a dairy regime

After WWII, one of the main societal goals was to ensure the availability of food at affordable prices, in other words, to impede the recurrence of hunger (normative rule). This was operationalized as significantly increasing agricultural production through the modernization and specialization of farming (cognitive rule). This goal and its outlined approach underpinned the emergence of supporting supranational and national laws (regulative rules)—specifically, Mansholt's policies and later the CAP. The regulatory framework—which consisted of agricultural and market policies on income support, price support, import tariffs, and export subsidies—aimed to incentivize agricultural production, guarantee food affordability domestically, and enable access to (international) markets.

Within this regime, scientific and technological developments facilitated further mechanization of farm processes and the increase in yields; for dairy this was done through the introduction of the milking machine, mechanized feed production, increased chemical inputs, and the use of breeding technology, amongst others. The dairy industry evolved to process and market the increased milk flow as profitably as possible both in domestic and foreign markets. The success—measured in terms of milk output per labour of unit—of the Dutch dairy regime during the early decades following WWII served to reinforce its core logic and to drive the sector further down the path of increased farm intensification and scale enlargement. At this stage, the key actors involved in regime reproduction were supranational and national governments, farmers and their representative organizations, as well as the dairy processing industry.

Milk quotas and regime change

I will move along the timeline to discuss the pressures that have impacted the regime and the ways in which it has and has not changed. It is important to note that many of the challenges facing the regime are the result of a confluence of factors; in this analysis I identify the most important ones. First, we see the increasingly problematic effects of the intensification of dairy, expressed as the unprofitable overproduction of milk. A fundamental aim (cognitive rule) of the regime is profitability as the sector is embedded in a market economy. When the regime was faced with the untenable situation of 'butter mountains' and 'milk lakes' in the 1970s and early 1980s it was forced to change to ensure its continuation. Transition theory argues that regimes change when they are challenged by internal pressures, landscape factors, or niche developments (Van Amstel et al., 2012) and because they aim for stable reproduction, regimes evolve from previous regimes. This means, as Wiskerke and van der Ploeg (2004) explain, that innovations are weighed against the degree to which they contribute to the regime's coherency or efficiency; changes that fall outside of the regime logic (i.e., regime rules) are deemed irrelevant and solutions that align to dominant rules and practices are favored. This incremental way to regime change is refereed to as path dependency. The overshooting of production that was incentivized by guaranteed milk prices drove the introduction of production quotas (regulative rule). This was a significant regime change as it modified one of the key dairy goals: to maximize production. Instituting production quotas was a policy calibration designed to overcome the expensive structural surpluses of milk by capping milk production in all Member States. Given this production limit, actors are said to have focused on production efficiency (dominant cognitive rule). Quotas represented a significant rule change for Dutch dairy. The quota transfer scheme enabled, to some extent, the dairy regime to continue its trajectory of intensification and scale enlargement. It can be argued that quotas represented an adaptation of the regime as opposed to a more radical change. This is evidenced by the consistent increase of milk yield, herd size, and the decrease of number of farms that has been documented during the quota period.

Dairy regime adaptations regarding environmental and animal welfare concerns

Also during the 1970s and 1980s, the impact of excess of nutrients on soil and water resources—another effect of the intensification of farming—gained growing attention. As explained earlier, regime tensions change the selection pressures facing the regime (Geels, 2004). In this case, the local reality of water pollution in areas of intensively farmed land (internal pressure) against the background of an environmental movement gaining momentum in Europe (landscape pressure based on cognitive and normative rules) led to the first policy responses from the EU. The articulation of a legal framework (regulative rules) on the subject of nutrients in dairy farming (i.e., Nitrates Directive, and derogation based on phosphate limits) represents an important regulatory building block within the regime. The introduction of these policies realigned regime reproduction to fall under the established legal phosphate limits and helped reduce the dairy sector's contribution towards the deterioration of natural resources. Once the abolishment of quotas neared and within the confluence of a series of factors (e.g., price volatility and growing global demand for dairy) the debate centered on the regained possibility of responding to market signals through milk production growth often legitimized by the relative efficiency of Dutch dairy production (cognitive rule). But soon after, phosphate limits were surpassed which triggered action to again rein in regime reproduction within regulative limits. The introduction of phosphate rights (regulative rule) is effectively a milk production cap. Here we see another instance of adaption of regime rules and practices as well as the interplay between different actors. Although there were attempts by the livestock sector to self-coordinate action to avoid phosphate limits from being surpassed, the supranational and national governments continue to be the primary actors determining the environmental rules for dairy. The debate and actions on phosphate rights signal the need for oversight and top coordination of milk production in the Netherlands.

In the last four decades, the practices employed to facilitate the profitable scale enlargement and intensification of dairy farming have repeatedly compromised animal and human health. Food safety scandals, the rise in antimicrobial resistance, the decrease in grazing and loss of traditional cultural landscapes have been important sources of pressure pointing to the undesirable and unsustainable effects of some of the dominant rules and practices guiding the sector. These societal concerns evidence strong values and expectations about dairy farming (normative rules). There is a growing tension between the trend toward intensive indoor farming systems—which broadly speaking entail greater use of feed concentrates and less or no hours of grazing—and securing animal welfare standards and the preservation of the traditional Dutch landscape.

In the context of this juxtaposition, NGOs have emerged as the actors articulating strong cultural values (normative rules) about dairying as an effort to realign sector performance to food safety and animal health and welfare goals. This can be observed in the grazing debate and through the development and results of the grazing covenant. It is important to emphasize that it has been a gradual process. During the last decade the sector has tried to balance its social acceptability with the economic driver or pressure for farmers to increase scale as a path to farm profitability. This tension has been enhanced in the last years by arguments stating that highly controlled indoor housing arrangements are a viable path towards reducing the environmental impact of dairy. Grazing is not a legally binding practice in Dutch dairy farming. However, through the introduction of market schemes (e.g., Weidegang logo) and grazing requirements for milk suppliers (regulative rules) the decrease in grazing practices has slowed down, which could be argued is a counter force to the scale enlargement in farming. While grazing has gradually gained a place within the Dutch dairy regime rules, an actual increase in the number of cows that graze outside is still to be seen. Another example of the work of NGOs in exerting pressure against undesirable directions of regime reproduction is the debate on mega farms. Mega farms are the maximum expression of the intensification of dairy at the cost of all the animal welfare and cultural values that are well embedded in Dutch society. NGOs have been leading actors in protesting against this development and pressuring local governments to reject permit request for these large-scale farming projects. This is a much more contested area, not in relation to divided opinions in society but regarding the lack of any law or standard that sets a clear guiding principle on farm scale. The lack of any policy surrounding scale reflects the reluctance of the government and the dairy industry to articulate their position on the matter.

Dutch dairy regime today

How could the Dutch dairy regime be defined now after the adaptations to the dominant rules and practices described earlier? As many actors voiced, the main goal for the sector is to maximize the profitable production of dairy within societal and environmental limits (cognitive goal). Beyond established legal obligations, some issues have been more readily integrated into the regime whilst others have been harder to address. This can be explained through the power that cognitive rules have on the way that dairy is operationalized daily. The sector is embedded in a market economy and in consequence, sustainability issues are coded and adopted once there is a model through which addressing them reduces costs, increases added value, and builds or safeguards brand equity. An example of this would be the degree of ambition and detail with which energy or animal health goals are expressed on the Sustainable Dairy Chain platform compared to sectoral goals on biodiversity. While links between energy or animal health and increased profitability are easily made, the relationship between biodiversity and profits is less articulated within the dairy regime. In addition while the selection environment now includes some of the societal demands for dairy, the traditional performance markers continue to revolve around profitability and productivity.

As described earlier, there have been changes in the actors that have influence in the evolution of the regime. The EU government has maintained a leading role in the development and implementation of market and environmental policies. The national government has also been an active partner in this matter. Actors that have gained presence in changing regime rules are non-governmental organizations working on animal rights and the preservation of the environment. Retailers have also gotten increasingly involved through their actions concerning increased sustainability standards for their private label dairy products as well as their participation in sector-wide actions such as the initiation of the Stichting Weidegang (Foundation for Grazing). During this period farmers' organizations have participated in all relevant sector initiatives but they do not play a leading role in building the sustainability agenda forward.

CONO and the Dutch dairy regime

Based on the findings of this study I argue that the Dutch dairy regime continues to be guided by its post-war logic with the addition of some important adaptations. These adapted rules and practices limit some of the negative social and environmental impacts of the sector and although they represent important changes they do not embody a radically different regime logic. Having said that, another key question guiding this research was to identify the ways in which dairy processors were affecting the dairy regime through their sustainability programs. I presented the trajectory of the Dutch co-operative CONO to illustrate this point. It is worth clarifying that it is not part of the scope of this study to assess the Caring Dairy or any of the other programs based on an environmental impact assessment or quantify their sustainability outcomes. The discussion presented here focuses on what is articulated under these programs and how their goals are pursued in relation the evolving regime logic. The study provides then an indication of impact and change in dominant rules and practices wherever it has been observed.

Within this study dairy processors such as CONO are conceptualized as regime actors framed not as fully coherent monolithic entities but as complex organizations or networks of actors that, drawing from the notion of obligatory passage points (Callon, 1986), have certain influence and power to configure specific conventions, rules, norms, approaches, or practices that become (practically) mandatory and reinforce their status as influential regime actors. The first point to discuss here is that of grazing. CONO started to pay a premium to member farmers who practiced grazing of their cows in 2002. This was a first for the sector, at the time there were many arguments that pointed to farmers' organizations as the best placed to articulate sustainability related goals and standards. For CONO grazing was a necessary quality and brand building aspect so the introduction of their grazing premium (regulative rule) responded to their business priorities. Later CONO framed the grazing premium also as a response to the need to preserve the Dutch cultural landscape in which, cows grazing on the meadows, is a key component (normative rule). Within this framing CONO self identified as an actor with both an interest and a medium to address the detrimental changes in the Dutch landscape. CONO played a pioneering role in the introduction of the grazing premium; as such, it created a precedent for dairy processors to be actively involved in incentivizing this practice. This was well received by animal welfare and environmental NGOs, which arguably furthered the belief that dairy processors have influence on grazing practices (cognitive rule). Later on, the 'Koe zoekt wei' (Cow looking for a meadow) manifesto and campaign was one of several that signaled the expectation (normative rule) and willingness of consumers to pay for pasture-based milk. This represented an emerging change in the selection environment for the dairy regime. The establishment of Stichting Weidegang (Foundation for Grazing) and later the grazing covenant were the next concrete steps that supported the establishing of grazing standards (regulative rule) and resulted in more dairy processors instituting grazing premiums. While the decline in grazing trend has not been reversed yet, it has slowed down. It can be argued that this is evidence of grazing incentives and practices becoming, if not an obligatory passage point for all yet, increasingly stable within the regime.

There are several insights about the regime impact of CONO's sustainability engagement through the Caring Dairy program. First and similar to their impact regarding grazing, CONO was the first to implement a sustainability program in the Dutch dairy sector. Through that the co-operative modeled the active engagement of dairy processors with broader sustainability issues. While not legally binding, it can be argued that having a sustainability program is now a mainstream practice for actors within the sector.

Further, there are two important aspects of the Caring Dairy program to analyze and discuss: content and approach. In terms of content, the program as developed by Unilever contained a comprehensive range of themes. The Caring Dairy indicators connected to highly debated issues on nutrient management, animal welfare, and antibiotic use. These issues were also eventually included in the Duurzame Zuivelketen agenda (DZK, Sustainable Dairy Chain) and the sustainability program of FrieslandCampina Foqus Planet, which represents tacit consensus about tensions to be addressed and solved through the regime. Additionally, beyond these most pressing issues the Caring Dairy program addresses some topics such as farm economics, biodiversity, local economy, and social and human capital. For now these themes still remain less debated and beyond or at the periphery of most dairy processors' programs. It is therefore hard to identify and assess the specific regime impact of the contents of the Caring Dairy program.

Regarding Caring Dairy's operational approach and its relationship to the regime I would argue that as a model its impact has been limited. During the first decade of the program its implementation was voluntary and rewarded through a premium.

The focus was on thematic workshops, which were later reshaped into two-year learning trajectories based on farmers' interest, and farm-specific improvement plans (cognitive rule). While this model has wide acceptance amongst member farmers and external actors characterized the program as pioneering and ahead of other processors, it is a model that is not easily replicable for larger organizations in the sector and one for which success is difficult to assess in traditional performance terms.[48] The impact on farmers' mindsets—namely, increased awareness and understanding of sustainability issues—was repeatedly cited as the most significant effect of the program until then. While very relevant this is hard to quantify and communicate in market terms (cognitive rule), which can prove problematic as it continues to underpin the regime logic.

The need to focus on harmonized measurements and performance monitoring in order to quantify and assess progress was debated and contested internally. CONO faced resistance on its first attempt to move from a voluntary and growth-focused program (i.e., assessing progress against previous farm performance as opposed to externally set levels) to a goal-based tiered performance monitoring system with basic requirements for all supplying farmers (regulative rule). This illustrates some of the clashes between different approaches to operationalize sustainability, which in turn reflect clashing cognitive paradigms. It also exemplifies how regime actors are not monolithic and internally coherent—as they are often treated in transitions literature. In fact, as seen in the case of CONO, these actors are a collection of different perspectives and expectations (normative rules). The move to basic mandatory standards as the first step within a tiered sustainability program (in early 2017) is likely to have been driven by a confluence of factors. The most prominent factor probably is the increasing need for harmonized data on farm performance in order to internally assess progress as well as communicate results to external audiences. In the Netherlands, this will be especially useful, as other dairy processors such as FrieslandCampina have operationalized their sustainability program Foqus Planet as an add-on to their existing standardized quality scheme. Given the scale of their operations, the impact of their approach is likely to have an impact on the selection environment and the larger regime.

One aspect of the Caring Dairy Program that intersects both content and approach are the farm monitoring tools that it has developed in order to support improvement cycles at farm level. Besides its use by CONO farmers, the Cow Compass has been adopted by FrieslandCampina as well as DOC Kaas, Rouveen, Bel Leerdammer, and other dairy processors in the Netherlands. In that respect CONO has impacted how certain aspects of sustainability are addressed and assessed.

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[48] I reiterate that this is based on the data gathered via in-depth interviews with actors involved in the program as well as the analysis of the annual reports published by Ben & Jerry's USA.

Conclusion

The departing point in this chapter is the challenge faced by the Dutch dairy sector to increase milk production in response to the growing dairy demand outside of Europe whilst respecting the legal and social limits delineated at national and regional level. To understand how the dairy sector has been changing in the face of this challenge I described its development since WWII including the evolving debate about the future viability of the sector, as well as responses from the government, dairy processors, sectoral platforms, etc. Based on the findings I argue that there have been significant adaptations in the way the sector operates. These adaptations have been developed as ways for the actors in the sector to continue to be driven by market forces while still operate within the applicable legal boundaries and local social acceptability.

Another key point in this chapter was to investigate if and how the actions of dairy processors—hypothesized as having significant influence over rules and practices—affected the way that dairy was done in the Netherlands. I presented the case of CONO as a way to explore this question. Through its initiatives regarding grazing and the implementation of a sustainability program, CONO has affected the Dutch dairy sector in two ways. First, by identifying grazing as an important practice for safeguarding the legitimacy of the Dutch dairy sector in various ways (i.e., in its connection to cheese quality, animal welfare and the perseveration of the landscape). Secondly, by identifying dairy processors as actors who have interests and mechanisms to facilitate the compliance of legally established dairy targets as well as addressing social concerns related to the performance of the sector.

In chapter seven I contrast the findings of the three case studies and discuss the results in terms of common development traits, context-specific characteristics of the dairy sector across cases, as well as the different approaches to sustainability programs and their relevance for regime change and the study of sustainability transitions.

The dairy sector in Ireland

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Introduction

Dairy is, and has been for many centuries, a staple in Irish agriculture, diets, and agri-food exports. Foley (1993) describes how the clement Irish environment with its mild temperatures and plentiful grasslands provided fertile ground for the emergence of dairying. His account allows us to travel back in time into the lives and diets of the Irish 5,000 years ago where we can see that milk was a leading source of food for the population. The trajectory of milk as a dietary staple continued and expanded across centuries through milk processing, adding buttermilk, butter, cheese, curd, and whey to the table. The introduction of the potato in the 17th century—or more specifically, the socio-economic changes triggered by its introduction—certainly put milk into a less prominent spot in the Irish diet (Lucas, 1960). Nevertheless the Irish are amongst the top three milk consumers globally (Canadian Dairy Information Centre, 2015a). In such a conducive natural environment, the scale of dairy production has traditionally gone beyond the local market demand; there are records of occasional export licenses for butter and cheese dating back to the 15th century (Foley, 1993), and butter was Ireland's most important agricultural export in the late 18th and early 19th centuries (Solar, 1990). Today, the trade of dairy products continues to be an important economic building block. Ireland's top export markets for dairy are the UK (30% of total dairy exports), China, the Netherlands, Germany, and the US. Top product categories are butter, cheese, infant formula, milk and cream. At present, exports of dairy products and ingredients amount to three billion euros or 30% of Ireland's agri-food exports (Bord Bía, 2016c). This is relevant for a developed economy to which the contribution from the agri-food sector is still significant (7.6% of GVA in 2014) (DAFM, 2016).

Agriculture is not only a strong building block of the economy but is also the largest user of land. Ireland is known as 'the Emerald Isle.' This popular moniker, first recorded in writing in the 18th century, is said to refer to the predominantly green Irish landscape (Armao, 2013).[49] Two-thirds of the almost 70,000 km^2 of total land area are dedicated to agriculture (World Bank, 2013,2015a), of which 80% consists of grassland pastures (Bord Bía, 2016e; EPA, 2013). Around 19% of the total forage area is dedicated to dairy production (Dillon et al., 2016). There are 18,000 dairy farms (ICMSA, 2016) and although dairy is practiced to some extent in all regions, it is concentrated in the south, especially in the southwest of the island (i.e., Cork and Kerry counties) (Central Statistics Office, 2010).

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[49] Interestingly, the island was heavily deforested during the English settlement in the 16th and 17th centuries, however with a climate conducive for the growth of grass and herbs, the landscape maintained its characteristic green color. From a strictly legal perspective, there is no official color for Ireland, however the color green has been strongly associated with it, to the extent that contemporary images produced about the country look predominantly green (in color) (Armao, 2013).

Structure of chapter

This chapter starts off with an account of the development of the Irish dairy sector since the post-war era. Next, I present the debates on the abolition of milk quotas, the challenges identified for dairy in Ireland, as well as the emerging responses related to those challenges. I then zoom in into Glanbia Ingredients Ireland, the leading dairy processor in the country, to study the development of their sustainability code. The approach to the implementation of the code and some of the additional measures devised as part of their general response are described in detail. This leads to the analysis where I examine the key developmental traits of the sector, the emerging challenges and responses, and how they relate to the viability of dairy in Ireland.

Post-war development of the Irish dairy sector

In order to understand post-war development of dairy in Ireland, it is important to note that the Irish dairy sector entered the WWII years from an already weakened position. The decades following Ireland's independence were characterized by stagnation. As an illustration, the number of livestock units registered in 1922, the year of independence, was only surpassed in 1960 (Gillmor, 1987). Several factors played a role: the Great Depression had a significant impact on agricultural prices, which had a wide effect given the centrality of agriculture in the national economy (e.g., in 1929 the majority of Irish workforce was employed in agriculture, which together with food and drink accounted for almost 90% of exports) (Daly, 2011). During the 1930s, the trade war with Britain resulted in heavy duties on Irish exports, which proved especially difficult for the agricultural sector, including dairy. Dairy was also recovering from the foot and mouth outbreak of 1941, which had reduced the milk production base considerably. Finally, during the war—and similarly to what happened in continental Europe—grain production was prioritized over dairy as a measure to compensate food shortages (Foley, 1993).

Despite its neutrality during the war Ireland was not spared from the sequels affecting the region. Whelan (1992) describes the weak standing of post-war Irish economy: "By 1947 the continuation of war-time dislocation was manifested in rationing, rising inflation, falling living standards, frequent strikes, unemployment and emigration" (p. 50). Furthermore, just as most other European nations, Ireland was increasingly reliant on the US. For example, in 1947 imports from the US accounted for more than 26% compared to 10% a decade prior (Whelan, 1992). It was then that the Irish economy and agricultural sector started to take a turn; policies embedded in measures to support the European recovery were firmly committed to increasing agricultural output as part of an overall economic modernization strategy (Walsh, 1992). These goals were articulated in a document issued by the Department of Finance in 1948:

Table 5.1 Timeline of key events in the Irish dairy sector

Year	Event
1922	Ireland is established as an independent state - period of stagnation for agriculture
1930s	Trade war with Britain
1941	Foot and mouth disease outbreak
1945	End of WWII
1950s	Recovery of agricultural sectors
1960s	**Modernization of dairy farming (CAP)**
1970s	Dairy sector's rapid growth
1970s	Surplus production of milk in Europe
1972	**Ireland enters the European Union**
1984	**Introduction of EU milk production quotas**
1991	**EU Nitrates Directive**
1999	Glanbia uses Japanese kubota membrane technology on wastewater treatment
2006	**Glanbia signs up to the Sustainable Energy Ireland's Energy Agreements Program**
2009	**New Entrant Scheme is launched**
2009	**Glanbia transitions to the European energy management standard**
2010	**Food Harvest 2020 strategy report is published**
2010	Key customer inquires about sustainability in Glanbia
2010	Development of Glanbia's sustainability program begins
2010	**Glanbia launches Fix Milk price scheme**
2011	Pilot carbon audit on Glanbia farms starts, certified by the Carbon Trust
2012	Glanbia Ingredients Ireland (GIIL) is established
2012	**Origin Green is launched**
2013	Strategic environmental assessment (SEA) for Food Harvest is carried out
2013	Dairy Carbon Navigator is launched
2013	**Introduction of Sustainable Dairy Assurance Scheme**
2013	The Open Source Sustainability code piloted in 300 GIIL farms
2014	**GIIL launches the Open Source Sustainability and Quality Assurance code**
2014	Joint farm development Program (GIIL and Teagasc)
2015	**Climate Action and Low Carbon Bill is passed**
2015	EU country report on Ireland identifies failure to achieve emission reduction targets
2015	Food Wise 2025 is published
2015	SEA for Food Wise 2025 is carried out
2015	GIIL's Belview processing plant is inaugurated
2015	**GIIL launches revised Fixed Milk and Feed Price Scheme**
2016	**EU announces binding emissions reduction targets for 2030**
2016	**MilkFlex loans scheme is launched**

bold	key rule-related changes in sector
blue	key rule-related changes by processor

> *We can most effectively strengthen our own economic structure and contribute to the economic recovery of Europe by an increase in food production. The resultant expansion of Irish exports of meat, eggs and dairy produce, the high protein value which Ireland is particularly suited to produce, will meet an urgent European demand and reduce Europe's present dependence on dollar sources of supply. Ireland depends on this recovery in food exports from their present depressed level for the increase in earnings necessary to restore equilibrium in her overall balance of payments (Murphy, 2009, p. 56).*

This document further showcases agriculture as an engine of the national economy as well as the positioning of Ireland as a naturally suitable place for high protein food production.[50] As this chapter continues we will see how these two key points have continued to serve as core arguments within policy debates and decision making in Ireland.

Policies and funding were set in motion to support the increase in agricultural production. In the late 1940s, electrical power was extended to rural areas, a change that would impact the dairy sector. Not only did it allow for the introduction of machine milking—which would reduce the labor intensity of the process—but also opened the possibility of increasing herd size (Foley, 1993). Throughout the 1950s, state-financed educational and advisory services as well as price supports were introduced and increased in all farming sectors. Increasing mechanization and greater use of fertilizers were additional developments at the time (Walsh, 1992). After decades of stagnation, an increase in productivity in dairying was visible towards the end of the 1950s, and in the 1960s the sector continued its recovery with a move from mixed farming towards a specialization path (Foley, 1993). The decades that followed were characterized by rapid development. Dairy farming took major steps in terms of recovery, expansion and specialization. It is important, however, to appraise the level of mechanization and intensification that was achieved in Irish dairy at the time in relation to other European sectors. For instance, the technical possibility of using milking machines existed since the late 1940s; still, the adoption of the technology did not take off in Ireland until the 1960s and 1970s. By 1960 the number of milking machines in Ireland was 10,500 (Walshe, 1968). How does this compare to the Dutch dairy sector, for example? In the same year in the

[50] This document—a letter by T.K. Whitaker, the then principal officer at the Department of Finance—was written in the framework of the debate between Ireland and the U.S. about the European Recovery Program (informally known as the Marshall Plan). As part of the program, the U.S. was ready to provide a loan to Ireland. This letter goes on to argue that U.S. aid was needed if Ireland were to tap into its food production potential. It states that this support, however, must be provided as a grant as opposed to a loan, as Ireland was not in a position to repay. Eventually, throughout the duration of the program, Ireland would go on to receive $146 million of which only $18 million was grant aid (Murphy, 2009).

Netherlands the number of milking machines had reached 30,000 (Bieleman, 2010). Although the two countries had similar numbers of cattle—the Dutch dairy herd was 1.6 million cows while the Irish was 1.3 million—the Netherlands employed milking machines at a rate three times that of Ireland. Some differentiating factors were related to access to capital and farm structure; at the time the average herd size in Ireland was only 5.5 cows compared to 9 cows per farm in the Netherlands (Van Horne & Prins, 2002; Walshe, 1968). This illustrates the extent to which Irish dairy had modernized—while the sector made significant progress against its post-war productivity and growth goals it was still recovering from its pre-war stagnation.

The agricultural sector continued to grow and by the early 1960s Irish farmers started to argue for access to the European Economic Community (EEC, now the EU). They considered that their traditionally advantageous position as trading partner of Britain had lost ground and there was no clear benefit in giving priority to Britain over other markets. The National Farmers Association (NFA) maintained that participation to the EEC would grant them access to new trading opportunities as well as the benefits of the Common Agricultural Policy (CAP), such as guaranteed high prices (Murphy, 2002). The Irish government contested the NFA's argument, citing the likelihood that the loss of the British market and all trade preferences then enjoyed by Ireland would not be compensated by new trading with European members, or at least not sufficiently fast in order to cover the losses. Eventually, and once Ireland learned the intentions of Britain to apply for EEC membership, the Irish application was submitted. After a lengthy waiting period Ireland along with Denmark and the United Kingdom was granted access to the EU in 1972 (NA, 2016d). While the agricultural modernization process was accelerated by the entrance to the EU, it is argued that the development has been uneven across different regions; the concentration and intensification of farming did not express itself in the west of Ireland as much as it did in other areas (Emerson & Gillmor, 1999).

The period after entrance to the EU and before the 1984 imposition of quotas was characterized by an increase in prices and milk production. Soon after joining, Ireland benefited from price support and export subsidies. The price for Irish milk increased 75% and although this was a period of high inflation it further incentivized milk production, which had already increased in anticipation to EU accession (Hennessy & Kinsella, 2013). The result was a doubling of milk production volume between 1973 and 1984; this growth is explained in small part by an increase in cattle but mostly by a sharp increase in milk yields, which almost doubled in that period (Donnellan, 2015). This put Ireland at the top when compared to the average milk yield increase in Europe for the same period, which was 23% (Petit et al., 1987).

The amount of milk surplus being generated in the EU quickly became problematic and production quotas were introduced in 1984 as a measure to manage supply levels, limit CAP expenditure, and stabilize prices (European Commission, 2015d).

The Irish government strongly opposed their introduction; they maintained that dairy was a crucial component of the agricultural sector and of their newly burgeoning economy. The strong diplomatic efforts resulted in a derogation for Ireland: while milk quotas were allocated based on production volume at 1981 levels plus 1% for most member states, Irish quota was granted based on their 1983 milk production level plus 5% (Donnellan & Hennessy, 2015b). Despite the derogation, milk quotas are argued to have effectively truncated the dairy sector's expansion and hindered the growth of the industry (McDonald et al., 2014). Similarly to what was observed in the Dutch case study, the introduction of milk quotas was identified as the most influential event in the post-war development on the sector. Interviewees characterized the introduction of quotas as halting production growth and other key development aspects of the sector.

> *Quotas came in 1984 so for the past 30 years dairy farmers have been stymied in terms of their expansion plans [. . .]. When milk quotas came into Ireland we came from quite a low base in terms of scale, efficiency, and demographic of farmer suppliers. They were all at a low level compared to our European peers. So effectively we started from behind if you like. (GL2)*

> *Specifically in dairy farming expansion has been stunted on account of quotas. (GL4)*

> *The last 40 years from a development point of view have been a disaster because of the quota regime. [. . .] Our share of the global market declined and New Zealand in particular, and North America would have grown hugely. New Zealand's production was the same as Ireland at the time when quotas started. New Zealand's production is now almost four times the Irish production. [. . .] So the industry stood still and the world moved on. (GL9)*

> *The introduction of quotas has been the biggest [factor]. We were expanding at a huge rate [. . .] we are the best-positioned country in the northern hemisphere to produce milk and we will do that, given the opportunity. Most people identified that back in the 1980s then quotas came in and just stopped that. (GL12)*

During the first years under the quota framework farmers who sought to increase scale at the farm level were forced to attain additional land. This was done via long-term leasing or purchasing, as quota was attached to it. Later on, quota-trading schemes allowed more room to maneuver, but at high prices, there was still relatively little trading. In 2000 changes in the trading framework allowed for permanent transfer of quotas, which stimulated significant quota trading (almost 300 million liters of milk were traded in 2000 vs. 70 million liters traded in the second half of the 1990s) (Hennessy et al., 2015). With time trading became more flexible in general, especially towards—and in preparation for—the end of the quota era. However, specific arrangements and rules for quota transfer differed across member states and in Ireland the trading of quota was regionalized. This meant that quotas could be traded within the region but not outside of it. This 'ring-fenced' restriction was aligned to social and rural development policy objectives but it is argued to have constrained milk quota from moving to more efficient farming regions (Shrestha & Hennessy, 2008). Quotas, it could be argued, transformed the financial requirements and operating logic for the dairy sector.

> *The constant throughout this time was a constraint on those who were in expansion mode and if they did expand they incurred in very high expenses either entering into long term leases or alternatively a big capital expenditure in purchasing land. (GL2)*

> *During the time of the Celtic tiger it was virtually impossible for a farmer to buy land and to buy land with quota was even harder still. A lot of business people, and home developers bought land as an investment. There was a lot of competition against farmers buying land so that didn't happen that much, on small bits I suppose, but farmers were not able to buy a dairy farm and move in there. (GL4)*

> *A lot of people got tied in into very small quotas. Over the years, the units became uneconomic, then they had to be bought out. Then you had the introduction of quota transfer, huge amounts of money were paid to buy quotas. So it was all the time investing in a depreciated asset instead of investing in the business. You were investing in an asset that was very likely going to disappear at some point in time. So I think that is the single most impacting thing I would identify. (GL12)*

Based on data from the National Farm Survey, Hennessy and colleagues (2015) calculated that in the period between 1995 and 2013 the total amount invested by Irish dairy farmers in the purchase of quotas was estimated at €1.4 billion (for 2.5 million liters of milk).

Actors identified other interrelated impacts of the quota scheme. Below some interviewees discuss the lack of new entrants to the sector and its hampering effect on the organic renewal of dairy farming in Ireland.

> *Until recent years there were no new entrants and that was the biggest problem in dairying in Ireland, that no young farmer when he finished school could enter dairy unless his parents or an uncle [were already in*

dairy]. If he was a designated nephew, that was the only way you could enter farming by inheriting quota. So for those reasons it has been very stunted maybe until recent years. (GL4)

Because of these constraints and quota you had quite a number of youngish guys disillusioned and they opted for other farming systems. Some of them opted out [of] dairy entirely so the supplier numbers quit dramatically. (GL2)

Very little development, no new people coming to the industry. So the farmers that were there 40 years ago are still there. That's an overstatement, there've been some new people but very few. [. . .] We lost a generation of people in the industry, a whole generation of farmers in between me and my son should have come in. There should be more farmers between those two age groups but there aren't because the opportunities didn't seem to be there. [. . .] So you had an industry with a cap on its production and output and you had an industry with the same participants on the pitch and that is not good. So, no new growth coming in and very little innovation. (GL9)

One of the previous quotes mentions that there were no new entrants until recently. This refers to the New Entrant Scheme that was launched by the Department of Agriculture, Food and the Marine in 2009. Through the scheme a small part of the milk quota was allocated to new dairy farmers. The allocated quota came from the quota increase that was planned for the last years of the regime in order to ensure a smooth phasing out of the production cap. This was the first time since 1984 that farmers were able to enter dairying. The allocation process included an assessment of a five-year business plan produced by farmer applicants (McDonald et al., 2013). The scheme, in place during the last five years of the quota regime, facilitated the entrance of more than 400 dairy farmers (DAFM, 2013).

Other impacts discussed by interviewees were those connected to cost reduction programs. These were driven by the introduction of quotas and were recognized as having a positive effect in boosting efficiency. At the same time, one interviewee argued that the cost reduction focus has proven taxing on innovation efforts.

Production was always limited to that extent. We all paid attention to cost and made a structure around making as much money as possible out of limited amount of production. (GL8)

I think the big policy here has been the milk quota, which constrains the milk in volume, and so the driver from a research perspective was to reduce costs of production. We can't increase the output of milk then *the way to make more profit is to reduce the costs of producing the milk. (GL1)*

I suppose some of the good stuff that came from it was that there were huge cost reduction programs that were implemented because of the fact that we weren't expanding in order to take out costs. And you can do that for a certain amount of time. Because there is only so much costs in a system that you can touch and once you go to a certain point you are doing harm to the business, you are taking out intellectual property, you are taking out people, strategic thinkers, people that add value in the long term. So if you cut back in R&D, that is the level you get to eventually. And then after a while you say 'this was not a great idea, we need to invest in this and that.' (GL9)

Farm profitability

In its early stages, the milk quota scheme facilitated the stabilization of prices and in combination with cost reduction efforts in an already low-cost production system (i.e., grass based), it resulted in good margins throughout the 1980s. The rise in the cost of inputs such as fuel, fertilizer, and feed, however, started to exert pressure on farm margins since the late 1990s (Hennessy et al., 2015).[51] Electricity in Ireland has been amongst the most expensive in Europe in recent decades (Eurostat, 2016) and while the share of local renewable energy has increased lately, the island still imports 85% of its energy (Howley et al., 2015). Also, the use of concentrate feed has increased in the last 20 years from practically zero to over a 1,000 kg per cow annually (for reference, that is around 50% of the average use in Dutch dairy) (Hennessy et al., 2015; NZO, 2016b). But the increased exposure of European dairy to global market forces as a result of the reduction in price support mechanisms is argued to be the key price-related development within the Irish dairy sector (Hennessy, et al., 2015). Variation in global dairy demand, and fluctuations in supply from other major dairy players like New Zealand are such world market changes to which Irish dairy is increasingly susceptible (Keane & O'Connor, 2009). The result is a significant increase in both frequency and level of volatility in European milk prices, which has affected the sector since the early 2000s. In the last decade in particular the level of volatility has increased dramatically. As an illustration, O'Connor and colleagues (2015) calculated that before 2007, price fluctuations were seldom of more than 5% over any three-month period whereas now, price changes of 15% or more are often observed.[52] Such volatility has affected Irish dairy farms; in 2009 annual farm income dropped to €25,000 and only two years later peaked at almost

[51] The cost of feed represents around 20% of total production costs. Fuel and electricity make up for 10 to 15% of costs, and fertilizers another 10 to 15%. These figures represent the cost breakdown in an average year (Hennessy, et al., 2015).

[52] The study referenced here used European wholesale skim milk powder (SMP) prices.

€70,000 including subsidies (Hennessy, et al., 2015). The swings in price and costs disturb farm (financial) stability and planning; however, dairy remains the most profitable farming sector in Ireland.

> *The best chance at making a living is dairying and the best chance to be fully employed is dairying. [. . .] If you want to have employment for family—if it's a family farm and a lot of Irish farms are family farms—for a son to come back into, then dairying is probably the one with the best potential to create enough employment and enough income for a family with a limited amount of hectares. (GL8)*

In 2015 the average farm income was a little over €60,000 for dairy followed by a distant second at an annual income of €30,000 for tillage farming. All farming sectors should be noted are heavily subsidized (Moran, 2016b). For Irish dairy in particular subsidies have been approximately 40% of farm income since 2005 (Hennessy, et al., 2015).

Another observable development in the sector relates to farm structure. This, as it has been discussed earlier, is not a trend observed only in Ireland but also more generally in Europe. Herd size has been steadily increasing in parallel to a decrease in cow numbers and the number of dairy farmers (Donnellan, 2015; Keane, 1991). In 1960 there were 1.28 million dairy cows, around 100,000 dairy farmers and the average herd size was 6 cows. In fact, herds of 10 or fewer cows made up 84% of all dairy herds (Walshe, 1968).

> *The scale [of farming] consequently went up because we had a finite quota, so you know nationally now we have 18,000 dairy farmers, back at the outset of milk quotas we had 70,000 or something of that nature, so there has been a huge contraction in numbers with a consequent increase in scale. (GL2)*

When quotas were introduced in 1984 there were approximately 1.4 million cows, 80,000 dairy farmers, and the average herd size was 18 cows (Cullen, 2016). In 2014 there were 1.1 million cows, 17,000 dairy farmers, which is a decrease of almost 80% in a period of 30 years and the average herd size went from 18 up to 60 cows (Irish Farmers Association, 2015a). The sharpest decrease was in the category of farmers with smaller herds. At the outset of quotas there were approximately 48,000 herds with 20 or fewer cows, and this herd size represented about 60% of all herds. In 2014 less than 10% of herds have 20 or less cows and there are more than 2,500 herds with more than 100 cows—a farm size that was practically non-existent when quotas were introduced (Hennessy et al., 2015). Farm size has also increased, mostly through leasing of land (Central Statistics Office, 2010). In 1960 most dairy farms were between 6 and 20 hectares; if we look at the average size of a dairy farm in 2010 it has gone up to 55 hectares (Central Statistics Office, 2012; Walshe, 1968).

So far I have described how the modernization and intensification logic that has largely characterized the post-war development of European dairy farming also had a clear effect on the Irish sector. The traditionally small-scale Irish dairy farming has evolved into larger, more productive—still predominantly grass-based—farming units. When compared to the development of dairy in other EU member states it can be seen that the change has been of a different magnitude. The Irish dairy sector had a different starting point given its historic pre-war development. In addition, the growth resulting from EU accession was short lived as milk quotas came relatively soon after. The introduction of quotas has been the most influential factor shaping the sector in the last 30 years. It is argued that their introduction improved the cost-efficiency of operations but significantly hindered the sector's growth. Their abolition is expected to have significant effects, as it will further expose and orientate the Irish dairy sector to world market dynamics. In what follows I will describe the emergence and key points of the post-quota debate. It's important to clarify—just as I did when describing the development and main themes of the debate on sustainability of Dutch dairy—that the points raised here are the ones that consistently emerged during the mapping done for this study. There are however other themes that are both relevant and discussed amongst groups of actors but were relatively less present during my observation.

Post-quota future

The post-quota debate has centered on the opportunities attached to milk production growth—namely, increasing Ireland's share in dairy export markets. Some of the accompanying challenges facing the Irish dairy sector relate to buffering more pronounced price volatility, navigating the impact of changes in world demand and supply, as well as addressing environmental issues and complying with the respective European and global objectives.

The debate about the development of the sector after quotas gained momentum close to the abolition of quotas in 2015 and it continues today. A good place to start delineating the key points of this debate is 2010. Why? In the summer of 2010 the industry-led report Food Harvest 2020 was launched by the then minister for agriculture, fisheries & food, Brendan Smith. The strategy report for the agri-food sector was presented by Smith as a "comprehensive and considered roadmap for the development of Ireland's key indigenous sector." He also emphasized that the strategy "captures the considerable complexity of this sector. It underlines its unique and special position within the Irish economy, and it illustrates the potential which exists for this sector to grow even further." Finally, Smith highlighted the role of the sector in leading the economic recovery of the country (Smith, 2010). It is important to make a note here as we encounter again the arguments about the crucial role that agriculture plays in Irish economic development as well as the comparative advantage of Ireland as agricultural producer in the region. The Food Harvest 2020 report included recommendations as well as growth targets for each sector, for dairy this was a 50% increase in milk production by 2020 (DAFM, 2010). This ambitious growth target was discussed by farmers and other actors in the dairy sector in terms of its feasibility, as well as the challenges and opportunities connected to it; below I present the components of that discussion.

First, some interviewees discussed their own growth plans as well as what they expect to be the building blocks of the 50% proposed growth target for the dairy sector. It was mentioned that while there would certainly be an increase in cow numbers, another important component rested on improving milk yield per cow.

> *That [Food Harvest 2020 dairy growth goal] doesn't mean a 50% increase in the dairy area. There will be more land taken into more intensive production but also there is an increase of yield per cow. We are coming from a very low base compared to Europe. Our top 10% [performing farmers] are right up there together with our European peers but it's a very long tail of distribution with a low milk yield per cow. I think it's 4,700 liters per year in average so there is a lot of scope to push that up, even without having to resort to all-year housing. You can push it up to 6,500 liters on a grass-based system. (GL1)*

> *Once milk quotas go, the alternative farm enterprises will go and the farmers will work exclusively in milk production. So within the farm unit you will get a larger scale and you will have more productivity because today, again constrained by quotas, our farmers are not harvesting full genetic potential that they have invested in their herds. That is the broad picture: bigger numbers, bigger scale, higher productivity and more efficiency.[53] (GL2)*

> *At the moment we are milking 70 cows with the intention of going towards 100 when quotas disappear. And the quicker the better, we want to see them go. [. . .] We looked at our farm yesterday and we reckon we can get the 20% increase without increasing cow numbers, just increasing how much the cow is producing. We could get the same increasing in solid output without effecting any change across the board in cow numbers. Without a doubt, there is room [to grow]. [. . .] I think you are going to see cows added. Everybody has been gearing up towards expansion, the*

[53] Alternative farm enterprises refer to dairy farmers who also have another farming operation—commonly beef.

heifers are there, all is in place, and I think you are going to see building numbers, along the increase in efficiency. To be honest I think the 50% will be easily achieved. [. . .] I think a combination of increased numbers and better cows. (GL12)

Post-quota milk production growth in Ireland is mostly framed as a long overdue development for the sector as well as an opportunity to supply the increasing world demand for dairy through the low-carbon Irish grass-based production system. According to a study on the livestock sector's contribution to the European greenhouse gas emissions carried out by Leip and colleagues (2010) the lowest cow milk emissions are created in Austria and Ireland.

We have been held back. You have to understand Ireland and how backwards we were in the 1960s, we had very poor prices. [. . .] We joined the EU and then in the 1970s we saw really good prices but a shortage of capital, interest rates were high and people were afraid to borrow to increase production and suddenly just as we were getting our leg, the quotas came so we have been held back. (GL8)

North America wouldn't compare to us now from their production systems, they are very intense and environmentally a lot harder than ours. (GL9)

The emissions of Irish milk are the lowest in the EU, the lowest carbon footprint in the EU. I think only New Zealand has a lower footprint, but we are right up there. (GL1)

Ireland is the best place and the most sustainable place to buy your dairy ingredients from. (GL10)

When asked to discuss the possible extent of the post-quota growth, interviewees described that it is unlikely for dairy farming in Ireland to reach industrial levels due to land availability constraints. They expect family farms to grow and specialize further while maintaining the management mostly within the family. Finally, they foresee the continuation of the family farm as the most common type of farm for Irish dairy.

In Ireland, most of our farms are family farms that have 70 to 80 cow units. I would see those farmers growing in the period post quotas, to 100 to 120 cows and I would see that level of those farms being very sustainable and viable in the current context. That would be the mainstream type of farming activity that you would have in Ireland. You will of course see large scale commercial farms emerging and they will have to operate under sustainable practices I would suggest, but it will a very different

> *model. If I look forward as far as I can, I would see that the family unit will continue to be the core production in Ireland. And that would be around 120 perhaps 130 cows and operated fundamentally by the family and I think that would be very sustainable in Ireland. (G11)*

> *I think we are going to produce a lot more milk. I'd say the units are going to get bigger but not colossal. The vast big bulk of production will still come from family farms where people have 80-100 cows. And then you have a big unit here and there with a couple of hundred cows. But establishing a thousand-cow farm in Ireland isn't easy because of the land structure and ownership of land. (GL9)*

Access to land constitutes a limiting factor to farm expansion and to entrance of new farmers with no expectation of land inheritance. Firstly, the volume of land for sale every year is marginal. In 2015, for example, 0.6% of the total agricultural land was offered for sale, and this was 14% less than what was offered in 2014 (Newenham, 2016). Several informants mentioned anecdotally that land does not 'change hands' in Ireland, mostly because traditional small farming communities don't sell land (GL1; GL4). It is often quoted that land is sold once in 400 to 500 years in Ireland while in France, for example, it is sold every 70 years (Anderson, 2013; Whelan, 2014). Secondly, even if the price of land has decreased in the last decade, the farmland prices in Ireland are still amongst the highest in Europe (NA, 2011; Whelan, 2014). Farmland rental is rather common. For instance, 30% of all Irish farms are renting some land (Central Statistics Office, 2010). Renting land is argued to provide little security for new entrants as they build their farm business given that contracts commonly run for 11 months or less (Bogue, 2013).

Further, within the topic of growth and the possible changes in farm structure, interviewees identified factors and perceived risks that are taken into consideration when contemplating or planning farm expansion. Questions about succession surfaced when discussing potential future changes in the scale of farming operations.

> *My plan for when quotas end is not to increase in any substantial way until I see what my son decides to do. He has another year in what we call secondary school and after that he'll probably go to college, which depending on the course can be 3 to 4 years. Possibly he will come home to farm then. At the moment I calve 70 cows this spring and that is enough for me. (GL4)*

The age profile of farmers as well as farm succession are prominent discussions, and not only in Ireland but across Europe. According to data from 2013, the majority of European farmers were older than 55 years in contrast to only 6% under the age of 35. In fact, one third of all farmers are over 65, which is the normal retirement age.

The current ratio—for every young farmer (<35 yrs.) there were nine elder ones (>55 yrs.)—paints a stark picture (European Commission, 2015c). Regarding farm succession, Burton and Fisher (2015) provide strong evidence to their argument that a farm succession crisis is unfolding in Europe, although its expression is not spatially uniform. In Ireland the average age of farmers is 57 years old (Donnelly, 2015) and the results of a recent survey of 421 farmers showed that only 40% had a confirmed successor (Bogue, 2013).

These are farm structure issues relevant to the sectors development and renewal. In fact, in a study by University College Dublin on the innovation in the Irish agri-food sector researchers identified age structure and lack of land mobility as the strongest barriers to innovation at farm level (Renwick et al., 2014).

Moreover, interviewees discussed additional labor and scale increments in its relation to farm profitability and quality of life.

> *I would say a guy with 70 to 80 cows is probably in a reasonable sustainable unit because it can generate an income, more or less a reasonable income [. . .] . There is a step from being a one-man outfit to justifying a labor unit. You have to go above that because the incremental cost of that is going to eat up the profit from the extra production. You have to be either at 80 to 100 in a one-man's unit with maybe some help in the spring or the next level is 150 because once you pass 100 then one man cannot do it himself because he wouldn't have a lifestyle that is acceptable and of course depends hugely on how they run their farms. (GL9)*

> *I would prefer if I could stay at 50 or 60 cows, have a good quality of life and family life rather than going to 100 cows, bringing in an extra person and that person taking probably 30 cows worth of a salary. (GL7)*

An interviewee further connected the main drive for growth within the sector with the viability of rural communities across the country—a point that was outside of the general debate on scale.

> *If we expand and get bigger, then I question if that is sustainable because if one expands some other farmer is gone. [. . .] right now we can just be in our own little piece of land and it's doable. But I question if that will be enough [to sustain us] in 10 or 20 years from now. It's questionable. [. . .] I don't want to expand at someone else's cost. Then the community suffers because you have bigger farms [but] less farmers, less people in the community, less shops, smaller schools, less teachers. [The farmer representative] is now dealing with 100 farmers, then he'll be dealing with*

50, in 20 years maybe he'll be dealing with only 10. [His] job will be gone before he knows it. (GL7)

Some actors voiced what could be argued is an added layer to all decisions at farm level—the expectation that once production caps are removed milk supply increase will drive prices down.

It also brings other challenges; you are a bit anxious about your investment, the equipment, etc. Am I just producing an extra 20 to 50% extra for the same amount of money that I was getting before I did anything? Because that is the worry, that is the anxiety that is there. (GL8)

There would be a concern amongst Irish farmers as indeed there is in dairy farmers across Europe, that when quotas go, will we get a big flow of milk. And will demand keep going so that the balance in that equation is kept right? That's a fear and a concern that people have. (GL2)

These statements illustrate how farmers are faced with decisions about scale and how these decisions are pondered against different scenarios. Farmers consider an increase in scale in part as a means to maintaining income level—anticipating a decrease in price— as well as incrementing it. The move towards a larger herd size is likely to entail additional farm labor, which in turn has management and financial implications. Quality of life is another aspect in the equation of farm expansion and growth. Farmers discuss different scale levels as resulting in better or potentially worse impacts in quality of life for an individual farmer. Their concerns regarding the extent to which scaling up operations will generate real benefits are not unfounded. Based on a longitudinal analysis on Irish dairy farm incomes under milk quotas, Hennessy and colleagues (2015) show that the growth in the last 30 years has been entirely scale driven. According to their calculations the profit per unit of production has not improved during this 30-year period and the increase in dairy farming income is the result of further enlarging and specializing farm operations—that is, only by increasing their output.

The opportunity to increase Ireland's dairy production and exports is accompanied, interviewees recognized, by a set of challenges. Financial management emerged at the top amongst various farm management challenges facing farmers. This is not surprising as actors themselves explained the inherent complexity that the profitability equation presents at different farm scale levels. Therefore managing the farm financially constitutes a crucial challenge. The reason is that despite of the inherent low-cost advantage of the predominant Irish grass-based system, increased price volatility is very likely and this will be difficult for farmers across the board. Those with expansion plans will have to not only navigate price volatility, but also secure and manage external capital as most growth is expected to materialize through investment loans.

> *Once the quotas end and we have a more open market I think it's going to be a continuous fluctuation and that is where efficiency is going to come in and play a big factor. You are going to have to be able to do what needs to be done when the price is good and keep some reserves for when things are not so good but I don't envisage that is going to be a leveled play. (GL4)*

> *I think most dairy farmers would have savings put aside. Some would have invested and done quite well but a big share of that expansion will come from borrowed money. It's the ability to pay that back that you need to look at. (GL5)*

> *Farmers [on a gradual expansion mode] are not necessarily going to take big risks in terms of borrowings and capital so, the biggest risk for those guys is price volatility and the necessity to keep going on the up the ladder in terms of efficiency improvement. For farmers that are in rapid expansion mode the biggest risk for them is their financial management and that they manage successfully the accessing of capital and the paying out their debt in that growth face. (GL2)*

> *The biggest challenge for farmers is to ensure that they don't overstep. All this extra production looks very attractive but if not done competitively, if the production costs aren't near where they should be and volatility is likely to go up, then farmers will face huge financial management challenges. [. . .] The difference between managing 70 cows and 140 is another big challenge. It's going to require a whole new level of scales of managing the herd itself and they'll have to manage people, because they'll need more help so they need better systems. [. . .] If it goes wrong in a small unit the farmer will be fine, just wait six months and he'll be grand but if it's a big unit that is heavily leveraged that may not have the capacity to loose way more money on a daily basis so all of that will be challenging. (GL9)*

The points raised by key actors in the sector so far are important interrelated threads on the debate about the future opportunities and challenges for the Irish sector. To summarize: first, significant growth in milk production is expected to occur and the main drivers of that growth are anticipated to be improvements in milk yield per cow and an increase in herd size. The predominant family farm will thus increase in size but remain to a large degree within family management and the most common farm type in Ireland. Even in a world without production quotas Irish dairy farming is not expected to reach industrial scales (e.g., 1,000-cow operations); limited farmland availability poses a practical challenge to further expansion. The main future opportunity that is identified by interviewees is the possibility to increase milk production and the Irish share of global dairy exports by tapping into the inherent potential of Ireland for low-cost, grass-based dairy production. While there is eagerness for growth, the question most commonly emerging is about the degree to which growth at the farm level—involving succession, additional labor and investments—will contribute to effectively weather market fluctuations and positively impact profitability, as opposed to enlarging farm operation for no sustained added benefit.

Sustainability debate and emerging responses

The previous section illustrates how the future expansion of the sector, especially the 50% milk production growth target stated on the Food Harvest 2020 report, has been a big item within the post-quota debate. Here, I continue with the delineation of that debate. I include responses emerging at the national level as well as from individual dairy processing actors. The description is structured as chronologically as possible to showcase the interactive and co-evolutionary nature of events. As you read on you will see the discussion about the environmental impacts of the sector's expansion becoming increasingly articulated. Explicit references to 'sustainability' and 'sustainable' as well as different framings and definitions of these terms will emerge as well. For the most part sustainability conversations refer to the environmental impacts of dairy production while social impacts are discussed to a lesser extent. Underpinning this debate are concerns about how to reconcile two realities. First, agriculture in Ireland is an important component of economic development. The agri-food sector's contribution to the national economy was 7.6% in 2014 and it accounts for more than 8% of all employment (DAFM, 2016); as such, agricultural policy is deeply embedded in an economic logic.[54] The other fact is that the greenhouse gas (GHG) emission intensity of Irish agriculture is very high. This is the result of the prominence of beef and dairy production, which together account for 70% of gross agricultural output (Bord Bía, 2016d). Actually, in Ireland agriculture is the single largest contributor to national GHG emissions, accounting for 33% of the total (EPA, 2015). Thus, issues of compatibility between growth targets and Ireland's commitments to reduce national greenhouse gas emissions is an issue that frequently arises in the debate and gathers the most attention and coverage.

To continue let us reposition ourselves in the timeline to 2010 when the Food Harvest 2020 strategy report was launched. The report was structured around the theme of 'smart green growth.' The term *smart* is used to describe an approach that centers

[54] That is of the national gross value added (GVA) at factor cost which is GVA at market prices minus any indirect taxes plus any subsidies.

on enhancing levels of productivity and competitiveness as well as on innovating at the market and supply chain levels. *Green* is presented as "a natural marketing opportunity for Irish agri-food to build on" (DAFM, 2010, p. 5). The opportunity, according to the report, rests on utilizing the overlap of two ideas commonly associated with the color green. On the one hand, there is a historic association of this color and Ireland's agricultural landscape and on the other, the modern use of the term *green* refers to attention or concern for the natural environment. It is added that successfully tapping into this opportunity will require the green credentials of Ireland to be effectively documented and communicated. Finally, *growth* refers to, as detailed earlier, the sector's expansion through increased productivity, more added-value products, and greater economies of scale through consolidation both at the primary production as well as the processing levels. In the report, climate change, water quality, biodiversity, and renewability of energy are identified as the main environmental issues facing the Irish agri-food sector. The recommendations about how to address pointed mostly to further research, knowledge transfer and the implementation of technology (DAFM, 2010).

The report received criticism from environmental organizations that highlighted its insufficient detail and coverage of the implications of the proposed growth targets (Carey, 2012). In 2012, a stakeholder consultation was carried out as part of the *Environmental Analysis of Scenarios Related to Implementation of Recommendations in Food Harvest 2020* process. In response to this consultation, Environmental Pillar, an organization comprised of 29 independent non-governmental organizations representing the views of the Irish environmental sector, argued that this was not the right process to assess the impact of the Food Harvest 2020 report. The organization explained that the report required assessment under the Habitats Directive just as any program or policy intended to be adopted by the government. Environmental Pillar maintained that Appropriate Assessments as well as a Strategic Environmental Assessment (SEA) would be required to fully and officially determine the impact of the proposals of Food Harvest 2020 (Environmental Pillar, 2012).

A Strategic Environmental Assessment was eventually carried out in 2013 by the Department of Agriculture, Food and the Marine (DAFM). On the final report of the assessment it was concluded that at national level and before factoring mitigation efforts, the changes proposed by the Food Harvest 2020 strategy would result in "slight negative impact in the environmental characteristics biodiversity, flora and fauna; water quality; air quality and climatic factors and to a neutral/imperceptible impact on soils and landscape" (Farrelly et al., 2014, p. i). It was added that if high level of mitigation efforts were adopted these negative impacts could be neutralized (Farrelly et al., 2014). An Taisce, an independent charity organization working on preservation and protection of Ireland's natural and built heritage, voiced concerns about some of the points of the assessment which understated the potential negative impact of the Food Harvest recommendations. An Taisce also pointed to the legal ambiguity of the Food Harvest 2020 strategy report as well as its strategic environmental assessment. This ambiguity caused contestation regarding the process through which the report had been assessed as it gave space for the Department of Agriculture, Food and the Marine to argue that Food Harvest 2020 was an industry-led initiative and as such it was exempted from the official assessment required for government policies. However, this industry-led initiative as well as its environmental assessment were facilitated and fully recognized by the Department of Agriculture as a key input for its policy making efforts, which makes them subject to the scrutiny required by any state-adopted measure (An Taisce, 2013).

As the debate around the assessment of Food Harvest 2020 was unfolding, researchers from Teagasc—the Irish Agriculture and Food Development Authority, a semi-state body that does research, advisory work, and education for farming in Ireland—published a series of analyses on the GHG emission consequences of the Food Harvest targets. Before we dive into the results it is important to clarify that these analyses focus on the whole agricultural production, not only dairy. Still they are relevant input given the prominent position of dairy within agricultural output. On the first analysis the GHG emissions of Irish agriculture were modeled under two different scenarios. On the reference scenario there was no policy change and agricultural output grew mostly influenced by the increase of dairy after quotas, but was below Food Harvest 2020 growth targets. Under these circumstances the GHG emissions from agriculture in the year 2020 would be 10% below 2005 levels. Under the second scenario, which corresponded to the attainment of the Food Harvest 2020 targets, the GHG emissions of the agricultural sector would be 3% lower than those of 2005 (Donnellan & Hanrahan, 2011).[55]

Why is it informative to compare the results against 2005 GHG levels? The 2005 GHG emission levels were taken as baseline from which binding annual greenhouse gas emission reduction targets for 2020 were established for all EU Member States—Ireland's target is a reduction of 20% from 2005 levels.[56] The other analysis produced by Teagasc looked at the abatement potential of mitigation measures including their costs and benefits. Their analysis revealed that through mitigation

[55] The results in detail: The 2020 GHG emissions under the reference scenario, (that is, no new policy) in metric tons of carbon dioxide equivalent (Mt CO_2 Eq.) would be 16.8. This would constitute a 10% reduction compared to the 2005 level of 18.7 Mt CO_2 Eq. Under the second scenario, where Food Harvest goals are attained, the GHG emissions by 2020 would be 18.1 Mt CO_2 Eq., which is a 3% reduction on the 2005 levels (Donnellan & Hanrahan, 2011).

56 This was agreed through the EU Effort Sharing Decision. The emission targets are expressed as percentage changes from 2005 levels. The Effort Sharing Decision targets cover sectors such as housing, agriculture, waste and transport (excluding aviation), which are not included on the European Emission Trading System (European Commission, 2016f).

efforts the emissions resulting from the Food Harvest 2020 growth could be reduced by 5.5%. While this level of emissions would still be well above Ireland's 2020 GHG reduction target, their analysis showed that for the level of growth, the increase in GHG emissions was of smaller proportion, which would represent a decline in the carbon intensity of agricultural production (Schulte et al., 2012).

Origin Green: sustainability at sector-wide level

Also at this point, there was a key development in terms of sustainability related responses—the launch of the Origin Green program in 2012. Through its strategy, the Food Harvest report had effectively reframed (environmental) sustainability. It took the notion from an implicit potential obstacle for the sector's growth to a competitive advantage for agri-food products based on Ireland's naturally occurring green credentials (e.g., low-carbon meat and dairy production). Origin Green was the marketing and verification program designed to operationalize the commitment of the food industry to those green credentials. What is the background to this program? The Origin Green (OG) program was developed and launched by Bord Bía. Bord Bía, or the Irish Food Board, is a non-commercial state-sponsored body tasked with the marketing of Irish food, drink and horticultural products throughout the world (Bord Bía, 2016b). The program emerged out of the need for an umbrella 'Brand Ireland' (Bord Bía, 2014a). The specific angle and approach of the program were designed based on research carried out with international trade customers on their perception of the sustainability of Irish food as well as their own needs in terms of sustainability-related requirements. This preparatory stage was described by one of the interviewees:

> *We conducted a big amount of research prior to the idea of coming up with Origin Green because we wanted to see how could we build the reputation of the industry internationally. [. . .] We already know that the products we export, mainly beef and dairy, are known for their quality. So how do we actually build on that and leverage our other exports? [How do we] give a point of differentiation for other exports? [. . .] When we explored this whole idea about reputation with a notion of green, we discovered that [international trade customers] said 'Yes you have this reputation, but you know what? We need to see proof. We need to see the proof behind this.' So we set out to answer that and now we are building the proof points around that for the industry (GL6).*

This is how Origin Green became the national sustainability program for the Irish food and drink industry. It is described as "the only sustainability programme in the world which operates on a national scale, uniting government, the private sector and food producers"(Bord Bía, 2016g, p. 2). How does it work? Origin Green is a voluntary program; it offers a structure for companies to identify and set targets as well as report on their progress regularly. To construct their plan, participating companies have to decide on at least two of the following target areas: raw material sourcing, manufacturing processes, and social sustainability. Raw material sourcing (e.g., commitment to source certified raw material or the development of sustainability programs with suppliers) and social sustainability—defined as health and nutrition of products, the company's role in the local community, and employee wellbeing—have to be two of the identified target areas. Also, at least one target area needs to represent an ambitious goal, judged and justified by the company itself, entailing significant increase on current levels of improvement. Once the target areas are identified, the baseline year from which improvements will be measured is agreed upon. The base year can vary per target area but cannot be more than two years prior to the companies' registration to Origin Green. Then the timeline and targets, including intermediate ones, are set. Finally, the company signs a commitment to report annually on its progress indicating if they are ahead, on, or behind schedule. An independent third party assesses the reported progress by periodically verifying the authenticity of a sample of progress reports. Bord Bía focuses on gathering the evidence under which they can demonstrate the green credentials of the Irish food and drink industry, and substantiate the Origin Green brand (Bord Bía, 2014c). At this stage there are no sector-wide targets or commitments. Bord Bía assists companies in drafting their plans but given the diversity and specificity of each company, their focus is on synthesizing the cumulative improvements of the industry.

> *We give them support when they are developing their plans. We are not telling them what to do; we recognize everyone is at a different stage and different priorities. So we are just taking the headlines from their plans and putting them together. [. . .] It could be that as time goes on—maybe in three years' time when the first set of three year plans are delivered—we will have a better idea of where we stand as an industry. So then, perhaps, we might look into setting targets because as you get more efficient in one particular area is harder to find more efficiencies [. . .]. We might go down that route but not yet. (GL6)*

As of October 2016 there were 208 Origin Green verified members—companies who have completed the cycle of registration and drafting of target plans—out of which there are 32 dairy companies (Bord Bía, 2016a). The aim is to have 100% of Irish food and drink exports sourced from Origin Green verified members (Bord Bía, 2016g).

In recognizing that the grass-based nature of Irish meat and dairy production systems is at the core of their sustainability efforts and claims, a farm component was developed as part of the Origin Green program. The OG farm module builds on Bord Bía's Quality Assurance Scheme. This quality assurance scheme has been operating for over 20 years and it verifies food grown and processed in Ireland against a set of criteria (i.e., traceability, hygiene, animal welfare, environment, safe use of chemicals, safe use of medicine, and food safety). Bord Bía provides quality schemes for beef, lamb, pig, poultry, eggs, and horticulture. Products verified through this quality scheme can make use of Bord Bía's quality mark. The quality mark has most market penetration on meat products (Bord Bía, 2014b). After the OG program was launched, Bord Bía started to work on developing a tool to measure sustainability at the farm level. That led them to redefine their quality assurance schemes into sustainability assurance schemes in collaboration with Teagasc. The first sustainability scheme was provided for beef and in 2013 the sustainable dairy assurance scheme was launched.

> *What it does at farm level is, it utilizes the fact that we have quality assurance programs in place across sectors. And how can we build sustainability assessments that incorporate issues like GHG emissions, animal welfare, water, and biodiversity into our quality assurance schemes? We built in a sustainability component; we started with beef and now are rolling it out to other sectors. And every time we go to the farm—which is once every 18 months—we are now tracking that farm in terms of what they are doing regarding sustainability headings. We are also working with Teagasc, who is building a feedback and advice program with farmers. (GL5)*

The Sustainable Dairy Assurance Scheme (SDAS) is a voluntary scheme accredited to the ISO standard for product certification.[57] The SDAS consists of quality assurance criteria, sustainability criteria, and recommended best practices. The information related to the quality assurance criteria is required for certification and scored by an independent auditor. For the sustainability component of the scheme, farmers are asked to keep records of various farm practices, such as housing and feeding of cows, use of chemical fertilizers, as well as manure spreading and application method. The information is collected during the Bord Bía farm visit—periodically happening every 18 months—and is assessed in order to provide feedback to farmers and create benchmarks; however, compliance with the sustainability criteria is not required for certification. The scheme also provides an ample set of suggestions that can boost the sustainability performance of the farm. Some illustrations include developing procedures to minimize water use, incorporating clover into grassland swards where possible to aid nitrogen fixation and reduce the need for chemical fertilizer, and using efficient water heating systems (Bord Bía, 2013).

In addition, Teagasc and Bord Bía developed the Dairy Carbon Navigator, a tool designed for advisors and farmers that links carbon footprint to financial performance of the farm. This tool was developed to support the SDAS and it is used in the framework of the dairy discussion groups. These groups consist of 12

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[57] The ISO/IEC 17065:2012, which establishes the requirements for bodies certifying products, processes and services.

farmers from one area who meet monthly—taking turns in visiting each other's farms—to discuss individual performance as well as benchmark against similar farms within the group (Cornall, 2016). The Dairy Carbon Navigator focuses on five key mitigation measures: improved energy efficiency, extended grazing season, increased Economic Breeding Index score, improved nitrogen use efficiency, and improved slurry management.[58] Once the relevant information is fed into the tool, it assesses the current performance of the farm, ranking it into a low, good, or excellent scale. It also maps the target level and computes what the achievement of that target would result regarding GHG emissions (percentage of reduction) and financial benefits (Teagasc & Bord Bía, 2013). The core aim of the Carbon Navigator is to translate mitigation practices into financial terms in order to drive action at farm level towards efficiency gains that are cost-beneficial.

The introduction of the Sustainable Dairy Assurance Scheme back in December of 2013 was well received within the sector. Actors recognized that the scheme allows farmers, cooperatives, and Bord Bía to demonstrate a commitment to reducing the emission intensity of their production, which is increasingly relevant given their growth ambitions. It does, however, place an additional administrative burden on farmers. The chairman of the Irish Farmers Association's (IFA) National Dairy Committee maintained that while the scheme has concrete merits, its requirements for farmers have to be reasonable and fall into the normal good practices of dairy farming. He added that "a significant job of communication is now required by industry to convince dairy farmers that it is worth their while volunteering themselves for the scrutiny of the audits" (Agriland, 2013, para. 16).

One interviewee remarked on the general increase of control and management work that farmers—often working by themselves or with limited staff—encounter, especially in the face of the sector's expansion.

> *It's not about just adding an extra 50 cows. You have to have everything else in place. I have a student that is helping me with the paperwork. She is not costing me much at the moment because it's an internship but the paperwork here, I would say I have to put more time in the office or we need to have someone else in the office. That is one of the drawbacks I suppose, in the old days we didn't have that much paperwork, traceability, etc. (GL8)*

The initial uptake for the Sustainability Dairy Assurance Scheme was slower than expected and almost a year later after its launch about a third of dairy farmers had applied to the system (O'Brien, 2014). However, according to recent information on

58 The Economic Breeding Index is a profit index aimed at helping farmers identify the most profitable bulls and cows for breeding dairy herd replacements (Teagasc, 2014b).

the Bord Bía website (as of October 2016), the SDAS is now being implemented in all Irish dairy farms (Bord Bía, 2016f). One factor that is likely to have significantly facilitated the rolling out of the SDAS is the adoption and reference of the SDAS on the individual processors' sustainability strategies. The top five Irish dairy processors are all verified members of the Origin Green program. They have included amongst their sustainability targets the goal of increasing the proportion of their suppliers adopting the Origin Green scheme. One relevant example is Glanbia Ingredients Ireland. In June of 2014 Glanbia Ingredients Ireland launched its Open Source Sustainability and Quality Assurance code. As part of their approach to sustainability they committed its 4,800 farmer suppliers to accreditation to the SDAS. I will discuss this in further detail in the next section but for now it is relevant to note that the SDAS has become a core component of Irish processors' sustainability claims and practices.

Emissions and milk production growth

How did the debate over dairy expansion continue to unfold? It was marked by several events. In February of 2015, as the Origin Green program gained increasing traction and its membership was well underway to reaching full levels, the European Commission released its draft country report on Ireland. In the report it was stated that Ireland was not going to come close to reaching its 2020 GHG emission reduction targets. On top of that, the report specified that Ireland's commitment to its existing climate and energy targets was not reflected on an integrated strategy aimed at effecting the required structural change (European Commission, 2015a). The report confirmed what other recent studies had already identified, but perhaps most importantly this report came less than a month after the Climate Action and Low Carbon Bill had passed. The passing of the climate bill was three years overdue. While it was recognized that the passing of the bill represented a step in the right direction, there was criticism. The bill did not include any targets, and lacked a definition of 'low carbon,' as well as a mechanism to guarantee the independence of the expert council—intended to advise the Minister of Environment (Carey, 2015; McGee, 2015). Given the context and the timing (not only was the report released after the passing of the bill but it also came a few months before the abolition of quotas) it heightened concerns about Ireland's ability to comply with its binding commitments while pursuing the ambitious expansion of its agri-food sector (An Taisce, 2015a). It is important to note that public awareness of these concerns is relatively less generalized than, for instance, in the Netherlands or the United Kingdom. An interviewee noted that non-government organizations are badly funded and the extent to which their studies or actions is covered and discussed in the media is limited (GL14).

A day after the milk quotas were removed, the minister for agriculture, Simon Coveney, discussed the role of agriculture in the 20% reduction of emissions. He stated that agriculture did not have the capacity to achieve reductions of that magnitude and other sectors had to do more. He argued that the joint challenge of climate change—referring to fellow EU members—required an approach that not only addressed the emission levels but also responded to global food security issues. He added, "What I will not do is reduce herd size, when we have a good emissions record, to facilitate blunt targets that only apply to Ireland" (Moran, 2015, para. 11). The Irish Farmers Association has lobbied strongly along the same lines. As the Paris Climate Conference was approaching the IFA articulated its position as follows:

> *As we approach the international climate talks in Paris this December and endeavour to agree [to] a successor to the Kyoto Protocol, the policy response to climate change must be more holistic. The international community must accept that it is not realistic to implement a crude cut in emissions from food production at a time of increasing global demand for food. It must also consider the many parts of the world that suffer from resource stress and are therefore not in a position to increase food production. [. . .] A new approach to climate policy must avoid the flaws of previous policies, which ignored increases in global emissions due to carbon leakage. This occurs when food production is restricted in emission efficient areas of the world and displaced by less carbon efficient food production in other areas. (Irish Farmers Association, 2015b, para. 4)*

We see evidence of Ireland's lack of progress towards its binding emission targets as well as claims, from the agricultural sector's perspective, challenging their distributive fairness. The argument re-emerges: targets for Ireland should reflect the low-carbon intensity of Irish meat and dairy production as well as Ireland's potential role in global food production.

What follows is the last section of the account of the dairy sector's development. The events described here point to the same theme: the challenge to reconcile the agri-food sector's growth with the nation's emission reduction obligations. After that, I will move into the responses from dairy processors, including the case of Glanbia Ingredients Ireland.

The follow up to the Food Harvest 2020 strategy came in July of 2015 when the Food Wise 2025 report was launched. This strategy report differed in some respects from its predecessor. Most notably, while Food Wise 2025 continued on the theme of growth, there was a reframing of terms—growth targets were expressed as growth 'projections' achievable by 2025. In the report the projections were identified "on the basis of available data" (DAFM, 2015a, p. 10), which conveys a sense of scientific rigor and an inevitability of developments that are already on their way. Moreover, these growth projections—only four—were specified at the sector-wide level with no breakdown or sector-specific allocation, and exclusively stated in value terms.

› Increase the value of agri-food exports by 85% to €19 billion,
› Increase value added to the sector by 70% to €13 billion,
› Increase the value of primary production by 65% to €10 billion.
› The creation of an additional 23,000 direct jobs in the agri-food sector all along the supply chain from primary production to high value added product development.

(DAFM, 2015a)

These growth projections would be the result of the Irish agri-food sector capitalizing on a set of developments: The removal of milk quotas, the increasing demand for meat and dairy products in Asian and African markets, as well as the expected growth of the high-value added markets (i.e., added value dairy products such as cheese and desserts, whey-based performance supplements, as well as health and nutrition products for specific age groups such as infants and senior consumers (DAFM, 2015a).

The report contains over 350 recommendations and despite small differences in form, the essence of the strategy gives continuity to the Food Harvest underpinning argument—namely, Ireland has strong role within the Irish economy and there is potential for substantial growth in the future (DAFM, 2015b). Regarding the sustainability performance of the expanding sector, in the Food Wise 2025 strategy it is argued that the growth projections have to be achieved through the sustainable intensification of the Irish agri-food sector which will require the sector to adjust and readily uptake the latest innovations, new technologies, and processes. In the report it is stated that, especially for dairy given the magnitude of the expected growth, the environmental challenges will be significant but in order to maintain its competitive advantage "significant efforts will be required to maximize production efficiency whilst minimizing the effects on the environment and declines in biodiversity" (DAFM, 2015a, p. 24).

The assessment of the environmental impacts of the Food Wise 2025 growth projections was done following the protocol of a Strategic Environmental Assessment (SEA) and finalized a few months after the Food Wise strategy was launched. In the assessment it was concluded that with the exception of the seafood sector, the growth on all other sectors would have mostly neutral and positive effects on environmental objectives. For dairy, the vast majority of the identified impacts were assessed as neutral and positive; the only area where some effects were expected to be 'slight negative/uncertain' was soil and grassland management. This was linked to the increase in fertilizer use intended to boost soil fertility (Phillip Farelly & Co., 2015). Remarkably, the assessment did not include the effects of growing the national dairy herd size. This choice drew a lot of criticism as the dairy expansion is projected to invariably entail a larger national herd. In fact, by the end of 2015 the growth was already measurable. The number of dairy cows was 10% higher than the previous year and the amount of milk grew 13% on that same period (Central Statistics Office, 2016a,2016b).[59] Disregarding the growth in the number of dairy cows was part of how the scenarios used in the assessment were defined. The SEA works by comparing scenarios and the dairy herd expansion was treated as already undergoing as opposed to resulting from the policy adoption within a specific scenario. Thus the growth in cow numbers did not emerge as an impact of the Food Wise strategy (Matthews, 2015a). Environmental groups also fed back through the consultation process of the SEA; they pointed to the methodological flaws in the scenario definition and pointed, among other things, to the lack of attention to climate implications of the increase in GHG emissions, the impacts on biodiversity, as well as the effects on water quality of the Food Wise 2025 strategy (An Taisce, 2015b; BirdWatch Ireland, 2015).

In July of 2016—a year after the Food Wise 2025 strategy was presented—the EU announced the 2030 binding greenhouse gas emission reductions for its member states (European Commission, 2016h). These were based on the overall European climate targets decided two years prior, which included a reduction of 40% in GHG emissions with respect to 1990 levels (European Commission, 2014). The process leading up to the decision on member-specific targets is said to have included months of consultations and lobbying by member states, including Ireland, which faced significant pressure over its high level of agricultural emissions and the fact that it was already expected to miss its current 2020 target.

For Ireland the 2030 target was a reduction in GHG emissions of 30% compared to 2005. This was considered an overall decrease in ambition and a granting of concessions to Ireland (Lynch, 2016). The country will be allowed to reduce its target by 9.6% through the use of flexibility schemes (i.e., through the Emissions Trading System and land use related offsets). Given this flexibility Ireland could be required to reduce its GHG emissions by only 20.4% by 2030, practically the same as its current goal (European Commission, 2016h). In reference to the 2030 targets, the Minister for Communications, Energy and Natural Resources stated, "It is important that the targets are achievable, implementable and practical. There is not much point in putting targets in place that cannot be achieved"(RTE, 2016, min. 1:34).

For farmers' organizations the targets were perceived as "challenging but more balanced than previous targets" (Forde, 2016, para. 2). The president of the Irish Farmers Association argued that there is limited mitigation potential in agriculture and reiterated that other sectors will have to deliver more towards the national target as food production cannot be compromised. He calculated that the maximum

[59] According to the Central Statistics Office of Ireland, there were 1,239,900 dairy cows in December 2015 compared to 1,127,700 in December 2014. Also, according to their data the Intake of cows' milk by Creameries and Pasteurizers grew from 5,648.5 to 6,395.2 million liters.

contribution from the agricultural sector into the reductions for 2030 would be 8% (NA, 2016b). Environmental organizations argued that the new targets moved Europe further away from the goal—agreed in Paris—of limiting global warming to below 2 degrees Celsius (Environmental Pillar, 2016). Further, Prof. Barry McMullin, chair of An Taisce's climate change committee explained that the reduced targets benefited the agri-food business interest at the expense of other Irish sectors and nations. He added that the potential economic, health and security related impacts for the public would be significant. Regarding the flexibility to offset emissions through forestry and other land use practices, Prof. McMullin argued that it is a flawed tool that fails to address the real emission reduction needs (Taisce, 2016). This was echoed by a coalition of civil society organizations that prepared a report addressing the arguments of the agri-sector. It is often argued that Ireland has a significant role in global food security and its carbon efficiency should provide license to produce beyond its environmental obligations in order to prevent carbon leakage (i.e., production moving elsewhere). These arguments were addressed and rebutted. First, in the report a study conducted by Doyle (2016) is cited to demonstrate that in net calorie terms Ireland is actually importing food rather than exporting. Further, the majority of Irish exports are meat and dairy products and it is argued that these products limit, rather than enhance, global food security because they use up food (i.e, grains) and land that could be otherwise used directly for human consumption. Additionally, the emission intensity of the total food production in Ireland jeopardizes effective climate mitigation and negatively affects the climate change effects on agricultural production, especially in developing countries (Environmental Pillar & Stop Climate Chaos, 2016).

The points within the debate are clear and the removal of the quotas is proving to be as influential as their introduction. It can be concluded that the development of the Irish dairy sector has been shaped not only by a policy environment that drove intensification and scaling up of farm operations, but also by context-specific conditions such as Ireland's mild weather and plentiful grasslands. As the post-quota world presents the opportunity to expand the dairy sector, the challenge emerges as to how to pursue that growth opportunity within the environmental limits and binding obligations of the country. While the agri-food sector and the government argue for concessions to Ireland on the basis of its potential role in global food security and its carbon efficient production, academic and non-government organizations warn that the benefits of unchecked expansion would be short-lived and eventually counterproductive with respect to Irish environmental assets, viability of rural livelihoods, and global food security.

Dairy processors and sustainability responses

As we have seen, the context in which Irish dairy processors operate is rapidly changing. How are dairy processors responding to the perceived opportunities and challenges for the sector? In the next section I will briefly introduce Irish milk processing, including an overview of the largest dairy processors. Later I will proceed with the detailed description of the approach and programs of Glanbia Ingredients Ireland—the focus organization in this case study.

The evolution of dairy farming and the milk processing sector can be best understood as intertwined trajectories. In the case of Ireland, if we look at the development of the sector's milk processing arm we see significant changes in the last two centuries. The first move from individual dairy farms processing their own milk to utilizing more consolidated operations came in the late 1890s when the centrifugal milk separator was introduced in Ireland. The separator—which was faster and better at extracting cream from milk—required the milk supply of more than one farm to make its operation financially possible. This is how hundreds of small creameries were formed in Ireland—there were 800 by the early 1900s (Breathnach, 2000). The abundance of small creameries, however, created excessive competition and an unstable situation, especially given the difficult decades that followed—through the country's struggle for independence until the aftermath of the Second World War. The number of creameries was reduced mostly through government intervention, and by 1969 there were 139 central creameries (Fox et al., 1971). Efforts to advance milk processing consolidation have continued to take place, and calls for further rationalization are still part of the current policy debate (e.g., Dairy Industry Prospectus Report of 2003, IFA's Prospectus report on Dairy Reform in 2009, Food Harvest 2020, and Food Wise 2025). Today the milk processing sector is dominated by a much more reduced number of organizations. At the top of the list is Glanbia Ingredients Ireland (GIIL), processing 30% of Ireland's milk pool. GIIL is followed by Kerry, Dairygold, Lakeland, Arrawbawn, and Aurivo; these six organizations together process approximately 90% of the Irish milk pool.

As members of the Origin Green program these processors have identified target areas as well as strategies around those goals. After having reviewed their respective websites, annual reports, and other materials, it can be observed that a large part of their sustainability response consists of their Origin Green corporate plan and the commitment to the Sustainable Dairy Assurance Scheme (Arrabawn, 2015; Aurivo, 2016; Dairies, 2015; Dairygold, 2016; Kerry, 2015). This could be explained as both the Origin Green program as well as the processors' sustainability programs or lists (i.e., an account of actions relevant to sustainability outside of an integrated sustainability program) emerged around the same time (2012) and it is expected for processors to reference to their Origin Green trajectory when referring to their sustainability initiatives. This does not mean that before 2012 these large dairy processors were not working on increasing energy efficiency, reducing emissions of their direct operations, reducing water use, or limiting the creation of waste; rather it highlights that these processors started to articulate these practices under the umbrella of sustainability around this time.

Glanbia Ingredients Ireland

In this next section we zoom in into Glanbia Ingredients Ireland, specifically into its engagement with sustainability related issues in the last decade. Glanbia Ingredients Ireland (GIIL) was established in 2012 as a direct response to the prospect of post-quota growth for the Irish dairy sector. "When the proposed abolition of EU milk quotas was originally announced in 2008, it represented the first opportunity for expansion in the Irish dairy industry for 30 years. It was as a result of this that GIIL was born" (Glanbia, 2016a, para. 4). But the dairy processor's history can be traced to a much earlier time; it was formed through the merger of two co-operatives located in the southeast: Waterford and Avonmore. Both Waterford and Avonmore had their origins in the mid-1960s and emerged from the amalgamation of smaller cooperatives. The process of consolidation for Avonmore led to the construction of the multi-purpose dairy plant in Ballyragget, which at the time was the largest processing plant in Europe (Glanbia, 2016b).

As milk quotas were established, Waterford and Avonmore sought growth outside of Europe; Waterford entered Wisconsin in the US and the UK market, and Avonmore expanded to Idaho, Illinois and also to Wisconsin (Boland & Cook, 2013). In the early 1990s while these cooperatives continued their internationalization they also contemplated a possible merger. After several years of negotiation, in 1997 the merger was signed and the Avonmore Waterford Group was created, which had co-operative and public limited company (plc) components, as its parent organizations did. The group was of considerable size; after the merger it became the fourth largest dairy processor in Europe and the fourth biggest producer of cheese in the world. A couple of years later the Avonmore Waterford Group was renamed Glanbia, which in Irish means 'pure food' (Glanbia, 2016b). Through the 2000s Glanbia continued to grow internationally and it is now a global company operating in 32 countries with sales in over 130. Glanbia's key production and processing plants are located in Ireland, the US, the UK, Germany, and China. Through this period Glanbia restructured its activity into four business divisions: Glanbia Performance Nutrition, Global Ingredient, Dairy Ireland, and Joint Ventures & Associates (Glanbia, 2016c). This brings us to the late 2000s when, after the announcement of the future abolition of quotas, Glanbia was faced with the prospect of increasing future milk deliveries and the need for additional processing capacity. Glanbia proposed the creation of a joint venture between the cooperative and the PLC: Glanbia Ingredients Ireland. By creating GIIL the group would be able to invest in the construction of a new processing plant in Ireland. In 2012 this was approved and Glanbia Ingredients Ireland, owned by Glanbia Co-op (60%) and Glanbia PLC (40%), was created (Mazzarol et al., 2014).

Glanbia Ingredients Ireland has over 4,800 member farmers across 16 counties in the southeast of Ireland. GIIL's processing plants give a sense of their product range and size of operations. First, the Ballyragget plan—operating since Avonmore times—continues to be the largest multi-purpose dairy facility in Europe. Through significant investment, today it processes up to 1 billion liters of milk, 900 million liters of whey (a byproduct cheese manufacturing), and 180,000 tons of dairy ingredients annually. GIIL's flagship water treatment project was implemented at Ballyragget. I will discuss that further when we review their sustainability initiatives. Ballyragget is where their head offices are located. Other processing facilities include Corman Miloko, a formulation and packaging facility; Virginia, traditionally supplying cream for alcohol beverages and more recently also processing milk for clinical and nutrition markets; and Wexford Creamery, where 17,000 tons of cheddar cheese are produced per year. GIIL acquired Wexford in 2014 and has designated €5 million investment into its expansion (Glanbia, 2016d). Finally, GIIL's newly built Belview plant is the first and largest infrastructure investment made by an Irish company in the last 80 years. Belview was partially funded by the government through its industry development agency and it was inaugurated in March of 2015.[60] At the opening event the minister for agriculture, food and the marine, Simon Coveney, talked about the investment in Belview as a "real sign of confidence in the future of Ireland's dairy sector" as well as the direct result of the recent changes in policy conditions when he added that "the project has been made possible by a decision confirmed during Ireland's presidency of the European Union in 2013 to abolish dairy quotas, and by the vision outlined in the Food Harvest 2020 strategy"(NA, 2015e, para. 7). This new processing plant required an investment of over €235 million. It specializes in milk powder for infant formula, skimmed, whole, and enriched milk powder products, as well as concentrated skimmed milk and cream (Glanbia, 2015).

GIIL's sustainability program

Glanbia Ingredients Ireland has taken several steps in order to adapt to the projected post-quota growth of milk production in Ireland. By 2020, GIIL expects its 4,800 farmer suppliers to increase their production by 63% (Glanbia, 2015). The processor is aware of the legal requirements and customer expectations in relation to their operations. GIIL is a founding member of the Origin Green program and, as we will see, their sustainability program is embedded in their quality program and in dialogue with Bord Bía schemes, as it is Bord Bía who audits and certifies GIIL farmers. In this section I will describe the sustainability program Open Source Sustainability and Quality Assurance Code as part of the engagement of GIIL with sustainability issues facing the Irish dairy sector.

The beginning: why and how

How did the Open Source code originate? Several interviewees stated that sustainability has continuously been a feature of GIIL's operating approach. GIIL is

[60] That is, Enterprise Ireland. This government organization is responsible for the development and growth of Irish enterprises in world markets (Enterprise Ireland, 2015)

an operational excellence company, therefore the focus on efficiency and reduction of negative impacts of processing has been a constant in their management efforts. The high-energy costs in Ireland, especially during the 2000s, as well as their closeness to the river Nore (Ballyragget's waste water discharge point), have also driven energy and water efficiency, as well as waste reduction initiatives.

> *I would say that sustainability was always a feature function of Glanbia Ingredients Ireland but we might not have necessarily identified it as sustainability and I would say that is true across all the headings that we now identify as sustainability today. [. . .] Back in the day, say 2006, when our customers spoke about sustainability, it was very much on the processing side so we had always been doing the right thing, and trying to be as efficient as possible. We ticked all the boxes but we still didn't call it sustainability. (GL10)*

> *I think we are ahead of the group here in terms of a lot of the stuff we were doing. We were doing it for the right reasons anyway. You know we were minimizing water usage on the sites because to generate water, it costs money. We were minimizing affluent on the site because it costs money to treat affluent, and also if we can retain all the fat and protein on the site, we have a greater recovery, we are minimizing energy because it costs. So a lot of those things were good things to do anyway and we were one of the first companies to get the energy standard in this country. We are on that agenda and we've run that path for a long time anyway. (GL13)*

The need to document GIIL's sustainability initiatives and develop a code became clear during a meeting with one of GIIL's key customers in 2010.

> *It was probably 2010 when [key customer] came to us and said 'we want to embark on a sustainability scheme. We have looked at Ireland and we have looked at [dairy ingredient] and we would like to have sustainable [dairy ingredient] initiative. We have done web search and we don't think that you fair very well when it comes to sustainability.' (GL10)*

The information was not readily available online; the Glanbia PLC website at the time was more orientated towards the US market and it was difficult to find information about their environmental efficiency efforts (GL10). Despite the fact that the website did not provide such information, GIIL had already accumulated relevant sustainability credentials.[61] Since 2000, Glanbia has been accredited to

[61] From here onwards you will notice that I use 'Glanbia' to refer to pre-2012 events. Informants almost always use 'Glanbia' which is understandable as the formation of GIIL is relatively recent. All mentions of

the international Environmental Management System ISO 14001. On the theme of energy, Glanbia has been working on its monitoring and reduction for over a decade. In 2006 they signed up to the Sustainable Energy Ireland's Energy Agreements Program and in 2007 they were the first Irish-owned company to implement the IS393 energy management system and get accreditation for it (Sustainable Energy Ireland, 2007). In 2009, Glanbia transitioned to the European energy management standard EN16001, for which the Irish IS393 system was actually a blueprint.

Another initiative related to reducing their environmental impact was the use of the Japanese kubota membrane technology on their wastewater treatment in 1999. Back then Glanbia was the first food company in the world to apply the technology in such a way, and now it is considered best available technology. The Kubota water treatment system, which was extended in 2007, allows Glanbia to discharge water of drinking quality into the adjacent river. Additionally, as the solid dairy sludge that results from the treatment contains nutrients found in milk, it goes under organic certification and returns to the soil as organic fertilizer. More than 150 farms have free access to it and use it under a compliant nutrient management plan (GIIL, 2012). Finally in 2010, the Virginia production plant became the first dairy processor to be certified by the Carbon Trust (GIIL, 2016a). The list of credentials was extensive and it continues to develop. Glanbia managed to successfully communicate the list of initiatives relevant to sustainability to their long-term customer. However, this episode made the Glanbia team reflect on the subject. Until that point they had a strong focus on the impact of their processing plants on the environment and at that level they had already effectively addressed all central issues.

> *Then we discussed 'what does sustainability mean to us?' and rather than focusing on the environmental aspect, which is very much a pillar, we in GIIL see sustainability as the ability to sustain our business into the future. [That means] ensuring that our farmers are sustainable into the future. [We want] to ensure that we have a market for their products to go into [and] we convert their milk in the best most efficient way without doing harm to the environment. [We want] farmers to remain profitable because there is no point in paying a farmer less for a liter of milk than what it costs them to produce it. That is not sustainable for anybody because [farmers] cannot stay in business and unless we are getting the milk processed we cannot fulfill our customer requirements. So there is a whole circle across the supply chain and it's all about the ability of all of us to stay in business and do as well as we possibly can. (GL10)*

The GIIL team described three main drivers for the development of a sustainability code. First, the correlation between economic and environmental sustainability at

'Glanbia' refer to actions or initiatives of Glanbia Ingredients Ireland.

farm level, which is based on their observations on GIIL's best performing farms; second, the legislative environment and prospects of stricter environmental limits, as well as the linking of sustainable environmental production parameters to CAP payments; finally, is the increasing customer demand for sustainably produced dairy ingredients—that is, and emphasis on food safety, traceability, animal health and welfare, and carbon footprint (GL2).

In 2010 and based on this reflection, the Glanbia team started working on what would later become the Open Source Sustainability and Quality Assurance Code (Open Source). Through this process they were broadening their focus from environmental efficiency at the processing level to include farm related sustainability parameters. The first steps included a dairy farming best practice scoping exercise. From this the team concluded that current farming practices in Ireland were well aligned to those identified as best dairy farming practices around the world. The priority then became to audit, measure, and document Glanbia supplier farms in order to assess the state of affairs with regards to sustainability parameters, establish a baseline, and generate data to substantiate sustainability claims.

> *It is satisfying the customers on the one hand and telling a story that is already on a fairly sound basis. And it's creating an awareness among our producers of a way that they themselves can move forward and they can reduce the costs. (GL12)*

Part of this initial stage entailed the establishment of a sustainability advisory board. It consisted of Glanbia's management, representation from Bord Bía, Teagasc, an International NGO, Glanbia's farmer suppliers, a key customer, as well as the former head of the EU Food Safety Authority (GIIL, 2014a). A second step was to carry out a pilot carbon audit. Carbon accounting was already a focus area for Glanbia as both the Ballyragget and Virginia plants were involved in the EU Emission Trading Scheme (Macken, 2011).[62] The methodology behind the carbon audit was developed in collaboration with Bord Bía and Teagasc, and it received certification from the Carbon Trust. The pilot carbon emissions assessment was carried between 2011 and 2012 on 115 GIIL farms. The sample strategy was designed to cover two farm categories: liquid milk producers and manufacturing milk producers. The results revealed that there was significant variation across farms and this diversity offered insights into the carbon impact of on-farm practices (GIIL, 2014b). From this pilot a 'carbon lite' version was developed to be included on the Open Source code (GL10). The Open Source code was built into Glanbia's quality assurance scheme, in place since 2006.

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[62] The pilot phase of the EU Emissions Trading Scheme took place between 2005 and 2008. Afterwards the Kyoto phase (2008–2012) started. Both Ballyragget and Virginia had lower verified emissions compared to their allocated amount during this period.

> *It's basically carrying on. What we did have for the past 7 years is a quality assurance scheme with our farmers, which entailed best practices around the farmyard, around the milking parlor, and dairy and around the milking process. Indeed there was a touch of animal health and welfare. This has now evolved into a bigger sustainability program and it has embraced additional practices and they fall under this big umbrella of sustainability. The new piece or the quantum has moved into environmental sustainability, which we didn't have in our quality assurance scheme but it is effectively an evolution. (GL2)*

The sustainability headings that were added to the existing Glanbia quality scheme were, in part, inspired from their customers' sustainability requirements. Mapping those requirements revealed that while most sustainability headings emerge consistently across geographies there were some themes that surfaced in specific contexts or whose priority varied across customers. For instance, water, waste, carbon emissions and energy efficiency, animal health and welfare, biodiversity, as well as health and safety were key priorities areas for their European customers. In the case of their Chinese market some attributes had very high priority, "for our markets in China, quality, and traceability are utmost to them" (GL10).

Implementation approach
The Open Source Sustainability and Quality Assurance code incorporates a quality assurance module, a carbon audit, and an on-farm sustainability section. The quality assurance module encompasses all relevant criteria related to regulation on food and hygiene as well as GIIL's quality parameters to which compliance is required from all milk producers. The on-farm sustainability section includes suggestions on best practices around the themes of soil and grassland management, water use and conservation, energy use and conservation, waste management, biodiversity, economic sustainability, social sustainability, healthy and safety, and milk suppliers' health. By the summer of 2013, the Open Source code had been piloted with over 300 farmers—who voluntarily participated—and approved by the board. GIIL established a dedicated on-farm sustainability advisory team to inform and support farmers in the preparation for the code's implementation. The Open Source code is applied through a certification process. This means a third party, in this case Bord Bía, carries out the audit, assessment, and certification of farmers. As the sustainability and carbon module have been incorporated into the quality assurance scheme its application is mandatory for all GIIL farmers. However, at present, certification is only dependent on satisfactory compliance to the quality assurance criteria. The carbon and on-farm sustainability parameters are audited but do not influence certification (GIIL, 2014b).

> *[The program is mandatory] because otherwise it won't work. If we have a milk collector going around the country and this guy here is in the*

program and this guy isn't, you're going to have to collect the two milks in one tank and to make an absolutely laugh of the whole project. So you can't have them opting in and out. But what you can have is that it is an accreditation process rather than a pass/fail process. [. . .] We have to aim to get all of our people accredited. We have to get there. And it's a program over a period of time with a lot of emphasis on help directed towards probably 20% of the suppliers; the other 80% is going to be fine. (GL12)

The application of the code started in early 2014 and after achieving certification farmers get audited every 18 months. Bord Bía's SDAS scheme is enveloped into GIIL Open Source code thus the audit covers all components and GIIL farmers are in turn participating also to the Sustainable Dairy Assurance Scheme (GIIL, 2014b; GL10).

On-farm performance targets are in the future for GIIL farmers but the team stated that for now the focus is on creating a baseline through the Open Source audit and have a thorough understanding of the current conditions of GIIL farmers.

We will [have targets] eventually [. . .]. Our thinking is evolving as it is work in progress. [. . .] We will probably have to identify specific farm types, whether is number of cows, geography, milking system, etc. I think the targets will be tailored and very much science based, in collaboration with Teagasc. [. . .] We may have a blanket target but all other targets will feed into this, we will have specific targets in certain areas for all of the farmers. I think we will be able to have targets around energy use and carbon. (It is) a bit more difficult to have one for water because not all of the farms have meters and you can't really measure if you don't have a meter. I think it will be a long time off before we have challenging targets with respect to biodiversity (because) there is a huge debate about the measures of biodiversity at the moment. (GL10)

Performance targets at the processing level have been identified through the Origin Green program, of which GIIL was a founding company. For their Origin Green 2020 targets, GIIL committed to increasing energy efficiency by 20% based on 2010 levels, reducing direct carbon emissions by a further 10% also based on 2010 levels, achievement of zero waste to landfill by 2015, and further reducing fresh water requirements by 25%. Finally, as their raw material sourcing policy within Origin Green, Glanbia commits to sustainable sourcing 100% of their dairy ingredients by 2020. Sustainably sourced is operationalized as ensuring that their farm supplier base is being audited, complying, and continually improving against the Open Source sustainability themes (GIIL, 2014a).

Additional on-farm initiatives

GIIL has developed a series of programs to assist farmer suppliers in realizing a profitable model of quality milk production. Some of these precede the developing of the Open Source code and others were developed in order to support its application. They respond to the challenges identified earlier for the sector: price volatility, access to capital, general financial management, as well as on-farm efficiency gains, productivity, and resource use, as well as general farm management.

Prior to the release of the Open Source code, there were farm advice and extension programs delivered by GIIL in collaboration with Teagasc and other partners. These previous joint programs included, amongst others, farmer discussion groups, commercial demonstration farms, as well as programs on best practices customized to farm type. GIIL also made an online financial planning tool available to farmers where they can input the current farm status and future expansion plans, and see the impact on their financial performance and the availability of capital for the expansion (GL2). GIIL continued the collaboration with Teagasc and developed a new joint Farm Development Program for 2014–2017. Although the program provided continuity to core dairy farming themes, it was developed specifically around the additional and heightened challenges posed by the removal of quotas. The Farm development program aims to improve dairy farmers' cost control and farm profitability, maximize grass usage, improve herd fertility and calving pattern, boost milk solid production, improve milk quality, and maximize compliance with the Open Source code (GIIL, 2015a). The program is delivered by 28 Teagasc advisers with the support of nine GIIL Farm Development Managers through previously used methods such as discussion groups and visits to demonstration farms, but also individual consultations (Teagasc, 2014a).

In 2010 Glanbia developed a fixed milk price scheme in response to the financial challenges facing their farmers; as you recall 2009 was an especially difficult year for the sector. The scheme—which had no precedent in the sector—offered farmers the possibility to obtain a fixed milk price for three years on part of their milk volume. The price is linked to the cost of production in order to protect the farmer from increases on input costs (Cadogan, 2012; MacConnell, 2010). An interviewee explained the general goal of Glanbia's price initiatives for farmers and the rate of adoption after three years of their introduction.

> *We have a number of initiatives that we have rolled out and that we are in the process of rolling out. If you recall it, I mentioned price volatility and economic sustainability and the ability for people to access capital and pay their debts. If you take those challenges, what is Glanbia doing? We have a fixed milk price scheme. This is our third year, our third scheme whereby we offer farmers a milk price, which is tied to the cost of production. So it's effectively a hinge against movements in input costs,*

and it guarantees the farmers a margin because milk price is tied to input costs [. . .]. So that is effectively a hinge against price volatility. That is one of the initiatives. At this stage 50% of our suppliers have on average 30% of their milk pool volume in one of the three price initiatives, so that safeguards against price volatility which in itself comes from the global supply and demand dynamics. (GL2)

In 2015 a new iteration was launched. The Fixed Milk and Feed Price Scheme included a feature allowing farmers to also fix the price of a portion of their feed requirements (GIIL, 2015b). In relation to access to capital the MilkFlex loans scheme was launched in March of 2016. The €100 million loan fund is a collaboration between Glanbia Co-Operative Society, Rabobank, the Ireland Strategic Investment Fund, and Finance Ireland. The main feature is that the loan will include a system of 'flex triggers.' These triggers are linked to GIILs' manufacturing milk price and are designed to activate if certain high or low thresholds are reached. Once this is activated the repayment terms change accordingly.[63] The goal is to provide farmers with cash flow when necessary. Including other features, the scheme requires no security, however the repayments are automatically deducted from the farmer's milk receipts. Also repayments are tied to the seasonality of the supply curve, therefore there are no repayments required during low milk production months—namely, from November until the end of February (GIIL, 2016b; Moran, 2016a).

So far we have seen how GIIL has defined and approached sustainability. For the organization it is the continuation of their emphasis on quality and operational excellence. It is worth noting that as the Open Source code was developed, in 2012 the sustainability function expanded—both in terms of scope as well as staff—and migrated from the environmental management unit to the strategy unit (GL10).

Through the Open Source code the key concerns that are addressed on the farm side are linked to the economic viability of the farm into the future, as well as compliance with environmental standards and market demands. By working on

[63] These are the conditions attached to 'flex triggers' and the resulting adjustments: If the GIIL manufacturing milk price falls below 28 cent per liter (cpl) during three consecutive months, both principal and interest repayments are automatically adjusted downwards by 50% for the following six months. This mechanism can be activated a maximum of four times during the term of the loan. If the milk price falls below 26 cpl for three consecutive months, then all loan repayments are automatically suspended for six months. This measure can only be activated two times during the loan period. Also if the milk price increases above 34 cpl for three consecutive months the loan repayments are automatically adjusted upwards, increasing by 25% for the following six months. This can only be activated four times during the period of the loan. Finally, if an outbreak of a notifiable disease reduced the farmer's milk volume output significantly on the previous year, then the loan repayments are suspended for the following six months (Moran, 2016a).

various processing related initiatives the organization continues to work on their environmental efficiency levels and general best business practices. External stakeholders perceive GIIL to be leading in terms of sustainability; internal perceptions of the Open Source code also showcase positive perceptions of the program. The market relevance of the sustainability code emerged in conversation with several interviewees.

> *I would've always been very much focused on the parameters that I mentioned earlier—be it energy, water—it's the same; they all cost money, so it's part of the job. For me it really made sense—and I thought sustainability was something important—when actually we started getting the feedback from customers who said 'yeah that is worth paying for' and maybe you wouldn't get extra money for it but you would certainly get in the door. [. . .] I'd say when it came apparent to me that it was something that really mattered to customers and it was something that customers wanted and it was helping us distinguish ourselves from others, I suppose that is when it dawned on me. (GL13)*

> *I think [GIIL is] looking ahead and not just coping with consumer needs and requirements, but also trying to foresee them as well and be prepared for them. [. . .] When the consumer approaches them and inquires about sustainability, at least they have their homework done and they have figures to stand over their claims about Irish farmers in that area [. . .] and how they compare with farmers abroad. It helps [with] quality as well; they're all intertwined really. Anything that can give an advantage it's a help. (GL4)*

The engagement of GIIL with sustainability issues both at the processing and farm levels reflects a general approach of systematized solutions through which efficiency and traceability of product and practices can be ensured and improved upon. As expressed by the previous quotes of interviewees, the focus is on addressing present customer sustainability related demands as well as anticipating them in order to create a differentiated advantage in relation to other Irish dairy processors as well as global dairy competitors in Europe and Oceania. GIIL's Open Source code is at a relatively early stage of development and implementation. Currently GIIL is working on creating a baseline of farm performance across several themes, which is expected to later feed into market claims. In the next section I will analyze and discuss the case of the Irish dairy sector as well as that of GIIL's engagement with sustainability issues in relation to the dairy regime.

Analysis: development, change and dairy processors

In this chapter I have provided an account of how the Irish dairy sector developed in the post-war era including some background on its shape prior to First World War. This chapter also includes a discussion on the effects of the introduction of milk production quotas on the sector, such as the drive for cost-efficiency of milk production, farm structure changes, and impacts on the sector's expansion and renewal. Afterwards I reviewed the development of dairy in Ireland in relation to the abolition of quotas. Policies and industry plans indicate the expansion of Irish dairy. I describe the concerns that are raised about the environmental impacts of increased milk production and the ability of the sector to comply with the country's legal obligations. The development of sector-wide sustainability schemes and the sustainability program of the leading dairy company in Ireland, GIIL, are also presented. I will draw on the conceptual framework as defined on chapter two to analyze the development of the Irish dairy sector in connection to the challenges pertaining its future viability.

The departing point for this analysis is to delineate the Irish dairy regime as it formed after WII. As done for the Dutch case I draw from the detailed account of the development of the Irish sector to identify the stable and dominant rules and practices (Geels, 2002) that underpinned its development. Just as in the previous chapter, I look at the nature of rules to distinguish between regulative, cognitive, and normative ones. Next, I review how the regime has changed as a result of pressures and tensions, especially as the sector faces a post-quota dairy market.

Rules and the delineation of a regime

Despite Ireland's neutrality during the WWII, the impacts of the war were significant. Similar to other European nations, the main societal priority for Ireland was its recovery (normative rule) through an increase in food production. This increase was framed not as a matter of self-sufficiency but explicitly as a way to reinvigorate both the national and European economies and contribute to the supply of Europe's needs for high-protein food (cognitive rule). Policies during the post-war recovery period aimed at incentivizing the increase in agricultural production by modernizing and specializing farming (regulative rule). This was reinforced through education and extension policies as well as price supports (regulative rules). The introduction of electricity, the adoption of the milking machine, and the move from mixed to specialized farming in the 1960s illustrate some of the practices that reenacted the regime rules and in turn shaped the recovery and development of the sector. Another component within this dairy regime is its strong export orientation (cognitive rule). And it was especially this market orientation that led farmers to advocate for access to the EU. Once it was granted, the modernization and expansion of the dairy sector was accelerated. This growth was mostly driven by price supports and export subsidies (regulative rule) and delivered through the increase in milk yields.

The key points guiding the reproduction of the Irish dairy regime can be argued to be the intensification of dairy production and its profitable trade in international markets. The main actors involved in the reproduction of the regime at this stage were primarily government and farmers' organizations.

Milk quotas and regime change

The intensification of dairy across Europe started to surpass economic, environmental, and social limits. These limits were expressed differently across Member States; the level of intensification in Ireland was not in par with that of other nations such as the Netherlands or the United Kingdom. This is what underpinned the resistance to the introduction of milk quotas and the coordinated lobbying to obtain derogation (normative and cognitive rule). The introduction of quotas in 1984 (regulative rule) was identified by actors as the most influential event in the development of the Irish dairy sector. This was a significant change in the regulative rules governing regime reproduction across Europe and in Ireland it had significant developmental impacts.

The regulation to cap milk production forced the actors in the sector to adapt the dominant thinking towards increased efficiency in milk production (cognitive rule). Practices such as scale enlargement, mechanization, and increase in concentrate feed per cow, and cost-reduction efforts became staples of regime reproduction and resulted in higher milk yields, larger herds, and the sharp reduction in number of farms. Some challenges for farmers as they adapted to milk quotas were the financial requirements for scaling up, which, given factors such as the scarce access to land and the regional restriction for quota trading (regulative rule) made the financial costs of expanding quite significant. An interesting point is the regional restriction in quota trading; while other Member States traded quotas more liberally, in Ireland, rural development and other political priorities (cognitive rule) guided the institution of this trading frontier which ensured that dairy farming remained in all traditional dairying regions as opposed to fully concentrated in the most efficient area of the country.

The reproduction of the Irish dairy regime has faced increasing pressure since the 1990s as several factors have been increasingly affecting farm profitability. The downward push has been driven by growing input costs (e.g., energy, fertilizer, feed, etc.) as well as the effects of landscape factors such as variation in global dairy supply and demand, market developments in connected regimes (e.g., biofuels), as well as economic crises—all of which the sector has been increasingly exposed to since the reduction of price support mechanism (regulative rule). The practice, as described earlier in the chapter, that has resulted in the increase in farm income (regime reproduction) during the last three decades has been scale enlargement.

While the post-war regime logic of expansion found ways to adapt to production quotas and maintain the sector's capacity to produce milk, there were some tensions in its reproduction. There was a lack of new entrants due to the operational barriers (i.e., access to land for aspiring farmers with no succession possibility within their family) as well as the disillusionment about the viability of dairy farming in the future (cognitive rule). This resulted in lack of innovation and organic renewal of the sector.

Adaptations and gearing up for a post-quota world

The abolition of quotas represented as significant of a change regarding regime rules as was their introduction. The dominant framing for this regime change centered on the opportunities for the Irish dairy sector to pursue and attain overdue growth, their advantageous position to supply the increasing dairy demand with environmentally friendly produce, and in addition, on their role as an engine of the Irish economy (cognitive rule). An ambitious growth goal of a 50% increase in milk output was articulated in an industry-led report that while not officially a government policy, in practice it was treated as such. The debate and responses that ensued reflect on the one hand, the goal to reinvigorate the Irish dairy sector and prepare it for the new market context (cognitive rule), and in the other, concerns that such growth will compromise compliance to legally environmental targets (regulative and normative rules).

One of the issues challenging future regime viability is low farm succession and low rate of new entrants. One of the responses to address the barriers to farming was the New Entrant Scheme launched by the Department of Agriculture, Food and the Marine in 2009 (regulative rule). Recommendations on the Food Wise 2025 report include the development of additional policies and schemes to support young entrant farmers.

Regime tensions between production growth and environmental impact are at the core of the debate about the sustainability of the regime. This debate has been gathering attention since 2010 after the release of Food Harvest 2020, but has drawn most interest after the abolition of quotas and the EU announcement about Ireland missing its 2020 GHG emission reduction target. There are two key points in the debate. On one side, NGOs and academics argue that Irish dairy production does have significant adverse environmental effects (e.g., water pollution, biodiversity loss, GHG emissions, etc.) that if not adequately considered when setting growth productions targets, will become problematic and hinder future regime viability (cognitive rule). On the other side, the dominant position is that Irish dairy has inherently strong sustainability credentials (i.e., scale of farming is still relatively small, dairying is pasture based, and one of the lowest GHG emitting in Europe), therefore the sector is best placed to continue growing, supply raising global dairy demand, and be an engine for the Irish economy (dominant cognitive rule).

From the dominant perspective, the key challenge for the sector is then to weather volatility, and secure farm profitability as well as long-term financial security while documenting current green credentials and working to maintain them. Underpinned by this regime logic, actors in the dairy sector have articulated two interrelated responses to guide regime reproduction: industry strategies for growth, and a sector-wide marketing and verification program for green credentials. First, in order to support the financial strength of the sector (regime pressure), Food Harvest 2020 and Food Wise 2025 (de facto regulative rules) outlined ambitious strategies for growth, including specific added value strategies for dairy to ensure domestic and international market success. These reports reframed sustainability (normative rule) into a naturally inherent competitive advantage for the sector (cognitive frame) that needs to be effectively managed in order to tap into its added value potential for Irish dairy.

The second interrelated response is the Origin Green scheme (regulative rule), which aims to integrate sustainability as a component of the dominant regime. The concept of obligatory passage points is particularly useful for analyzing this scheme. This notion refers to nodes (i.e., rules, conventions, approaches, and processes) that are created and through their effect in rendering certain actions or procedures mandatory they reinforce the influence of the actors controlling them (Callon, 1986). How is the OG scheme an obligatory passage point? First, through their membership rules for dairy processors they effectively code and operationally determine what sustainability entails and how to work on such themes. Equally for their dairy farm component (SDAS) sustainability was translated into an additional module to the already existing quality audit scheme, which shapes the way in which sustainability is and can be made operational. Another aspect of the Origin Green scheme is that it operates at national level. The membership of dairy companies already includes the largest players and all farms are already participating to the sustainability farm scheme, which makes it a de facto obligatory practice for anyone who wishes to produce, process, sell, or export Irish dairy. The Origin Green (OG) program was developed and launched by the Irish Food Board (Bord Bía), which is the government-sponsored organization tasked with the marketing of Irish food, drink and horticultural products throughout the world. The fact that the body in charge of supporting the export of dairy food products is the one through which sustainability has been incorporated into the regime reinforces the drive to address and cultivate sustainability credentials as the market frames them. Finally, because these schemes have been created and with national coverage, there is little to no space for other rules or practices to guide the reproduction of Irish dairy.

Irish dairy regime today

The dominant rules and practices that have guided the reproduction of the regime during the last seven decades have been in essence the same. The cognitive framing of production growth legitimized by the natural conditions of the island, and its potential to be an engine to the Irish export-oriented economy were voiced as arguments in the post-war era, in the resistance to milk quotas, and most recently with respect to GHG emission reductions. I argue that while some regulatory and normative rules have changed, cognitive rules continue to be reproduced. The current dominant thinking has adapted to sustainability demands by incorporating them as assets or competitive advantages of Irish dairy and actively documenting and cultivating them. Some questions like the long-term effect of scale enlargement on rural farming communities are not debated. Other sustainability demands that clash with the dominant regime logic, such as reduction of dairy production in order to comply with EU GHG emission reduction targets, are resisted. Even with reduced targets, rules and practices will have to change to meet GHG emission targets. This will continue to exert pressure on the regime. Regime configuration and adaptation during the last decade have been principally led by the Irish government (through its agricultural related bodies), farmers' organizations, and the dairy industry by drawing on internally available resources. In the last five years however we have seen the emergence of NGOs as critical voices giving feedback into regime rules and practices.

GIIL and the Irish dairy regime

The findings of this study point to a continuation of the post-war logic as a core guide underpinning the Irish dairy regime. A key question in this study was to analyze and discuss the ways in which dairy processors were impacting the dairy regime through their sustainability programs. In this chapter I detailed the development of the sustainability program of Glanbia Ingredients Ireland as well as various other initiatives from the co-operative related to the viability of Irish dairy. The discussion around GIIL's sustainability involvement focuses on what is articulated under their program and how their goals are pursued in relation the dominant regime logic. The aim is to provide a reflection about change and its directionality in dominant rules and practices when applicable in the case.

As the largest dairy processor in Ireland, GIIL is an important actor with regards to regime reproduction. In this study regime actors are conceptualized as having significant influence in the most accepted ways of fulfilling a societal function—in this case dairy production. These actors are often able to create or modify obligatory passage points, which reinforces their standing and influence. GIIL, as a regime actor, could be conceptualized as one that is well aligned to the dominant Irish dairy regime and works—in collaboration with other influential actors like the government—towards its stable reproduction.

In the face of post-quota production growth, GIIL has responded in two ways. GIIL was actually formed out of the need to grow and the organization has invested significantly into the expansion of its processing capacity. Another response is the development of its Open Source Sustainability and Quality Assurance code (regulative rule). GIIL conceptualizes sustainability, as their ability to secure profitable market access for their farmers' milk while respecting the environment and maintaining the credentials of Irish dairy (cognitive rule). Both responses are designed to fulfill that aim.

GIIL's Open Source Sustainability and Quality Assurance code builds on the co-operative's previous initiatives and efforts to drive efficiency and reduce the environmental impact of its operations (practices). The need to articulate the sustainability code was initiated by a request from a key customer which signaled a changing market context (selection environment) and further driven in anticipation of increasingly competitive post-quota market. For GIIL sustainability is an added value strategy with high potential given that data is diligently gather and available to substantiate claims (cognitive rule).

The development of the Open Source code an the Origin Green platforms happened very much in parallel which explains the compatibility of definitions (green growth), approaches (standardized as part of quality assurance), and underlying principles guiding their implementation (participation is required). It is precisely because there is a pre-competitively platform with processing and farming sustainability modules that the Open Source code goes beyond the Origin Green farming schemes and complements it by outlining suggestions on best practices on soil and grassland management, water use, energy use, waste management, biodiversity, economic sustainability, social sustainability, healthy and safety. While the sustainability and carbon modules of the Open Source code are monitored, they are not assessed for certification. It is expected that performance targets will be established in the future.

GIIL is seeking to ensure stable regime reproduction that falls within legal boundaries and fulfills market expectations. GIIL offers a range of initiatives in order to better equip farmer members to confront price volatility, capital access challenges, and general financial management; some of these are quite innovative for the sector. As such it could be argued that GIIL is well aligned with regime logic of further intensification and is anticipating changes in the regime selection environment more proactively than it could be said for the sector in general.

Conclusion

This chapter explores the post-war development of the Irish dairy sector. This includes the influence of the milk quota regime, as well as the debates and responses that surround their abolition. The Irish dairy sector is ready to expand. However, increasing milk production brings significant challenges. Important issues to be addressed include weathering price volatility, especially while financing scale enlargements, and operating within legal environmental boundaries. Based on the case study findings I argue that while some changes in normative and regulative rules are observed, the main cognitive framing—which is focused on growth and the intensification of farming—is still guiding the development of the sector.

In this case I also presented the approach and responses that have emerged in relation to questions about the sustainability of Irish dairy. I presented the sector-wide sustainability program developed by the Irish Food Board in collaboration with the dairy industry and other partners, as well as the response from leading dairy processor GIIL. The sustainability code developed by GIIL and incorporated into their quality scheme is aligned to the general approach of the sector. Further, I argue that GIIL is proactively finding ways for farmers to deal with upcoming challenges and in that way ensure the viability of Irish dairy.

The dairy sector in the United Kingdom

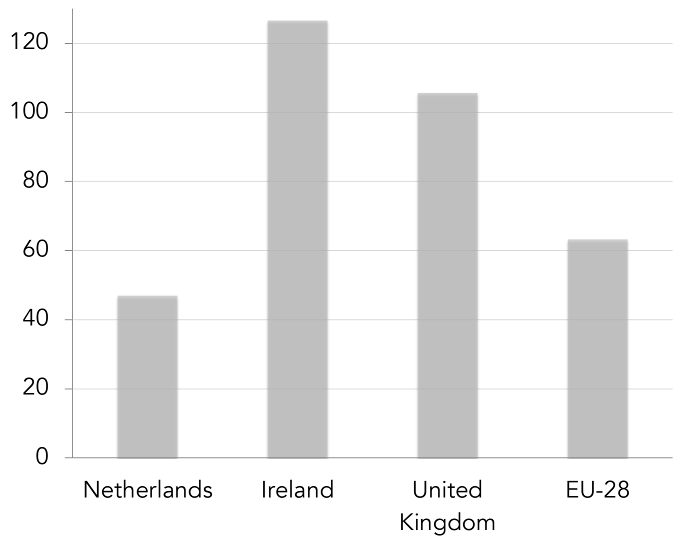
6

Introduction

"The cow is a walking beatitude . . . we could not run history well without her." Agricultural historian David Taylor began his article on the development of the English dairy sector in the period between 1860 and 1930 with this 1885 quote by T. Swann. It conveys the significant role of dairy in agriculture in that period, which is when milk emerged and consolidated as the top agricultural product sold by farms (Taylor, 1974). Milk has maintained a prominent role in British agriculture through today; it has consistently been the highest value agricultural commodity for over five decades (FAO, 2015b). In the broader picture, the UK is the third largest milk producer in Europe (i.e., after Germany and France) and tenth largest in the world (AHDB Dairy, 2015b).

Most UK dairy is consumed domestically and half of all milk produced is consumed as fresh liquid milk (DEFRA, 2016c). In fact, despite the decreasing trend of the last decades, the milk per capita consumption in the UK is still one of the highest in Europe—and it is not only the characteristic milk in their tea. On average, every Briton consumes 104 liters of milk, over 3 kg of butter, and 13 kg of cheese annually (AHDB Dairy, 2015b; Canadian Dairy Information Centre, 2015a; Dawson et al., 2014). Figure 6.1 illustrates differences in liquid milk consumption per capita amongst the case study countries as well as the EU-28 average for contrast.

Figure 6.1 Annual per capita milk consumption in 2015 (liters per capita)



(Canadian Dairy Information Centre, 2015a. Amended by author)

Another frequently cited feature related to milk consumption is the rate of doorstep milk deliveries. Doorstep deliveries became a regular feature of milk retail after 1850 (Atkins, 1980) and continued to be the most used milk retail channel until the early 1980s when rates started to decline. In 1995 doorstep deliveries still accounted for 45% of household purchases of milk in Great Britain, however in 2015 this had fallen to 3% (Bate, 2016; MDC, 2004).[64]

Dairy also plays an important economic role within agriculture. In the last five years milk has accounted for around 15% of total agricultural output in the UK. In 2015 this was worth £3.6 billion in market prices.[65] Agriculture as a whole accounted for £10 billion of the £108 the agri-food sector contributed to the national economy in 2014. And that represents over 7% of the national gross value added (DEFRA, 2016a).[66]

Similar to neighboring Ireland, the UK has plentiful grass resources, providing an environment conducive to dairy farming. Dairying is thus strongly connected to the landscape. Grasslands cover over two-thirds of the 170,000 km^2 of utilized agricultural area—70% of the total land in the UK.[67] Dairy farming is present across the UK but is more concentrated in the southwest where grass-growing conditions are very favorable. Midlands and Wales are also strong dairy regions (Hopkins, 2008). At the time of writing the number of dairy farms operating in the country was 13,400 and following a downward trend; the national herd was 1.9 million cows (AHDB Dairy, 2016e,2016h)

Structure of chapter

This chapter follows the same structure as previous ones. First, I present the development of the dairy sector since the post-war era. In this case, I include some additional background on the earlier development of dairying in the UK. I then present the challenges facing the sector, which are heightened by the abolition of quotas. That is followed by the debates on sustainability issues as well as the emerging responses related to those challenges. In order to explore the engagement

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[64] The decline is argued to have been driven by the increasing market penetration of supermarkets, supermarkets' larger milk assortment offer (e.g., different sizes, flavors, fat percentages, etc.) (Roberts, 1988), as well as the price difference. Supermarkets were increasingly able to offer lower prices; in 1995 the average price difference for a pint of milk was 14 pence, by 2015 a milk pint via doorstep delivery was on average 56 pence more expensive (Bate, 2016).

[65] Output at market prices excludes subsidies and includes some non-agricultural activities and transactions within the industry.

[66] The agri-food sector includes, agriculture, food and drink manufacturing, food and drink wholesaling, food and drink retailing, and non-residential catering.

[67] There are several types of grasslands in the UK: 32% is older sown or permanent grass, 6% recently sown grassland, and 30% are rough grazing lands (Hopkins, 2008).

Table 6.1 Timeline of key events in the British dairy sector

Year	Event
1822	**First animal protection law is passed**
1824	The Royal Society for the Prevention of Cruelty to Animals is founded
1875	The National Anti-Vivisection Society is founded
1898	The British Union for the Abolition of Vivisection is founded
1933	**Milk Marketing Boards are established**
1945	End of WWII
1950s	Recovery of agricultural sectors
1960s	**Modernization and specialization of dairy farming (CAP)**
1960s	Animal and environmental protection movement
1964	Animal Machines by Ruth Harrison is published
1965	Brambell report on animal health and welfare
1967	Compassion in World Farming is founded
1968	**Animal welfare is introduced into the legislation through the Agriculture (Miscellaneous Provisions) Act**
1970s	Increased visibility of water pollution
1970s	Surplus of milk production in Europe
1973	**The UK enters the European Union**
1975	Food From Our Own Resources report
1978	**MMB adapts to operate closer to EU rules**
1978	MMB invest in processing capacity (Dairy Crest)
1979	**Milk churn collection comes to a stop**
1979	Farm Animal Welfare Committee is formed
1979	**Five Freedoms are outlined by FAWC**
1984	**Introduction of EU milk production quotas**
1986	**Single European Act is signed**
1987	**EU legislates quota trading**
1987	MMB removes processing arm Dairy Crest
1987	**The veal crate is banned in the UK**
1987	**Environmental Sensitive Areas scheme is introduced**
1990	**Food Safety Act is introduced**
1990s	**Generic assurance schemes are developed for food**
1991	**EU Nitrates Directive**
1991	**Countryside Stewardship Scheme is introduced**
1992	BSE epidemic reaches peak in the UK
1993	**MMB is fully revoked through the Agriculture Marketing Act**
1993	Five Freedoms are fully outlined by FAWC
1994	**RSCPA launches the Freedom Food scheme (now RSPCA Assured)**
1996	**The veal crate is banned in the EU (enforced in 2007)**
1999	Monopolies and Mergers Commission recommends the division of Milk Marque
1999	**National Dairy Farm Assurance Scheme is launched**
2000	Milk Marque divides into three: Milk Link, Axis Milk, and Zenith Milk
2000	**Producer assurance schemes converge into the British Farm Standard under the logo of a red tractor**
2001	First Milk is created out of the merge of Axis Milk and Scottish Milk
2001	Foot and mouth disease outbreak
2002	Zenith Milk merges with the Milk Group to form Dairy Farmers of Britain
2004	**ASDA launches DairyLink the first direct dairy farm supplier group**
2005	**Environmental Stewardship Scheme replaces previous schemes**
2005	Friends of the Earth launch the Big Ask campaign

2005 The Red Tractor logo is redesigned to include the national flag
2006 Animal Welfare Act is passed
2006 First Milk Academy is created
2007 Tesco launches direct dairy farm supplier group: Tesco Sustainable Dairy Group
2007 Welfare of Farmed Animals Regulations
2007 DEFRA initiates product roadmaps for several key products
2008 Climate Change Act is passed
2008 Milk roadmap is produced
2009 Dairy Farmers of Britain goes bankrupt
2009 FWAC proposes to move from Five Freedoms to Quality of Life for animals
2009 Cattle Health and Welfare Group is created
2010 An 8,100-cow dairy operation at Nocton Heath in Lincolnshire request permits
2010 First Milk establishes partnership with ScotBeef as an outlet for bull calves
2011 Application for Nocton mega farm is withdrawn
2011 The Co-operative launches their direct dairy farm supplier group
2011 Free Range Dairy Initiative starts
2011 The Milk Roadmap becomes the Dairy Roadmap (broader scope)
2011 First Milk starts developing a sustainability program
2011 First Milk starts whey partnership with Fonterra
2012 Müller takes over Robert Wiseman Dairies
2012 Arla Foods merges with Milk Link
2012 Extremely adverse weather affects the dairy sector
2012 Tesco launches Sustainable Beef and Pig Groups
2012 First Milk sustainability program First Things First is launched
2012 First Milk acquires CNP Professional (sports nutrition)
2012 First Milk Energy is established
2013 Horse meat scandal unfolds
2013 Dairy Roadmap report is published
2014 Countryside Stewardship Scheme replaces ESS scheme
2014 First Milk annual sustainability review report
2015 Müller buys Dairy Crest
2015 Dairy Roadmap report is published
2015 Arla UK rolls out Arlagården farm assurance scheme
2015 In January there is a two-week payment deferral for First Milk farmers
2015 First Milk CEO steps down
2016 Sale of CNP Professional is finalized
2016 First Milk operates on four production sites (vs. eight in 2012)
2016 Several milk price increases are announced by First Milk
2016 First Milk confirms partnership with Tesco for cheese group
2016 First Milk and Nestlé launch Next Generation Dairy Leaders Programme
2016 Anaerobic digester on largest First Milk production is installed

bold key rule-related changes in sector
blue key rule-related changes by processor

of dairy processors I study First Milk, one of the largest dairy processors in the UK, and the development of their sustainability program. The last section of this chapter is dedicated to the analysis of the development of the sector, the emerging responses from different actors, all in relation to current challenges and the future of British dairy.

Post-war development of the British dairy sector

In order to answer the question of how the British dairy sector developed in the decades that followed the Second World War, we need to go back into the early and mid-nineteenth century. During those decades, a growing population and their rising incomes shaped dairy and other agricultural markets. The production of butter, cheese, and milk increased in response to the shift towards a diet richer in meat and dairy. Furthermore, the expansion of railways increased access to the domestic market and also accelerated regional specialization (Hallas, 1991).

A few decades later, however, overseas competition started to gain significant presence in the UK. Between 1860 and 1913 the percentage of staple foodstuffs produced domestically—namely grain, meat, wool, and dairy—went from 80 to 45% (Winstanley, 2004). In that period of time, technical developments in transport and preservation technologies allowed for wheat to travel from the American prairies, Russia, and India into the UK. Similarly, refrigeration and, later on, deep-freezing made possible for North and South American beef as well as New Zealand and Australian sheep meat to make its way into the British market. Finally, butter and cheese products were able to safely travel from New Zealand, Denmark and even Canada. Food imports were affordable as Commonwealth members were favored trade partners (Singleton & Robertson, 1997; Winstanley, 2004).

In addition, imported food was of good quality, which caused domestic prices to drop significantly; the prices of butter and cheese, for example, dropped 25% in one decade (between 1880 and 1890) (Winstanley, 2004). At the time, the policy focus on inexpensive food favored imports while creating a tough environment for domestic dairy production (Roberts, 1988). This caused an important structural change in dairy farming. While it was a harsh environment for processed dairy, production of liquid milk was comparatively profitable. Why? One key reason is that fresh milk, unlike more processed dairy products like butter or cheese, did not travel well for very long. This shielded it from import competition. Additionally, demand for it increased sharply while prices for inputs increased more slowly—this put dairy farmers in a relatively strong position (Winter, 1984). This created an incentive for farmers to expand their dairy herd and reduce their meat, cheese, and butter production. Total milk production stayed essentially constant but the ratio of milk that was used for cheese and butter production fell significantly. Records show that by 1870 the proportion of milk that was processed into cheese and butter had fallen to 45% and by 1907 it was as low as 20% (Hallas, 1991).[68]

Milk marketing control

Winter (1984) argues that while on the surface dairy farmers enjoyed a relatively strong position after this period of structural change—especially compared to arable wheat farmers who had been significantly affected by American grain imports—there had been a fundamental erosion of their market standing and strength. He explains that dairy farmers had gone from producing a finished product (i.e., cheese or butter) sold by local small retailers, to becoming fresh milk suppliers to a dairy company "often in a near monopolistic position"(Winter, 1984, p.110) that would then sell their milk to distant urban markets. Alcock (1994) further argued that the time between the two World Wars was chaotic for agriculture in general, and challenging for dairy farmers in particular. Dairy farmers realized the difficulty of their situation; that is, dairy companies could dictate the price of milk and farmers were somewhat locked into the transaction. Given the short time span in which milk is fresh and fit for consumption, if milk were not immediately collected it would be a loss solely to the farmer. Further, towards the late 1920s farmers experienced how the decrease in world milk prices directly affected their margins while the benefit of high demand and increased prices—for example, during the winter of 1931 when there was a shortage of milk—was not passed on to them so directly (Wadleigh, 1932).

This was the context in which the Agricultural Marketing Act was passed by the British Parliament in 1931. The aim was to set up a framework in which social control of agricultural marketing could emerge. Wadleigh (1932) explains that this act allowed producers to gain control over the marketing of agricultural commodities. The system required for two-thirds of producers to vote and agree for their product to be marketed by an organization elected by themselves. There had been failed attempts at voluntary organizing within the dairy market (Winter, 1984) and this act created the possibility of a system of compulsory co-operative organization. To set up such an organization, producers of a commodity had to submit a scheme to regulate the marketing of their product to the Minister of Agriculture (Wadleigh, 1932). Shortly after the act was passed, the idea of a milk marketing scheme for England and Wales was explored by a reorganization committee set up by the Ministry of Agriculture. The committee recommendations were to create a producer-controlled scheme through not only one but five regional boards across the UK; the

[68] In some localities, the share of milk that was processed into cheese and butter prior to 1870 was approximately 60% (Hallas, 1991).

votes were in and the boards were established between 1933 and 1934 (Alcock, 1994; Mark & Strange, 1993).[69]

The Milk Marketing Board (MMB) was run by 15 elected producer representatives and three government appointees, as well as 12 democratically elected regional committees (Empson, 1998). The MMB had control over all milk sold. Farmers were not legally obliged to sell their milk but they had to be registered and exempted under the scheme (Giddings 1974, in: Winter 1984). If farmers agreed to tender their milk to the board, the MMB had the obligation to collect it regardless of distance or logistically complication to reach the farm. The pricing of the milk under the MMB scheme was calculated according to end-use. Fresh liquid milk had a higher value compared to milk destined to the manufacture of dairy products and was sold for a premium.[70] On the farm side, all farmers were paid a basic 'pooled' price to which operating costs were deducted. A key feature of the basic price calculation was that farmers were charged a uniform fee per liter of milk collected. This meant that larger dairy farms located closer to the MMB depots were in fact subsidizing the collection and transport of more remote and small farms in the region (Franks, 2001). The guarantee of milk collection and payment offered farmers security—something they had not experienced for decades. Having a guaranteed outlet drove farmers even farther from the processing of milk into other dairy products. During the Second World War the MMB played a vital role in managing the collection and distribution of milk and despite the challenges, milk production managed to continue through wartime. This consolidated the position of the MMB in the UK (Alcock, 1994).

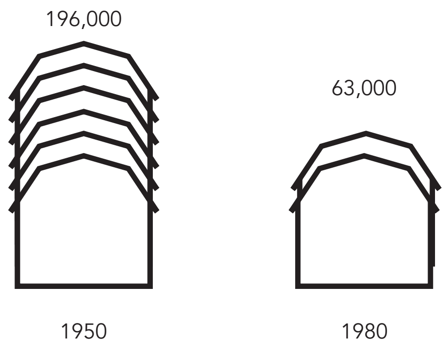
Post-war agricultural policies encouraged an increase in milk production and the British government made funding available to support research, education, and on-farm development (Boulton et al., 2011). The government expected the MMB to facilitate the modernization of dairy, especially after the war. The board's priorities included improving hygiene and quality controls, and increasing efficiency and productivity. The MMB supported this through the introduction of new techniques and practices, such as artificial insemination, machine milking, bulk collection, milk recording, etc. The MMB created the conditions for dairy specialization and expansion; a key example is the introduction of bulk collection of milk and the related policies designed to support its adoption. This allowed larger dairy farmers to further specialize and grow while smaller dairy producers, who were often less

[69] The five boards, which covered practically the whole of the UK, included the Milk Marketing Board of England and Wales, the Scottish Milk Marketing Board, the Aberdeen and District Milk Marketing Board, the North of Scotland Milk Marketing Board, and the Milk Marketing Board for Northern Ireland.

[70] As it was discussed earlier, the liquid milk market was not exposed to the influence of competing imports, as the perishability of milk did not allow for it to be transported while maintaining its properties. Additionally, milk processors required milk supplies year-round. That is why fresh milk for the liquid market was prioritized and processors paid the highest price for it (Bates & Pattisson, 1997).

able to invest in bulk tanks, were driven away from the sector (Winter, 1984). By the early 1970s bulk tanks had been installed in 32% of dairy farms (Baker, 1973, in: Winter 1984). Figure 6.2 shows the decrease in number of farms between 1950 and the early 1980s. This development was driven by a set of post-war policies put in place—including the entrance of the UK to the EU—and the general policy discourse on expansion of food production in the UK. An illustration of this line of thinking is the 1975 *Food From Our Own Resources* report. This report produced by the UK government highlighted the relevance of domestic food production in reducing the costs of, and dependency on, imports (Lawrence et al., 2013). It would be imprecise however, to report full policy and public coherence; the scaling up of dairy farming was not entirely uncontroversial. For example, the MMB announcement on milk churn collection coming to a stop by July 1979—which implied the full migration to refrigerated farm vats and bulk collection—sparked public debate. The implications of this decision were discussed during a debate at the House of Lords in 1978.

Figure 6.2 Number of dairy farms in the UK between 1950 and 1980



(Winter, 1984. Figure by author).

> *Milk will then be collected only by road tanker which, in the end, means the demise of small-scale milk production [. . .]. I want to know what will happen to the 60-gallon farmer, who is considered small. Is he to be abandoned? Is not he, too, a small business? [. . .] It is growing increasingly difficult to find dairies that will accept churn milk. [. . .] Why cannot the small gallonage of the little man, with maybe less than 60 gallons, go in a churn to the creameries as happens in Ireland? Can we do something about that? And, for heaven's sake, do not let the Common Market destroy our doorstep delivery of milk. The milkman delivering the milk also helps the farmer with the small gallonage. What is more, the milkman is part of the social services. Many old gentlemen or old ladies have had their lives saved, because, in their loneliness, the milkman is more often a visitor. [. . .] Once again we are worshipping at the shrine of bigness rather than keeping economic units at the optimum level. [. . .] If we are saying that little farms are to be moulded, rolled and cajoled by specious promises, that hedgerows should be destroyed and that we should make prairies out of farms that nature will ultimately destroy by blowing the earth away from them, or that we should go in for factory farming, what incentives will there be for our young who want to become*

farmers? There will be no small acreages for them to buy. [. . .] I express the hope that the Minister will spend some time studying this problem. Britain owes it to these food producers to work out a viable formula to keep the man with a small gallonage or a small acreage in existence. After all, he helped us to win the war with his food production. (Hansard, 10 July 1978 cc1406-25)

Amidst some dissenting voices, the mainstream policy drive in the UK supported the modernization and scaling up of dairy farming.

The push for the modernization of dairy was reinforced when in 1973 the EU granted access to the UK into the European Economic Community. A year prior the EU had passed legislation aimed to further modernize farming. This had a focus on professionalization of the trade and renewal of its workforce, which implied persuading older farmers into early retirement (European Commission, 2016e). Therefore, the UK's modernization logic was well aligned with EU policy and the scaling up of dairy farming continued. There was, however, an area of disagreement between the UK and the EU: the milk marketing boards. Before the UK's entrance to the EU, regulation on the common organization of the milk market within Europe had been already passed.[71] Through this legislation, arrangements similar to the MMB had been dismantled in the Netherlands, Italy, and Germany. The existence of the marketing boards was a contentious issue and given its complexity and significance it was not addressed at the time of the entry negotiations; it was postponed for after the five-year transitional period (Williams, 1997). By 1978, the MMB had made small changes to operate closer to EU legislation, however this was insufficient and an amendment to the EU framework was made to accommodate the UK and the MMB. Part of the terms for retention of the MMB included a clause in which farmers could process their own milk. While the amendment complicated to some extent the MMB's operation, the board continued to work much as before from an almost monopolistic position—in fact, in 1978, the MMB invested in milk processing and through Dairy Crest, the MMB was able to process a third of the national milk supply (Empson 1996, in Franks 2001). The MMB influence on market dynamics in the UK raised many debates internally and around the EU (Williams, 1993).

As discussed in the introduction of this thesis, by the late 1970s and early 1980s, the steady increase in dairy products—incentivized by high common prices—started to become an issue in Europe. The financial impact of handling surpluses on Member States reached problematic levels. The CAP expenditure as a percentage of the total EU spending reached 73% in 1980 (European Commission, 2016b).[72] While it was

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[71] Here I refer to regulation (EEC) No 804/68 of the Council of 27 June 1968 on the common organization of the market in milk and milk products.

[72] For reference, in 2015 the CAP expenditure as a share of the total EU budget was 39%.

agreed that the increasing budgetary burden of milk overproduction needed to be addressed, the discussion about changes to the Common Agricultural Policy (CAP) and the proposal to introduce quotas generated different views within the UK. Petit and colleagues (1987) describe the different positions that the National Farmers' Union (NFU), the Milk Marketing Board, as well as the Ministry of Agriculture had on the subject. The NFU stressed the importance of a soft landing for the introduction of quotas; they argued for quotas to be set high enough to allow farmers to adapt, especially since 1981 (the reference year in discussion) had been a particularly bad year for British dairy. Also, the NFU called for the transferability of quotas amongst producers and opposed any measures that created discrimination or burden to large-scale dairy producers. For example, the NFU was against the co-responsibility levy and wished its suppression. This levy was introduced in 1979 and required farmers to pay a fine for serious over-production (European Commission, 2016e). As to the position of the MMB, their argument was that the surplus of milk was much more a problem of underconsumption rather than overproduction, thus it called for greater efforts to expand the market through the reduction in consumer prices.[73] The MMB was not partial to the co-responsibility levy either; according to the board it could be used to favor small-scale farmers. In addition to the goal of reducing costly milk surpluses the Ministry of Agriculture, Fisheries and Food had other aims during the negotiations. The Ministry argued for a reduction of the overall agricultural spending, as well as the UK's contributions to the EU budget. The administration within the EU, according to the Ministry, was deemed too resource intensive. Lastly, the Ministry of Agriculture held similar views to the NFU on the co-responsibility levy; he feared it could be used to discourage further structural change in the sector. After many rounds of debate, the EU decided for the introduction of milk production quotas in 1984.

The introduction of quotas resulted in a rapid decline in the number of farmers as well as dairy cows. In the UK, when quotas were introduced in 1984 the national dairy herd had reached 3.3 million cows (Boulton et al., 2011). Thirty years later, as quotas were abolished in April of 2015, the number of cows had decreased to 1.8 million (AHDB Dairy, 2015b).[74] The number of dairy farmers in the UK went from 50,600 at the outset of quotas to 14,100 in 2014. And the decrease was especially sharp in the last two decades (AHDB Dairy, 2015b; Colman et al., 2002). Average herd size on British farms increased considerably; it went from 60 to 133 cows in the period under the quota regime. Sixty percent of UK's dairy cattle lives in herds larger than 150 cows; this includes 10% of cows living in herds of at least 500 (AHDB Dairy, 2016b; Henley, 2014). While similar structural changes occurred in

[73] It is interesting to note that the MMB of North Scotland did not share the same views and supported the introduction of quotas. They saw the measure as the only way to reduce over production of milk with the least damage to farmers' income.

[74] This includes the 2001 foot and mouth epidemic, which significantly impacted the sector.

other Member States, the liberal quota transfer framework devised in the UK further facilitated the intensification of dairy. Interestingly, the eagerness of the UK sector for transferability of quotas led to the first instance of leasing in Europe in 1986. This was in fact based on an imprecise interpretation of the regulation and thus not permitted. The UK was sanctioned for it but it led the EU to specifically legislate the leasing of quota in 1987. In the UK, not only did the transferability of quota started early but it was mostly unrestricted, certainly the least constrained within the EU (Oskam & Speijers, 1992).

What other changes emerged during the quota regime? In terms of milk production, the average milk yield per cow increased by 65%, reaching almost 8,000 liters in 2014. However, despite this increase in yields the annual milk production steadily dropped for the first twenty-five years of the quota regime, going from 16.7 to 13.1 billion liters of milk. The decline in milk output also resulted in costly surplus capacity in milk processing (Franks, 2001). After the low of 2009 the annual milk production in the UK has slowly increased, reaching over 14.6 billion liters in 2014 (Bate, 2016). While more often than not Member States struggled to avoid surpassing their national production quota and in consequence incur levies, in the UK the story was different. After the 1990s when deliveries did go over quota, for the last 10 years the total milk output was well under the production cap.[75] The under delivering of milk at the national level does not imply that all farmers produced under their individual quota limit. Actually, this quota gap created room for big producing farmers to go over their quota as fines were generated only if deliveries at the national level would surpass the quota limit (Aeral et al., 2012).

The demise of the MMB: from control to fragmentation

Another significant change that took place during the quota regime was the dismantling of the Milk Marketing Board. As discussed earlier, its existence had been contested since the UK joined the EU. The development of their processing arm, in the late 1970s, gave the MMB added market control (e.g., as a result the MMB had the largest butter and cheese manufacturing capacity). Despite the fact that it was short lived—that is, with the introduction of milk quotas and the reduction in milk volumes this added processing capacity quickly became an expensive feature—the MMB's scale continued to be increasingly problematic. The successive conservative governments favored free-operating markets and as for the EU, the MMB was incompatible with its principles, especially after the Single European Act was signed in 1986 (Fearne & Ray, 1996). Soon after and following EU regulation, the Milk Marketing Board of England and Wales (MMBEW) was required to remove its processing arm, Dairy Crest, from its organization; in 1987 Dairy Crest became a completely separate subsidiary (Empson, 1998). After a few years, the

[75] The yearly UK milk delivery deficit in the last decade of the regime—namely, between 2004 and 2014—expressed as quota percentage is: -1.1, -1.9, -3.3, -5.3, -9.7, -12.1, -9.7, -9.8, -13.8, and -10.6.

milk marketing boards were fully revoked through the 1993 Agriculture Marketing Act.

After sixty years of existence, the demise of the milk boards was a profound change for dairy in the UK. The most immediate effect is that it allowed for different market arrangements to emerge. Farmers' co-operatives, farmer-processor direct supplying contracts, and milk selling groups (i.e., groups who would collectively negotiate deals between farmers and processors), populated the newly deregulated market (Franks, 2001). Milk Marque, a farmers' co-operative, was the largest of these newly formed actors. It emerged out of the demise of the Milk Marketing Board of England and Wales (MMBEW). In the first year of deregulation it managed to secure the supply from 65% of the dairy farmers in that region. Dairy processors were not satisfied with this development as they saw Milk Marque as the practical continuation of the MMBEW. They devised contract packages to attract farmers and secure their milk sourcing through direct supplying relationships. It was a common practice to offer a 'Milk Marque + premium' price. Despite the prospect of higher prices and other benefits, farmers had a longstanding mistrust in dairy processors, which influenced their choice to initially stay with Milk Marque (Fearne & Ray, 1996). By 1996, however, some farmers were growing increasingly dissatisfied with Milk Marque's lower prices and their membership started to decrease. Several interviewees voiced the demise of the milk marketing boards as a critical point resulting in the fragmentation of the farming base and the decrease in farmers' market power. One interviewee articulated the following:

> *When the industry was deregulated, there was an almighty war for milk and the milk price just shot through the roof. The PLCs (public limited companies) were actually picking farmers up by promising them a penny or two per liter above what the co-ops were paying which the farmers bought into. [. . .] The whole industry fragmented. (FM10)*

The prospect of losing members prompted Milk Marque to introduce a plan for gradually acquiring processing capacity with a final goal of being able to process one billion liters of milk by 2000. After the first steps were taken—Milk Marque acquired processing capacity for 15,000 tons of cheese—the concerns about the influence that they could have over the milk market reemerged. In 1999, the Monopolies and Mergers Commission issued a recommendation about Milk Marque. It suggested its division into a number of independent organizations in order to avoid a monopolistic market situation (Franks, 2001). In 2000, Milk Marque divided itself into three regional co-operatives: Milk Link, Axis Milk, and Zenith Milk, which increased competition amongst suppliers while further fragmenting the supply base (Kirwan et al., 2002).

In the last sixteen years there have been periods of consolidation. Dairy processors, including the offspring of Milk Marque, have merged with PLCs or co-operatives to boost scale and market presence. Axis Milk joined with Scottish Milk in 2001 to form the co-operative First Milk (Akter & Rahman, 2010). Zenith Milk merged with the Milk Group in 2002 to form Dairy Farmers of Britain also based on the co-operative model. In 2009 however, Dairy Farmers of Britain—which at the time was owned by 1,800 member farmers—went bankrupt (Tasker, 2009). In the last few years the consolidation at the top of the list of processors has been notable. In 2012, the German dairy company Müller took over Robert Wiseman Dairies, the second largest milk processor in the UK, and formed Müller Wiseman which then became the largest private milk processing company in the UK (FM1; Kollewe, 2012). Also in 2012, Arla Foods, a co-operative owned by Danish, Swedish, and German dairy farmers, merged with Milk Link; as Arla Milk Link they became the largest dairy firm in the UK (BBC News, 2012). In December of 2015 the sale of Dairy Crest's milk operation to Müller was authorized and completed. The completion of this sale took place more than a year after its announcement due to competition concerns. Dairy Crest's milk unit merged with Müller Wiseman Dairies and after the operation it was renamed Müller Milk and Ingredients (Armstrong, 2015; Jack, 2015; Kollewe, 2014). The resulting top three processors in the UK are Arla Foods, Müller Milk and Ingredients, and First Milk. Arla Foods together with the recently formed Müller Milk process 50% of the UK's milk pool, each with roughly the same share (Arla UK, 2016; Dinkovski, 2016); jointly with First Milk they process around two-thirds of the total milk pool (DairyCo, 2012).

Post-quota future

The development of the UK dairy sector has been characterized, to a large extent, by three interrelated aspects. First is the increasing modernization and scaling up of dairy operations—a general development trend also observed in the Netherlands and Ireland. Secondly, the sector has had a strong orientation towards the domestic market; around 50% of the total milk production is consumed as liquid milk (Bate, 2016). The third point is the relatively weak market position of dairy producers. This is related to the traditional domestic market focus, which in turn generates a certain degree of dependency on retailers for market access. This is accentuated by the market concentration in food retailing and the comparatively more fragmented supplier base. Below I present how these interrelated aspects of the way in which British dairy has developed translate into challenges and opportunities for the sector. The implications of the development trajectory of the sector are not solely economic, for example the intensification of dairy farming can have clear environmental and social impacts. However, you will see that when challenges are discussed the economic dimension of dairying is consistently mentioned as the most pressing one.

> *Economic sustainability is really top of the agenda. That is a mix of both cost control and access to markets. Access to the revenue and margins actually being available in the supply chain. (FM2)*

Before moving into the discussion about the future challenges for dairy in the UK, it is useful to raise two points. First, the challenges and opportunities included here are those that consistently emerged within the scope of the study and from the mapping of the sector. The discussion presented in this chapter is by design not all-encompassing. There are other relevant debates and perspectives that are part of the overall discussion about the future of dairy but were less present during the data gathering of this study. Secondly, in the previous case studies this is the point where quotas became central to the debate on the development of the sector as they liaise the past and prospective dairy futures. In the UK, however, milk quotas have not had as prominent of a role. This can be explained by the fact that in the last decade of the scheme, milk production was well under quota. Thus this restriction was not seen as directly impeding milk production or thwarting the ability of the British sector to capture a share of the dairy export market. This does not imply that the broader implications of the removal of quotas have not been discussed. In fact the increasing exposure to market forces—a key outcome of quota abolition—has highlighted persistent issues, challenges, and opportunities for the dairy sector.

> *Quota is not really on the radar for most milk producers in the UK. And it is not on the radar for most of the processors either because it has not been an issue. Well, it has been an issue since the CAP reform and some of the volatility linked to that in the markets. And we would expect that (price volatility) to become surely not better once the quota comes off completely. (FM7)*

One of the challenges facing the sector relates to the implications of the increasing intensification of dairy production. In the UK dairy production systems differ across regions. Graze-based dairy production is widespread in Northern Ireland and the west of England and Wales. However, feed intensive housing systems are not entirely uncommon and there is a gradual move towards this type of system (Promar, 2015). Donnellan and Hennessy (2015a) explain that low milk prices have driven British dairy farmers to increase scale. One way for many of them has been to increase the stocking rates and in consequence their dependence on feed to supplements. The increase in input cost directly impacts margins and farm income. As price volatility is expected to increase, the reliance on external feed poses an additionally threat to profitability. In relation to this, interviewees pointed to the risks of dependency on feed supplements as well as the lack of understanding about drivers of input costs.

> *The majority of herds in this part of the world would graze but there are some pretty large businesses. . . I don't know, something like a*

2,000-cow unit [is] not far away [from here] and these guys have their cows intensively housed. [. . .] As the business gets bigger you are more prone to fluctuations. In a completely housed system a lot of your inputs are outside of your control. [. . .] The weakness of large volumes with small margins is that if the price jumps by a penny, their profit level might jump 50% whereas with the extreme grazing guys if the price jumps by a penny then their profit level jumps only 10%. But when it drops by a penny it also drops only 10% whereas the other system (intensive housing) loses half of its profitability. (FM8)

I think farmers should know more about their costs and they should maximize what we have here (grasslands) rather than shipping soya from Brazil. They should control the costs that they can. (FM9)

While total milk output from the British dairy sector is not projected to increase significantly in the coming years (AHDB Dairy, 2016c), the quest for profitability will continue to drive the scaling up and consolidation of the farming base. One third of dairy farmers in the UK had plans to expand after the removal of quotas (Donnellan & Hennessy, 2015a). The total cow numbers have indeed been increasing since mid 2013, from less than 1.8 to currently reaching 1.9 million cows (AHDB Dairy, 2016h). And the current average herd size of 133 cows is projected to increase to somewhere between 179 and 191 cows by 2020 (Promar, 2015). Increasing price volatility constitutes a challenge for farmers in general but especially for large-scale farming operations with high input cost.

Another aspect of the sector that constitutes a challenge for British dairy is its traditional focus on fresh liquid milk—a product with relatively little added value best traded locally—and in consequence, its dependence on the domestic market. The reason why this represents a challenge is related to the dominant role retailers have come to play in food supply chains. After the demise of the milk marketing boards, Banks and Marsden (1997) identified a period of 'reregulation,' which they describe as the shift in governance where retailers emerge as new actors with a dominant role in mediating access to market and defining quality criteria. As retailers face their own competitive environment, they too have followed a rationalizing strategy in order to benefit from economies of scale and lower costs. This has exerted downward pressure on the processor and producer margins (Kirwan et al., 2002), as well as pressed farmers into increasingly more intensive production systems (Smith & Marsden, 2004).

[Retailers] put a lot of pressure on our processors, or can do when it comes to renegotiating contracts. Our processors are doing—or have been doing in the past—very similar things when it comes to marketing of their products. They are all in the same market, predominantly liquid

> *milk but also cheese, butter, etc. and retailers have been able to use that to their advantage. The pressure that they put in the processors has led to some of that pressure to be passed back to the farm gate. (FM1)*
>
> *The UK has such a strong retail base, such a supermarket control over the majority of the market place and from a co-op point of view we are a relatively young business. Its history was basically brokering milk and we are trying to change that into a more value added business so we are trying to broaden our product range and go up that value added chain but all of this takes money and time so we are playing a little bit of catch up. (FM8)*

The market concentration of food supermarkets in the UK has indeed been significant in the last few decades. In the early 1990s, the four leading retailers—Tesco, Sainsbury's, Asda, and Morrisons—controlled 50% of the total grocery market; by the end of the 2000s their share of the market had increased to 75%. In the last five years, however, this trend has been shifting. Although still accounting for a dominant share of the market, the leading four retailers and especially Tesco have each lost between 3 and 1% of market share (Chaudhuri, 2015; NA, 2015d). The actors gaining market share are discount supermarket chains Aldi and Lidl. Both chains' competitive strategy is based on heavily discounted prices on consumer staple products and they currently have a joint market share of over 10%. Another retailer gaining market share—albeit at a relatively slower pace—is upper market chain Waitrose (Kantar Worldpanel, 2016). Further, convenience stores are increasingly gaining market presence in food purchases. A mix of demographic and lifestyle shifts have driven changes in food shopping habits; more frequent and smaller purchases are contributing to the expansion of convenience stores throughout the UK (Hood et al., 2016). While major retailers have also moved into the convenience store format, the leaders in this category are still symbol groups as well as independent stores (IGD, 2015).[76]

While mapping the debates about the future development of the dairy sector, a topic that would invariably emerge would be that of exports, specifically in relation to the UK's prevalent dependency on domestic dairy markets. The dairy export opportunities that are likely to arise for Member States were discussed by interviewees retrospectively, as well as in terms of their potential to create new market access for British dairy.

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[76] A symbol group is an organization to which a convenience retailer can be a member. Symbol group affiliated members typically purchase a proportion of the goods they sell from their symbol group operator. The Symbol group offers discounts as well as business and marketing advice and support. Amongst the leading ones in the British market are Premier, Spar, Londis, and Nisa (IGD, 2012).

The other problem we have in the UK is that we have been very internally facing for a number of years so we have been concentrating on the British consumer and very much on the supply of milk into the liquid market. The result of that is that we have not looked at exports. We have not built up exports from the UK and we have not been looking at other added value products that are anything different from the normal, from cheddar and liquid milk and that has put us way back compared to other countries. (FM7)

The UK has been pretty insular and probably if Ireland wants to export a lot of dairy products and their production capacity does leap into the direction they have forecasted, yes the UK could be pretty vulnerable, so we have to be pretty quick between now and 2015 to find other routes to market that are high value and export driven. (FM2)

There is no reason why there can't be British cheese and butter out in Israel or South Africa as there is Irish. This is a good market opportunity for us as well. It's something that we are looking to grow over time. (FM1)

A final point is that surfaced repeatedly is the impact of the structure of the sector on its market position. Interviewees referred to the fragmentation in the post-MMB era; they discussed how the increased supply-side competition had eroded the stance of farmers and hindered the emergence of strong co-operatives with farmer-owned processing capacity.

Co-operatives have not fared as well in the UK as they have in other countries where they are more prolific. (FM1)

The days of the big co-ops and the Milk Marketing Board are gone, you know? The power of dairy farmers is nowhere near where it should be and you see that with margins. (FM5)

The biggest issues facing the industry at the moment relate to structure of the whole industry, of the supply chain. Farmers have allowed themselves to be distanced fairly substantially from the added value element of the supply chain. So they have allowed themselves very much to become commodity producers, price takers. They were tempted by the siren sounds of an extra cent a liter when in reality they have actually let 3 to 5 cents a liter slip away from them and in order to get that back they are having to fight against a cost-based inflation that has actually become quite crippling, particularly in the last 12 months, tied in with weather issues and that has eroded profitability. [. . .] The other thing for our industry particularly is that still there has not been any rationalization of

> *processing capacity, still there is surplus in capacity and yet more is being built up which is not a good situation as a primary producer [. . .]. At the farm level, we are seeing that lower volume, that very small end of the market quietly falling away and that is where we see a lot of people leaving the industry. (FM6)*

At the time of the interview (summer 2013) dairy prices were recovering from the low levels of 2009 (DEFRA, 2016b) but the whole farming sector had been shaken by the extremely adverse weather of 2012. The period between April and June of 2012 was the wettest documented for the UK in more than one hundred years. This caused widespread flooding. Some parts of the country were even hit with snow, strong winds, and ice as April was recorded as the coldest in more than 20 years. Silage production was heavily affected; cows that were out grazing responded to the weather which in turn affected production, and farmers who had to buy additional feed were faced with high prices (AHDB Dairy, 2012; Benton et al., 2012). The impact was such that the average dairy farm income decreased over 40% that year (AHDB Dairy, 2016d). These difficult circumstances have—according to interviewees—created negative associations with dairy farming and reduced its (perceived) prospective viability.

> *If you look at dairy, it is a very challenging sector to be right now but it is also an industry where a lot of people are actually questioning why they are in it. [. . .] The last years have been the wettest years so in terms of the farm it's very challenging, for example to produce the grass that the cows have to graze on. There are a number of farmers that are saying, why bother? (FM5)*

> *We seem to have got to a mindset within the UK industry where people think that dairying is a very poor place to be and if you look at the UK since the quotas came in as an industry we are 6.5% smaller today than we were back in 1984 and yet you look at Holland and Ireland and they have all maintained the quota. If you look at Northern Ireland as an example, Northern Ireland as an industry is 35% bigger than it was in 1984. So why is it that they see such a bright future when they've got to deal with more price volatility, lower prices, and more difficult circumstances and yet they still have this very positive outlook. I think we've got a perception problem. (FM6)*

This difference in outlooks across sectors in different member states was indeed perceptible and the reservations about the future of the British dairy sector described by interviewees were noticeable. While data on actors' perspectives gathered during the study of the UK sector does not point to outright pessimism or an uninvolved dairy community, it does signal hesitation, which can potentially affect farm succession rates, investment and production decisions, and the general viability of dairy. What has happened since then? After reaching a peak in 2014, average milk prices in the UK have been steadily falling; as a result the average farm gate price decreased 30% by 2016 (AHDB Dairy, 2016i; DEFRA, 2016b).[77] During this period the dairy sector was often characterized as being in crisis.[78] Analysts pointed out that the crisis was less generalized than depicted and it was better explained by important differences in the prices received by farmers as well as their costs of production (Matthews, 2015b). While a more granular analysis indeed reveals a more nuanced picture, what can be argued is that farmers are operating in a more uncertain environment. A 2015 survey on farmers' confidence revealed that farmers were less optimistic about the next 12 months than they had been the year prior. Also while more than half of farmers were optimistic about the next five years, the share of optimistic farmers was smaller than in 2014. Regarding investment intentions, another finding of the survey was that the share of farmers who were unsure about investments grew by 5% between 2014 and 2015 (AHDB Dairy, 2015c).[79]

The challenges presented here connect the implications of the past development of the sector with expected futures for dairy in the UK. As noted earlier, all challenges can be translated to interrelated variables that directly affect farm profitability—that is, scale and system (costs) of production, access to markets, and the ability to capture value. Are these the only challenges to sustain dairy? Not necessarily, but positive economic results takes absolute precedence. As articulated by an interviewee, sustainability issues related to the environment and society can only be addressed once economic viability has been secured.

> *Well, [the dairy co-operative] has got its own definition, which involves three things—environment, ethics, and economics—which pretty much*

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[77] It must be noted that at the time of writing the average price for 2016 was 21.59 pence per liter and it was calculated based on January-September prices. The average milk price for the UK for 2014 and 2015 was 31.51 and 24.42 ppl respectively.

[78] In August of 2015 there were several protests over low milk prices carried out by farmers at Tesco, Asda, Sainsbury's and Morrisons stores (BBC News, 2015a; Ruddick, 2015). The national media covered the difficulties faced by dairy farmers through numerous pieces discussing not only low prices at retail level, but also changes in global demand and supply such as the Russian embargo and the post-quota increase in milk output. In general, the depiction was of a sector faced with strong challenges (For a sample of news articles see: Editorial, 2015; Harvey & Smithers, 2015; Henley, 2014; Spencer, 2015).

[79] The Farmer Intentions Survey 2015 carried out by AHDB Dairy used a representative sample of 850 farmers. In 2014 the share of farmers that were either optimistic or extremely optimistic about the confidence in their own business in the next 12 months was around 67%, in 2015 it was 45%. The same question but with a 5-year timeframe showed that in 2014 approximately 63% of farmers were optimistic or extremely so, while in 2015 this share decrease to 55%.

covers all the sections. Ultimately the economic one is the first one before you can do any of the other bits really. Sustainability is quite a broad subject and some of it probably doesn't fit all those three titles because if you have no [farm] succession you have no sustainability either. It's a phrase that not everyone understands. In terms of business, if you are not making money, obviously your environmental issues and ethical issues do not come into account. (FM8)

If you start talking about sustainability with an ordinary dairy farmer they'll start to talk about economics. (FM11)

Sustainability debate and emerging responses

How then has the sustainability debate evolved for dairy in the UK? And what responses have emerged to address these concerns? A large component of the debate pertains to the economics of the sector as previously explained. Therefore, the top theme to address here is that of profitability. As most of the challenges connected to profitability have been discussed before, here I present the most recent evaluation of farm profitability for dairy farms.

The Agriculture and Horticulture Development Board (AHDB), the not-for-profit, levy-funded organization working in the interests of dairy farmers in the UK, reports on the historical negative correlation that exists between the rates at which dairy farms exit the industry and milk price.[80] While their analysis demonstrates this correlation at national level as well as milk price as a key influencer on farm exits, the board stresses that price is not the only determinant; other aspects such as cost control and succession planning define the viability of dairy farm operations. The AHDB also examines farm sustainability—defined as the percentage of costs that farms can cover through milk sales and other dairy herd income both in the short and long terms. The results from the period of 2014 and 2015 showed that only 10% of farmers were covering full costs, 40% were covering cash costs, and 50% were in a highly vulnerable position as they were not able to fully cover the cash cost of milk production (AHDB Dairy, 2016a).

The profitability of farmers has generated significant pressure on retailers; they are put under the spotlight when milk prices go down, as a response retailers developed direct dairy farm supplier groups. ASDA's DairyLink was the first scheme from a major retailer; it was launched in 2004 and offered farmers a price premium per liter of fresh milk (ASDA, 2008). In 2007, ASDA enlarged the scope of the scheme by introducing opportunities for farmers to document and share best practices with

[80] Before the summer of 2015 the Agriculture and Horticulture Development Board for Dairy (AHDB Dairy) was known as DairyCo.

a focus on improving efficiency and animal health and welfare. ASDA DairyLink's dedicated supply comes from (aprox. 300) Arla farmer members (ASDA, 2014). Other retailers followed. In 2007, Tesco launched the Tesco Sustainable Dairy Group (TSDG) with 700 farmer members.

> *We took the decision to launch the Tesco Sustainable Dairy Group in 2007, at a time when milk prices were falling, confidence within the industry was at an all-time low and people were leaving the industry. [. . .] We also set up a cost tracking model so farmers submit their costs to us four times a year; those costs are analyzed by an external organization, and we review our prices twice a year. And within that milk price we allow for investment in the business, on herd, family labor, and also there are various stipulations that are required on our contract that we pay extra for. What that has given is that we have seen the group grow by 11% in volume. We have seen very few people leave the TSDG and the ones that have are just because they were retiring. So from a time when there was no confidence we think it has delivered confidence. [. . .] We have seen farmers invest into their business to improve facilities, ultimately this has an impact on animal welfare. (FM13)*

TSDG farmers manage herds ranging from 60 to 1,800 cows (Tesco, 2016). Farmers were selected based on the geographical supply requirements to create a dedicated supply as well as quality of milk. No distinction is made on herd size or type of operation (i.e., intensive vs. extensive).

> *One of the things that we like about the TSDG is that the farms that supply us can be 60 cows or 1,200 cows. And we have farms where the cows do not go out and we have farms where they are out for a considerable time of the year. So the diversity of farms is something that we like. It ensures that we are open to developments within the industry. It also ensures that we deliver a product that our customers want. We would not want to go down the route where it would be large-scale production within the TSDG. Equally, we would not want to double it to 1,400 farms each milking 60 cows. So it's a broad spectrum and we also look at succession planning within the TSDG. (FM13)*

In 2016, the TSDG increased its membership to 800 farms, becoming the largest in the UK. The core themes within the scheme are guaranteed fair prices, long-term contracts, access to knowledge from the Tesco Dairy Centre of Excellence (in partnership with Liverpool University), as well as to the Tesco Producer Club were farmers can purchase farm inputs at discounted prices. TSDG farmers are in turn required to adhere to the Red Tractor Assurance scheme, as well as work towards the outcome based standards (Tesco, 2016).[81]

> *We used to have a set of standards that was very prescriptive but now we have moved to a model that is more outcome based. For example if we measure lameness and friendliness of the animals, if the cows don't have any aberrations then whatever the facility they are in is obviously adequate, rather than stipulating cubicle measurements. (FM13)*

Finally, the Tesco Sustainable Beef Group and Pig Group were launched in 2012 (Horne, 2012). These groups were modeled after the dairy group (FM13).

The Sainsbury's Dairy Development Group (SDDG) was also launched in 2007. The core of the program was a price premium as well as offering farmers support on animal welfare and environmental issues. In 2012 a production cost model was developed to calculate milk price. The current membership is 281 farmers (Sainsbury's, 2016). In addition to the ones described here there are other direct farm supplier groups organized by retailers. These are, however, smaller in comparison (ranging from 40 to 60 farmer members).

A final illustration showcases the evolution of the direct supplier groups from a core price- and cost-driven response to an increasing scheme where different farming parameters are incorporated. The Co-operative Dairy Group was created in 2011 with over 220 farmers and was set as a long-term dedicated supply group. The Co-operative requires farmers to monitor and report on animal welfare indicators (e.g. lameness and body condition) as well as participate in an environmental stewardship scheme (The Co-operative, 2012).[82]

An annual milk price review for 2014 and 2015 shows that the highest prices paid per liter of milk are those that are arranged through direct supplier contracts and leading the ranks are Tesco, Sainsbury's, and The Co-operative (AHDB Dairy, 2015b).[83]

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[81] The Red Tractor Assurance scheme is a farm and food standards system in which independent inspectors assess animal welfare, food safety, traceability, and environmental aspects at different stages of the supply chain (Assured Food Standards, 2016f). This scheme will be explained in more detail later in this chapter.

[82] This is making reference to farmers taking part on the Environmental Stewardship Scheme (ESS). The ESS was introduced by DEFRA in 2005 and rewarded farmers and other land managers for the environmental management of their land (DEFRA, 2005).

[83] Farmers that belong to direct supplier groups have a base contract with their milk processor, be it a co-operative or a PLC, and in addition to that they have a supplementary agreement with the retailer. The decision to leave the retailer's direct supplier group does not impact the contract they have with the milk processor (FM13).

Some argue that one of the governance implications of this development is the increasing control from retailers and dairy processors over the conditions and practices through which milk is produced, which further removes it from primary producers (Ormond, 2016).

Ensuring the profitability of dairy farming constitutes a great challenge and in this section we have seen emerging normative expectations about the role of retailers in ensuring fair prices for farmers as well as the development of new types of contracts that regulate farming practices and the marketing of milk. While sustainability is mostly defined through economic variables, there are other aspects that surface when discussing sustainability more broadly. Let me introduce the themes that have emerged as building blocks on the agenda for dairy in the UK as well as the responses put forward by government as well as other actors in the dairy sector.

Animal welfare

Animal welfare is not a new topic in the UK. In fact, interviewees argued that for the general public, sustainability was practically equated to animal welfare.

> *If you bump into someone on the street and talk about food, the first thing that comes out of their mind is not sustainability, it's welfare. (FM6)*

The first law aimed at the protection of animals was actually passed in Britain in 1822 (Garner, 1999). Today according to the animal protection index developed by World Animal Protection, the UK—together with a few other countries—ranks at the top of their international assessment. The criteria used to evaluate the animal protection index for a country include the recognition of animals as sentient beings and the importance of their protection, the governance framework through which this is pursued, animal welfare standards, efforts made on animal welfare education, as well as awareness (WAP, 2016b).[84] How did the UK get here? Does this mean all animal welfare issues are solved? Let me answer that by introducing some of the actors and events that have been identified as influential in terms of animal welfare debates, policymaking, and private responses in the last decades.

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[84] World Animal Protection (WAP) is an international non-governmental organization working to end animal suffering around the world. WAP—known as the World Society for the Protection of Animals before 2014 —was born in 1981 out of the merger of the World Federation for the Protection of Animals and the International Society for the Prevention of Cruelty to Animals. As such it has been active for over 30 years but through its founding organizations it has a legacy of over 60 years of work. The Animal Protection Index was used to rank 50 countries in the world against 15 different indicators. All western European countries were assessed except for Portugal, Ireland, Belgium, Norway, and Greece. Countries ranked at the top (i.e., score A within a scale of A to G) were the UK, Switzerland, Austria, and New Zealand.

One of the key actors in the animal welfare movement in the UK is the Royal Society for the Prevention of Cruelty to Animals (RSPCA). The society was founded in 1824 with the specific aim of ensuring compliance to the above-mentioned 1822 law and improve the treatment of cattle and other farmed animals (Garner, 1999). Their role has not been only of an active voice in the debate but they have also put forward responses to contribute to the development of the market for animal welfare friendly food products. Other early organizations in the movement focused on animal cruelty within research and experimentation. The National Anti-Vivisection Society (NAVS), founded in 1875, was the first organization campaigning against animal experiments in the world, and more specifically against the practice of operating on live animals (NAVS, 2016). NAVS was followed by the British Union for the Abolition of Vivisection, known now as Cruelty Free International, which was founded in 1898 in Bristol (CFI, 2016). Following that, over a dozen other national organizations were established in the early decades of the 1900s. After that active period of articulating and building the animal protection debate in the early 1900s, the movement became somewhat less effervescent and it was until the 1960s that it revived (Garner, 1993).

Animal Machines, the book by Ruth Harrison published in 1964, was a red flare, a distress signal in an otherwise quiet debate about the life of animals in intensive housing operations (what then became commonly known as factory farming). Harrison's book detailed not only the precarious circumstances under which calves, pigs, and chickens were kept but also about the unreflective use of antibiotics, growth stimulants, and tranquilizers in the industry. The book was highly influential; it resulted in the commission of an investigation by the Ministry of Agriculture (Cottrell Free, 2000). The appointed committee for this task was chaired by F.W. Rogers Brambell, who was head of the department of Zoology at the University College of North Wales (now Bangor University). Prof. Brambell was joined by other eight members: two scientists on animal behavior and animal husbandry; three civil servants for the veterinary and agricultural advisory services; a member from the Royal Agricultural Society of England, which is an independent charity dedicated to the improvement of agriculture through the application of science and technology; an undersecretary from the Ministry of Agriculture, Fisheries, and Food; and a radio personality with a medical background who was knighted for her political and public service (Brambell et al., 1965; Hartley, 2013).

The report produced by the Brambell Committee had major consequences in both public and policy debates. The first was that *welfare* was defined as not only the physical but also mental wellbeing of animals. Secondly, the committee argued that measuring animal welfare called for multidisciplinary scientific approaches so the assessment of the animals' feelings as reflected by their behavior and functions could be accounted for. Also, the role of the stockman's care and experience was deemed of key importance. Another aspect that was emphasized was the long-term effect of the environment and treatment of animals. This referred to the exposure to situations that might be judged to be tolerable or even acceptable for animals in the short term but might create continuous stress or discomfort if the exposure is prolonged. Most fundamentally in the report the notion that an animal's productivity was a reliable indicator of its welfare was rejected for being undeveloped and incomplete. Four years after *Animal Machines* was published, the Brambell report led to the enactment of the Agriculture (Miscellaneous Provisions) Act of 1968. It did not only create a regulatory framework to govern animal husbandry but also effectively inserted the term *welfare* in British legislation about animal protection (Radford, 2004; Veissier et al., 2008). It was also in the late 1960s that Peter Roberts, a dairy farmer in Hampshire, founded Compassion in World Farming (CIWF) out of his concerns about the ways in which post-war farming was developing (CIWF, 2016). Compassion in World Farming is another influential non-governmental organization in the animal welfare field in the UK and increasingly in the European and international arenas (e.g., CIWF played a key role in the banning of the veal crate in 1987 in the UK and in the implementation of the ban at the European level, which was agreed in 1996 and fully enforced in 2007) (McKenna, 2001).[85]

Since those legislative building blocks of the late 1960s, the protection of animal welfare from farm to market or slaughter has continued to be regulated by both national and EU laws.[86] First, another direct result of the work done by the Brambell Committee was the formation of the Farm Animal Welfare Committee (FAWC) in 1979, which at the time included some common membership as it was formed as the Brambell Committee was ceasing to function (FAWC, 2009a). The Farm Animal Welfare Committee (FAWC) is an expert body advisor to the Department for Environment, Food, and Rural Affairs (DEFRA). It has carried the legacy of the Brambell Committee by reporting on the status of animal welfare and further legislative changes that might be required. The FAWC committee is currently comprised of a group of university fellows in the agricultural, veterinary, and food fields, animal farmers, veterinary surgeons, an animal welfare organization, and an organization working on promoting standards in the use of land and the built environment (FAWC, 2016).[87] In 1979, the FAWC outlined the Five Freedoms as part of their

[85] Veal crates are narrow stations made usually out of wood or barred surfaces. There veal calves have little to no visual or tactile contact with other animals, and the space does not allow for natural movement (e.g., turning around, grooming, and comfortably adopting a sleeping position) (McKenna, 2001).

[86] At the time of writing the decision of the United Kingdom to withdraw from the European Union (Brexit) had been taken but regulatory frameworks based on EU law in the UK continue to apply until otherwise specified.

[87] Members at the time of writing (2016): Peter Jinman, Chair, past President, Royal College of Veterinary Surgeons; Professor Henry Buller, Chair, Rural Geography and Director of the BA Human Geography Program, University of Exeter; Professor Richard Moody, fellow of the Institute for Food Science and Technology; Dr. Joanne Conington, Livestock Geneticist, Scotland's Rural College; Dr. Maria Carmen

first assessment of welfare codes and published a refined version in 1993. The Five Freedoms consist of: the freedom from hunger and thirst, by ready access to water and a diet to maintain health and vigor; freedom from discomfort, by providing an appropriate environment; freedom from pain, injury and disease, by prevention or rapid diagnosis and treatment; freedom to express normal behavior, by providing sufficient space, proper facilities and appropriate company of the animal's own kind; and freedom from fear and distress, by ensuring conditions and treatment, which avoid mental suffering. These guidelines have significantly influenced the legal and normative framework around animal farming (FAWC, 2009b).

Another key piece of legislation, which was introduced after several critical animal welfare and food scandals, is the Animal Welfare Act of 2006. It was introduced to consolidate and reinforce animal health and welfare legislation. The Act outlines the basic welfare requirements that need to be fulfilled and places the legal responsibility of this task on animal owners (i.e., the enactment of animal cruelty or failure to secure the welfare of animals has legal consequences such as fines or even prison). The Welfare of Farmed Animals Regulations 2007, which fall under the Act, provide further detail on the implementation of EU directives as well as specific required standards (DEFRA, 2007). In addition, the UK government provides codes of practice with the aim to help farmers understand the meaning of EU and national animal welfare laws as well as the practical and operational requirements to comply with these regulations (DEFRA & APHA, 2013); amongst these codes is the code of recommendations for the welfare of cattle (DEFRA, 2003).

The guiding principles on animal welfare continue to evolve. In 2009, the FAWC proposed to move beyond the Five Freedoms, as "the Five Freedoms themselves concentrate on suffering and needs. This focus reinforces the negative image of farming and food production" (FAWC, 2009, p.2). The new framework for assessing and supporting animal welfare revolves around quality of life. This is defined across three life states: a life not worth living, in which case the animal's life needs to be quickly enhanced through treatment or if not possible, humanely ended; a life worth living, which entails good husbandry, thoughtful handling and transport, as well as humane slaughtering practices; and a good life, which is defined as a life where the animal's welfare is substantially higher than the legal requirements. This is related to best practices in terms of strict health control through the highest standards of

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Hubbard, agricultural economist; Dr. David Grumett, Chancellor's Fellow in Christian Ethics and Practical Theology, University of Edinburgh; Dr. Andy Butterworth, Senior Lecturer, Bristol University Veterinary School; Steve Wotton, Senior Lecturer, University of Bristol's School of Veterinary Sciences; Richard Cooper, veterinary surgeon; Richard Jennison, veterinary surgeon; Mark White, veterinary surgeon; Gwyn Jones, dairy farmer, former Vice President of NFU; Martin Barker, pig farmer; Richard Kempsey, poultry farmer; Professor Michael Appleby, Chief Scientific Adviser, World Animal Protection; and Mike Elliott, Fellow, Royal Institution of Chartered Surveyors (FAWC, 2016).

veterinary care and low prevalence of sickness, display of normal animal behavior, and opportunities for comfort, pleasure, interest, and confidence (FAWC, 2009b).

As mentioned within the previous regulatory account there were two critical events that have had a wide impact on the contemporary public and policy debate and responses on animal welfare, not exclusively but especially in the UK. In the early 1990s the bovine spongiform encephalopathy (BSE) epidemic reached its most critical point in the country. The total number of reported cases of this terminal neurodegenerative disease—commonly referred to as mad cow disease—reached 185,000 (OIE, 2016). The second event to make a significant dent in animal welfare history was the foot and mouth outbreak in 2001. Britain was the most affected and official records point to over six million animals culled, of which over 700,000 were cattle; some estimate that up to four million additional young animals could have been killed but not reported (DEFRA, 2004). The impact of the epidemic was wide in scope; there were obvious economic consequences for farmers, rural communities, and other actors in the food chain. In rural communities, the outbreak generated a sense of deep distress and a generalized distrust in authorities and systems of control (Mort et al., 2005). Through the extensive media coverage of the outbreak, details of the impacts of the epidemic (e.g., details on the slaughtering of cattle, burning pyres, and the anguish suffered from farmers) reached much wider audiences, having a strong impact on the public debate (Baxter & Bowen, 2004).

Most recently, in 2013 the horsemeat scandal triggered questions and concerns about the safety, provenance, and processing of food products. Although this was not an animal welfare scandal per se and horsemeat is not unsafe for human consumption, the evidence of undeclared horsemeat as well as traces of pork DNA found in beef products sold at several UK retailers highlighted issues of trust and control across and increasingly long supply chains. It also prompted supranational coordination as the situation involved actors in other Member States (DEFRA, 2013).

Outside of the legislative frame, the most significant non-governmental response with regards to animal welfare came from the Royal Society for the Prevention of Cruelty to Animals (RSPCA). In 1994, RSPCA launched the Freedom Food scheme based on the Five Freedoms. Freedom Food was created amongst other things to restore consumer confidence and, as a higher welfare farm assurance scheme and food label, it continues to be the only scheme in the UK to be dedicated to the animal welfare of farmed animals. Recently renamed as RSPCA Assured, the scheme covers beef cattle, dairy cows, veal calves, chickens, egg laying hens, turkeys, salmon, and trout (RSPCA, 2015). A similar tool to RSPCA Assured is the Beter Leven scheme, which was introduced in 2007 by a Dutch animal welfare organization (this scheme was introduced in chapter four). According to DEFRA statistics, the sales of ethical products have increased steadily in the last ten years; in 2014 this category—which includes Freedom Foods—amounted to £8.5 billion or 4% of total consumer expenditure on food, drink, and catering (DEFRA, 2016a). Finally, a 20-year independent review of the RSPCA scheme concluded that it has played a significant role in driving up related standards, codes of practice, and legal frameworks in the UK and abroad (Pickett et al., 2014).

When it comes to industry responses, we have seen some animal welfare indicators being included within the requirements of several of the retailers' direct dairy farm supplier groups. Additionally, other platforms bring together a diverse range of actors from across and beyond the food supply chain. The Cattle Health and Welfare Group (CHAWG) funded by the Agriculture and Horticulture Development Boards for Dairy, Cattle and Lamb gathers important industry organizations, (farming) representative bodies, and government representation in a forum to discuss animal health and welfare.[88] This group emerged after the 2009 report where the FAWC provided its assessment on the welfare of the dairy cows (CHAWG, 2010). Their remit is to discuss, "encourage, and coordinate a programme of economically focused improvements to cattle health and welfare across Britain" (AHDB Beef & Lamb, 2016). The Dairy Cow Welfare Strategy document, which emphasizes the connection between animal welfare and productivity and profitability, has been put forward and revised annually since 2010. Their 2015 strategy report highlights some of the achievements made in the last years such as achieving a 90% Red Tractor farm assurance rate (the Red Tractor scheme will be described below). The strategy also describes new priorities like the shift to prevention rather than treatment and control approach to mastitis, increased attention to health and welfare of calf and heifer, as well as ensuring cow comfort which refers to the expression of natural cow behaviors (CHAWG, 2015).

As we can see, animal welfare is an important theme within the public food and farming debate in the UK. The work of NGOs, journalists, as well as active citizens has raised awareness about, and has strongly contested, factory farming. The regulatory framework reflects a clear opposition to animal cruelty and unnecessary suffering by identifying and prosecuting these practices; it also identifies compulsory minimum welfare requirements. In addition, market-based responses work to drive higher animal welfare standards in order to enhance welfare conditions across farming systems. And while the UK is in fact ahead of most other countries in the world, there are still issues to be addressed and consumers are largely unaware of them.

[88] Full list of CHAWG members: Animal Health Distributors Association, Animal Health & Welfare Board of England, Animal and Plant Health Agency, British Cattle Veterinary Association, AHDB Dairy, DairyUK, Defra, AHDB Beef & Lamb, Holstein UK/CIS, Livestock Auctioneers Association, National Beef Association, National Farmers Union, NFU Scotland, National Milk Records Group, National Office of Animal Health, Red Tractor Scheme Beef, Red Tractor Scheme Dairy, Royal Association of British Dairy Farmers, Royal Society for the Prevention of Cruelty to Animals, Scottish Government, University of Nottingham School of Veterinary Science and the Welsh Government.

For a nation of so-called animal lovers, people are remarkably ignorant about how their food is produced and where it comes from. (FM6)

Although blunt, this chasm might prove useful to characterize the current status of the public engagement in the animal welfare debate. An expert in the field describes the issues related to animal welfare in dairy farming:

Sometimes there is a real problem and the consumer does not know. The problem is not a pretend problem in the dairy industry; it is a real problem. There are a lot of lame cows, a lot of cows that are living shorter periods of time, a lot of mastitis, a lot of infertility. It is a major issue and anybody who tells you differently is kidding themselves. So it is not that every farm is bad but there are a lot of issues. (FM4)

The discussion about animal welfare within dairy farming, however, is mostly focused on two interrelated issues: zero-grazing and mega dairies. Outside of these specific forms of farming, the consumer is typically unaware of the problems that some cows experience at the farm. The way NGOs frame and present their campaigns is said to be highly influential.

[These issues are] not front and in the face of the consumer right now and the question is, why? Interestingly enough things that are in the face of consumers are things that people put in the press for various reasons. So the NGOs put them in the press, people like [celebrity chef] Jamie Oliver, and there is a big European campaign now around dairy [. . .] the big two focus are: no mega dairies and getting cows outside. I think the campaign will mature [because] these are the wrong drivers. Let's ask the right questions. When you ask, do you have birds in cages? And the answer is yes, then the pressure is to get them out of the cages. If you say to somebody, do you have your cows outside? It insinuates that if you don't, then the welfare of the cow or your whole system is bad, and it's not! We can give cows a good life, you know? Cows like to be outside but not all the time and not under any circumstances. So we are asking the wrong questions. (FM4)

The expression of this specific focus against mega dairies and zero-grazing systems is visible in the active public opposition of projects of this kind.

A farming company applied to put a unit of 8,000 cows in Lincolnshire. It got a huge amount of publicity. The farming company didn't approach it very well [. . .]. The consumer picked it up really negatively. So they did themselves a lot of disservice. Eventually a number of pressure groups and lobby groups got involved and the company withdrew the

> *plan application. That happened in the last two years or so. So the large intensive system has had a lot of scrutiny from the consumer. In North Wales there is a farm that asked to the planning commission for a 1,000 house unit, and they got the same pressure, so the lobby groups moved from the 8,000 cow to the 1,000 cow. [. . .] It's interesting because there are 1,000-cow herds in the UK but they have grown organically and slowly [. . .] some of them are grass based, so it's not about the size of the unit or the number of cows is more about getting them indoors, that is the issue. (FM11)*

The case this interviewee is referring to is the application made by Nocton Dairies for an 8,100-cow dairy operation at Nocton Heath in Lincolnshire in 2010. This case gained national attention and sparked debates about the future of dairy and the medium-sized farm enterprise (Levitt, 2010). Compassion in World Farming together with local and national organizations raised awareness about the environmental and animal welfare implications of such a development and campaigned against the approval of the application. The plan was then downscaled to a 3,700-cow dairy operation. After a year of debate Nocton Dairies withdrew the 3,700-cow plan. The reason cited by the farm company for this was that there were serious objections by the Environment Agency. The withdrawal was followed by a statement from the North Kesteven District Council that clarified the council's plans to reject the petition based on six environmental concerns (CIWF, 2011). Although a victory for those concerned about the implications of such a large dairy operation, the rejection based entirely on environmental objections does signal that zero-grazing systems are not viewed as inherently damaging for animal welfare.

Evidence for the public opposition of mega dairies is strong. British consumers have a negative perception of zero-grazing, not only because of the adverse animal welfare implications that are associated with that system, but also because dairy cows are part of the cultural landscape in various regions in the UK (Reed, 2012).

> *The areas where one would go on vacations like Devon and the south of Wales, those are also areas where cows are outside and it is beautiful. People like to see that. (FM11)*

While there is appreciation for that element of the traditional rural landscape, the topic of grazing is not particularly or widely debated in the UK, at least not as explicitly as it was observed in the Netherlands. The British public assumes grazing is practiced on the average dairy farming system and in consequence does not hold a negative perception about animal welfare in average farms.

> *There is no incentive [for grazing] because that is just the typical way in which milk is produced here and processors are not requiring it. Also from*

the consumer side and product differentiation, there is no pull because dairy farming is not perceived to be intensive enough. (FM1)

Indeed, traditional grass-based dairy farming makes up for the majority of dairy farming operations in the UK. However, this does not imply that grazing makes for the entirety of the herd's diet. As mentioned earlier there has been a reduction in the use of forage and a corresponding increase of other bought-in feed to boost the diet of high-yielding cows (Leip et al., 2010), as well as a small yet growing trend in zero-farming (Donnellan & Hennessy, 2015a).[89] Zero-grazing systems are those where cows are housed indoors throughout the year or for most of it. This decision can be driven by the wish to control the cow's diet, increase milk production and efficiency, increase herd size without increasing land, etc. (Haskell et al., 2006; Meul et al., 2012). What is the precise extent of this trend? There are no official statistics on the number of intensive indoor dairy farms. In the last few years, news articles have been reporting on the growing number of these types of farming operations (Henley, 2014; Wasley, 2015a). The most recent data comes from the 2016 World Animal Protection (WAP) report where, based on the study of planning applications for dairy farms submitted to every local planning authority in the UK, they were able to confirm 100 intensive indoor dairy farms and suspect of the existence of an additional 43. Based on these numbers a sober estimate would mean that 10% of the national herd is farmed under such systems (WAP, 2016a).

Despite the fact that intensive indoor housing is not the norm and the more common piecemeal approach to growth and intensification of housing makes some of these farm operations less visible to the public, there is an emergent free-range milk movement in the UK. Neil Darwent, a British dairy farmer, started the Free Range Dairy Initiative to promote pasture based dairy farming in 2011. This was in direct response to the debate about the 8,100-cow plan application and based on his growing concerns about the intensification of dairy. In 2014 the initiative became a community interest company: the Free Range Dairy Network.[90] Similar to the Weidegang logo in the Netherlands, the Pasture Promise label was launched to allow members of the network as well as consumers to identify free-range milk

[89] When it comes to the reduction of forage, it is hard to provide average figures given the diversity of farming systems. None of the following sources claims generalizability. Still, I include these data to illustrate and contrast actual farm practices against the general public perception of full grazing systems. Leip and coauthors (2010) estimate that 50% of the cow's diet is based on forage (i.e., no distinction made between grazed and bought in forage) while figures included in AHDB Dairy's farm data for October 2016 point to a much lower percentage of around 30% of total yield from forage and only 16% for grazed forage (AHDB Dairy, 2016g).

[90] A community interest company (CIC), introduced in the UK in 2005, is the legal form for a special type of limited company, which instead of serving the interests of private shareholders it exists to fulfill a community purpose. It is a form of social enterprise (UK Government, 2016).

products. Pasture Promise standards are independently verified and include a minimum grazing period of 180 full days (i.e., day and night) (Free Range Dairy, 2016a,2016b). The initiative is at an initial stage and the Milk with the Pasture Promise logo can be found only in some cities and farm shops across the UK.

From the data it can be argued that animal welfare is a key component of the public debate around animal farming. There is a legacy for a strong societal awareness and rejection of animal cruelty and suffering. Similar to the Netherlands and Ireland, the average dairy farm is not perceived to be intensive enough to be considered a threat the animal welfare of cows; the main issues of concern for the British public are the permanent housing of cows and the development of mega dairies, which are usually interrelated.

Environmental impacts of dairying

Another piece of the sustainability puzzle for dairy is the impact of its production on the environment. I will introduce the main lines within this debate as well as the principal regulatory and private responses that have emerged in relation to it.

In the UK, the debate about the environmental impact of agriculture emerged as evidence of the effects of intensive post-war agricultural practices on water quality accumulated through the 1970s and the mid-1980s (Domburg et al., 1998). This is perhaps unsurprising since during this period the use of inorganic nitrogen grew 135% in the UK. Some examples of agricultural water pollution were the high levels of nitrate observed in groundwater and river samples in eastern and southern England, indication of herbicides in both ground and surface waters across the country, as well as general water pollution from the overflow of cattle and pig slurry in western areas of the UK (Scheierling, 1995, 1996).

As a member of the EU, the legislative response to the environmental impacts of agriculture in the UK has been largely determined by the development of EU policy on the subject. As described in the Dutch case study EU water policy was incrementally developed through the 1970s and 1980s. The Nitrates Directive—which was passed in 1991 and was later integrated as a key part of the EU Water Framework Directive of 2000—is said to have the most influence in nitrogen leaching in agricultural activities including dairy (European Commission, 2016i; Oenema, et al., 2011 in: Velthof, et al., 2014). The directive was designed with the aim to reduce and prevent water pollution from agricultural sources. Member states are required to identify bodies of surface, fresh, and ground water that are affected by nitrates or are at risk of becoming polluted (i.e., in which the level of nitrates could be more than 50 mg/l). They are also compelled to designate nitrate vulnerable zones (NVZs) which are areas of land that are likely to contribute to nitrate levels above the threshold of 50 mg per liter. Under this directive, Members States are expected to establish a code of good agricultural practice for farmers to implement on a voluntary basis, as well as mandatory action programs to be carried out on NVZs—or across the whole territory if countries were to choose that. Finally, the directive calls for periodic monitoring and reporting every four years (European Commission, 2016k; Velthof et al., 2014). The implementation of the directive had a slow start in many countries but it eventually took off with member states requiring farmers to keep mineral accounting records and pay levies in case the allowed levels were exceeded (Scheierling, 1996). Some member states, such as Germany, Denmark, Luxembourg, Austria, Finland, the Netherlands and Ireland decided to apply action programs throughout their whole territory (Monteny, 2001; Velthof et al., 2014). In the UK several areas were designated as nitrate vulnerable zones and the directive together with the Control of Pollution Act became the most influential in regulating the impact of dairy on water and the general environment (Thomas & Bax, 1995).

The environmental impacts of dairying continued to become visible and by the early 1990s the public debate in the UK called for animal farming systems that addressed issues of pollution (i.e., not only water, but also air and land), concerns connected to the use of non-renewable resources such as fossil fuels, as well as the negative trend in landscape and biodiversity loss (Whittemore, 1995). In parallel to the evolution of the public debate, several environmental measures were developed at the EU and national levels. I will provide a brief overview.

Regarding EU regulations, the gradual process of incorporating environmental initiatives into the Common Agricultural Policy started in the early 1990s. This process has taken place through various reforms and can be characterized as the shift from price support measures towards direct payments for farmers that were expected to relieve some of the pressures from agricultural production on the environment (Matthews, 2013).[91] At the national level, the Environmental Sensitive Areas (ESAs) scheme was set up in 1987 by the then ministry of agriculture, fisheries, and food of the UK. The scheme was introduced in response to the shift from traditional farming practices that preserved the landscape towards more intensive ones. Within the scope of this voluntary scheme, farmers were rewarded for agricultural practices that protect and conserve rural landscapes with distinctive wildlife or historic relevance. A few years later, in 1991, the Countryside Stewardship Scheme was introduced to ensure that habitats located in the periphery of farming zones were also conserved (Lobley & Potter, 1998). In 2005, both of these schemes—which jointly had generated agreements with over 30,000 farmers—were replaced by the Environmental Stewardship Scheme (ESS). The ESS aimed to promote management practices that delivered environmental and preservation benefits. The ESS was designed to go beyond the Single Payment Scheme (a direct payment uncoupled from production

[91] The reforms through which the process of integrating environmental objectives into the CAP has materialized are the 1992 MacSharry reform, Agenda 2000, the Mid-term Review in 2003, the 2008 Health Check, and the 2013 CAP reform (European Commission, 2016d; Matthews, 2013).

to support farmers' incomes) and had three levels of involvement: entry level, organic entry level (under both, participation was granted on a non-competitive basis), and higher level stewardship (regionally targeted and competitive) (DEFRA, 2005; European Commission, 2009). Finally, in 2014 DEFRA announced that the ESS would be replaced by the Countryside Stewardship Scheme (CSS). The new scheme is more targeted than previous schemes—that is, there is a stronger focus on biodiversity and access to participation into the mid- and higher level schemes is based on a competitive selection process (Natural England, 2015).[92] The previous environmental schemes aimed to maximize coverage through fairly easy entry-level requirements; initial forecasts argue that the move to more focused—even if less geographically expansive—schemes are likely to deliver better habitat diversity and biodiversity than the former entry-level schemes (Hardman et al., 2016). While it is too early to fully assess the impact of the Countryside Stewardship Scheme, what can be seen is the incremental institutionalization of environmentally sensitive schemes to promote less intensive farming practices and curb the negative impacts of farming in the UK.

Another thread of the environmental debate that gained importance in the last decade is that of climate change. In the UK, the issue gained momentum—not exclusively but in part—with several developments: the release of Al Gore's 2006 documentary *An Inconvenient Truth*, which detailed the phenomenon of anthropocentric global warming (Daniels & Endfield, 2009); the publication in 2007 of the *Stern Review on the Economics of Climate Change*, which argued that early action on climate change outweighs the economic costs of inaction (Stern, 2007); the production of the Intergovernmental Panel on Climate Change (IPCC) fourth assessment report also in 2007, and the award of the Nobel Peace Prize to Al Gore and the IPCC that same year for their efforts to expand the understanding on climate change and raise awareness about the phenomenon (IPCC, 2015). In fact, before 2006 the issue of climate change had little prominence in the UK; political and public attention was intermittent and low. It was during 2006 that climate change became a highly politicized and public concern and involvement rose in an unprecedented way; a key driver behind igniting political action is argued to have been the Big Ask campaign from the environmental NGO Friends of the Earth (Carter & Jacobs, 2014). In 2005, Friends of the Earth launched a campaign calling for a climate change bill with statutory carbon dioxide emission reduction targets of 3% yearly until 2050—that is, a total emissions reduction of 80% from 1990 levels. The campaign, which featured renowned celebrities, was backed by a coalition of more than 100 NGOs. After enrolling the support of then leader of the conservative party David Cameron and over 400 members of parliament, the government announced in November of 2006 that a climate change law would be introduced (Friends of the Earth, 2008). Two years later in November 2008 the Climate Change Act was passed by the British

[92] No entry level is available under this program.

parliament. This law was the world's first in setting legally binding targets and was seen as ground-breaking (Lockwood, 2013).

Attention was also drawn to the links between agriculture and climate change. Agriculture accounts for 10% of the total UK's GHG emissions and half of those emissions are methane from the digestion process of ruminant animals and manure management; 41% of emissions are from nitrogen fertilizer used in both arable and grasslands; and the remainder 9% corresponds to emissions from the use of agricultural machinery (CCC, 2014). As one of the building blocks of the Climate Change Act target of an overall 80% decrease on 1990 emission levels by 2050, agriculture is expected to deliver a reduction of 11% on 2008 GHG emission levels by 2020 (AHDB Dairy, 2014). This does represent a challenge as the downward trend in agricultural emissions between 1990 and 2008—said to have been mainly driven by the reduction in livestock numbers—has since stabilized (CCC, 2014). The contribution of livestock systems to global warming was also subject of attention. As introduced in chapter one, several reports of international scope (e.g., *Livestock's Long Shadow* by Steinfield and coauthors 2006 and *Tackling Climate Change Through Livestock* by Gerber and colleagues 2013) highlighted the significant contribution of livestock systems to greenhouse gas (GHG) emissions. In the UK, an LCA-based study revealed that the food system as a whole contributes around 18% of the country's GHG emissions and within that, meat and dairy products are the biggest contributors (Garnett, 2009). An interviewee describes the increasing attention to the issue of emissions from animal farming as well as some of the actions it triggered within the food and dairy industry:

> *The pressure from NGOs interested in agriculture and livestock in particular has grown over the last 10 years and it really peaked around 2008, 2009. There was a lot of focus on livestock with the report [Livestock's] Long Shadow and that was probably a catalyst for the dairy industry to pay attention and start to do something. Around that time would've been the time when retailers and certainly processors started investing a lot of time and money into carbon foot printing and trying to quantify what their carbon footprint was and where it was coming from. [We were] trying to answer some of the challenges we were getting from NGO's. Around 2007 and 2008 that would've been the turning point. (FM12)*

The dairy division of the Agriculture and Horticulture Development Board (AHDB) carried out a three-year study to assess the carbon footprint of milk up to the farm gate, which represents 80% of the total footprint. Two of the main outcomes of the study were the absence of any relation between carbon footprint and farming system. Rather the study shows the carbon footprint of milk as a function of management practices and level of performance. Secondly, the assessment shows the breakdown of the total GHG emissions by gas type and source. According to the study methane accounted for 46%, followed by 36% of carbon dioxide and 18% of nitrous oxide. The key sources were similar to those identified for agriculture in general—namely, enteric emissions, manure management, fertilizers, as well as feed production (AHDB Dairy, 2014). On the latest climate action progress report, the authors described that national emissions are under the permitted budgets. They noted, however, that the reduction since 2012 has been driven almost exclusively by cuts in the power sector. This is argued to be untenable and more is expected from other sectors such as agriculture and industry (CCC, 2016). For dairy, the emission related targets are encompassed in the Dairy Roadmap, an industry-wide platform that I will introduce in more detail in the next section.

We will see that as a result of voluntary as well as legally binding environmental regulations, environmental issues about dairy production have been integrated into industry initiatives. Before I discuss these initiatives, it is interesting to note that while public concern about climate change was palpable and a key driver in setting legally binding targets for the country during the last decade, the awareness of the specific contribution of livestock and dairy systems to total GHG emissions amongst consumers is rather low (Bailey et al., 2014). This awareness gap was also discussed by one of the interviewees as he reported the views of an industry stakeholder:

> *He told me, "I will get a lot more good publicity if I save some fluffy calves than if I reduce my carbon footprint." Consumers are far more bothered by animal welfare than about sustainability issues really, despite that fact that in dairy the two are inherently linked. (FM12)*

In the preceding paragraphs I have described the development of the public and policy debate on some of the environmental impacts of dairy production. As it has been explained, the evolution of a regulatory framework has co-evolved around the debate. Below I will introduce two of the main integrated responses to these public debates. These initiatives incorporate a range of societal and policy concerns about the impacts of dairy production. These are the Red Tractor Scheme and the Dairy Roadmap.

Additional responses: food assurance schemes and sustainability programs

Two relevant additional responses to concerns about the negative impacts of dairy systems are food (quality and safety) assurance schemes and sustainability programs. I will first discuss food assurance schemes and later I will walk you through industry-led sustainability programs. Food assurance schemes work mostly on a voluntary basis but compliance is often indicated by food businesses as a requisite for their suppliers. The UK government monitors the veracity of claims made by assurance schemes through their Food Standards Agency (FSA), and while DEFRA is not responsible for any of the specific rules of the schemes—as these are private programs—it does encourage farmers to participate in order to support consumer trust, as well as safeguard market position (UK Government, 2012).

The leading food assurance scheme in the UK—Red Tractor Assurance—has an extensive coverage of almost all farming sectors (i.e., there are standards for beef, lamb, dairy, pigs, poultry, and crops), as well as supply chain standards (i.e., for transport, processing, storage, etc.) (Assured Food Standards, 2016d). Dairy Red Tractor members represent 95% of the total milk production in the UK (Assured Food Standards, 2015). What is the background to the emergence of this scheme? The food scandals of the 1990s in conjunction with the growing concern over the welfare of animals and the protection of the environment drove consumer demand for food products that are fully traceable, and whose characteristics and attributes are documented and verifiable (Bredahl et al., 2001). In addition, under the 1990 Food Safety Act's due diligence clause, retailers and other actors in the food chain were required to ensure the safety of the foods they were selling—with consumer protection as their core objective.[93]

The need to both comply with regulation and protect consumer trust stimulated the development of quality and food safety certification schemes in the UK (Richards et al., 2011). Various generic assurance schemes were developed by the industry in the 1990s; these were mostly targeted at the farm and processing stage of animal products (Bredahl, 2001).[94] The traditional focus has been on food safety, traceability, and public health; additional dimensions (i.e., beyond the law) related to animal welfare and environmental impacts have been integrated later and to varying degrees (Lewis et al., 2008). For dairy, the National Dairy Farm Assurance Scheme (NDFAS) was developed by the National Farmers' Union, the United Kingdom Federation of Milk Producer Organizations, the Dairy Industry Federation, and the British Cattle Veterinary Association. The scheme was launched

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[93] The Food Safety Act was the implementation of the 1989 EU Official Control of Foodstuffs Directive. After 2002 the General Food Law Regulation and European Hygiene regulations have replaced previous directives. The emphasis of these directives is on the monitoring of relevant food safety indicators across the food chain to ensure public safety and health. In the UK the compliance to the Food Hygiene Regulations of 2006 is the task of the Food Standards Agency (Bailey & Garforth, 2014).

[94] Here I make reference to the farm assurance schemes: Scotch Quality Beef and Lamb Assurance (SQBLA) developed in 1990, Scottish Pig Industry Initiative (SPII) of 1990, Northern Ireland Farm Quality Assurance (NIFQAS) of 1991, Farm Assured British Beef and Lamb (FABBL) of 1992, Farm Assured Welsh Lamb (FAWL) of 1992, Farm Assured British Pigs (FABPIGS) of 1996, Northern Ireland Pig Assurance Scheme (NIPAS) of 1999, and the National Dairy Farm Assurance Scheme of 1999. And the processing schemes: Guild of Scottish Quality Meat Suppliers (GSQMS) of 1988, Scottish Pork Industry Initiative (SPII) of 1991, and the British Quality Assured Pork (BQAP) (Bredahl et al., 2001).

in September 1999 (FAWC, 2001; NA, 1999).[95] The elaboration and introduction of the NDFAS was not necessarily trouble-free. The scheme was negotiated for four years and once released some farmers still had concerns about the added paper work of participation, as well as the effect that introducing higher standards for British products would create if lower quality food would still be imported (Curtis, 1999). Similar concerns resonated across other farm sectors (Duffy & Fearne, 2009; FAWC, 2001). Despite some contestation and given the context of food scandals of the 1990s, membership of these assurance schemes rose steeply to the point of becoming practically a compulsory requirement for farmers in order to gain market access (Bredahl et al., 2001).

Retailers also developed their own assurance schemes as an opportunity for generating a differentiated advantage against competitors. Therefore, their own independently verified assurance schemes go beyond the minimum regulatory requirements (Duffy & Fearne, 2009). Similarly, in 2000 several producer assurance schemes, including the dairy scheme, converged under the British Farm Standard. The standard was visually communicated through one consumer facing logo—a red tractor. This became its colloquial name and later its official one. Nesting previously separate assurance schemes under one with a recognizable logo was done to help consumers easily identify food products produced in the UK that adhere to certain quality standards for food safety, hygiene, animal welfare, and the environment (Lewis et al., 2008). The scheme has since been run by Assured Food Standards (AFS), which is a not-for-profit organization created in 2000 for this purpose and owned by the food industry (i.e., National Farmers' Union, Dairy UK, Ulster Farmers' Union, the Agriculture and Horticulture Development Board, British Retail Consortium, NFU Scotland and the Food and Drink Federation) (Assured Food Standards, 2013).[96] In 2005, the Red Tractor logo was redesigned to include the national flag; Richards and coauthors (2011) argue that "the subtext of this, as suggested by the Union Flag on the logo, is a flavor of 'buy British' protectionism offering a two-fold reassurance to shoppers: certified quality assurance coupled with a 'British is best' message"(Richards, et al., p. 37). The basic premise of the scheme is that farmers pay an annual fee to receive the assessment and certification from one of the certification bodies that manage the Red Tractor schemes and carry out the respective assessments.[97] In cases of no-compliance farmers need to solve and demonstrate their operations are up to standards in order to sell their products under the Red Tractor Assured logo (Assured Food Standards, 2016c).

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[95] The scheme was later named Assured Dairy Farms and after that, Red Tractor Farm Assurance Dairy.

[96] These organizations also act as company guarantors.

[97] There are: SAI Global, NSF-CMI, Northern Ireland Food Chain Certification, Acoura, and Quality Welsh Food Certification (Assured Food Standards, 2016a).

Red Tractor standards are reviewed every three years. In October, 2016 a consultation process was launched in order to gather farmers' views for the 2017–2020 standards (Assured Food Standards, 2016e). Some of the changes proposed for the Red Tractor Farm Assurance Dairy scheme included amongst others, keeping complete records of antibiotic use, an annual vet review of antibiotic use, carcasses management and storage that minimizes biosecurity risks and is out of public sight, reduced use of harmful chemicals in cleaning products, and additional measures to ensure sufficient colostrum intake by new born calves (Assured Food Standards, 2016b). Red Tractor Scheme standards incorporate all current regulation; as a result, certified farmers are performing according to the law. Some studies have pointed out, however, that the scheme works mostly as a baseline rather than an ambitious driver for further change in farming practices. For example, in 2005, the Sustainable Development Commission (SDC) requested an assessment of the Red Tractor Schemes against the main objectives for sustainable food and farming as defined by the SDC.[98] The conclusion was that in general the scheme corresponded to the minimum regulatory requirements and was able to deliver on food safety, basic animal welfare, and environmental benefits—albeit the latter to a lower degree. The scheme was characterized as having a robust and effective inspection approach but the authors of the report found that the Red Tractor standards were set at a level "well below those that the UK Sustainable Development Commission would argue are necessary in sustainable food production" (Levett-Therivel Consultants, 2005, p. 5) The Red Tractor Farm Assurance Dairy scheme in particular was deemed as being mostly about hygiene and basic animal welfare with no attention to its role in the traditional cultural landscape (Levett-Therivel Consultants, 2005).[99] In 2010, Lewis and coauthors (2010) published a study on the degree to which farm assurance schemes conformed and supported agri-environmental policy goals (i.e., air and water quality, water resources, soil health, climate change, biodiversity, and resource management). They argue that such an assessment is crucial given the UK's strong inclination—that is, relatively high compared to other countries—to minimize regulation and encourage voluntary standards to be adopted by the industry. Their assessment for the Red Tractor Farm Assurance Dairy scheme—using a low-medium-high scale—was low on all policy goal areas. Finally, in 2012, the animal welfare NGO Compassion in World Farming conducted an analysis to evaluate the welfare standards of the major farm assurances schemes. The Red Tractor Farm Assurance Dairy scheme was ranked last amongst the dairy schemes assessed (i.e. in order according to the study results these were the Soil Association, RSPCA Freedom

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98 The Sustainable Development Commission (SDC) is the UK Government's independent adviser on sustainable development (SDC, 2016).

99 The authors detailed that the schemes—dairy included¬¬–did not include key dimension of sustainable food systems such as viable livelihoods, rural economy and culture, environmental improvements, health and nutritional considerations, as well as accurate information about food and its local embeddedness (Levett-Therivel Consultants, 2005).

Food, and Scottish Organic Producers Association schemes) (CIWF, 2012). In sum, it can be argued that the Red Tractor schemes, as leaders with the most coverage in farm assurance in the UK, are able to ensure that farming practices are aligned to regulatory objectives through a robust and trustworthy system. Red Tractor schemes are however assessed to be less ambitious—in relation to other schemes and when assessed against integrated sustainable goals.

Another industry-led initiative addressing concerns about the negative impacts of dairy has been the development of the Dairy Roadmap under the coordination of Dairy UK. Dairy UK is the trade association that represents the British dairy supply chain. Its members include dairy processors, dairy co-operatives, farmers, and bottled milk buyers. Together, Dairy UK members collect and process around 85% of total national milk (Dairy UK, 2016a). The Dairy Roadmap is the medium through which the UK dairy industry has articulated its commitment to reduce the environmental footprint of dairy since 2008 (Dairy UK, 2015b).

The Dairy Roadmap—originally Milk Roadmap—was initiated by DEFRA in 2007 as part of their sustainable products approach. Within the scope of this approach, DEFRA developed ten product roadmaps based on a three-step formula: development of a vision, assessment of the product's environmental impact, and design of an improvement strategy to address them and deliver increasingly more sustainable products. Milk was one of the products chosen within the food and drink sector (DEFRA, 2008).[100] The roadmap for milk was developed by the sustainable consumption and production taskforce of the Dairy Supply Chain Forum (DSCF) and under the facilitation of Dairy UK.[101] The Milk Roadmap 2008 listed environmental commitments of farmers, processors, and retailers for 2010, 2015, and 2020 (DSCF, 2008).

Reports reviewing progress have been produced in 2009, 2011, and 2015.[102] The 2010 and 2015 targets for farmers covered areas such as water efficiency, active nutrient planning, implementation of manure management plans as well as farm

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[100] This work was led by the then newly formed Products and Materials unit within DEFRA, which in turn was established as part of the commitments agreed under the 2007 Waste Strategy for England. While the focus of the product roadmap is to improve the environmental performance of products, social and economic aspects were taken into account on the preparatory impact assessment of milk (see DEFRA report by Foster, et al. (2007), The Environmental, Social and Economic Impacts Associated with Liquid Milk Consumption in the UK and its Production).

[101] Taskforce members included, Dairy UK, Dairy Co (now AHDB Dairy), the Royal Association of British Dairy Farmers (RABDF), NFU, Tenant Farmers Association (TFA), DEFRA, Asda, Tesco, Sainsbury's, the Country Land and Business Association (CLA), Agricultural Industries Confederation (AIC), the Consumers' Food Group (CFG), WRAP, and Nampak Plastics (DSCF, 2008).

[102] Since 2011 the scope was broadened and the Milk Roadmap was rebranded as the Dairy Roadmap.

health plans, increased share of dairy land subscribed to Environmental Stewardship Schemes, use of renewable energy, reduction of serious pollution accidents on farm, support for AHDB Dairy in their research of new technologies, implementation of emission reduction developments. Targets for dairy processors across time horizons focus on the increased efficiency of water and energy use, the reduction of carbon emissions, waste to landfill, and damaging discharges, the increase in the use of recycled materials in packaging, as well as the development and implementation of a biodiversity plan (Dairy UK, 2013b; DSCF, 2008). The process of generating the sustainability agenda and specific targets is argued to follow the evolution of government priorities as well as regulation. In the last few years the scope of what falls under the sustainability agenda for the sector has broadened beyond a strong focus on energy and carbon to include water and biodiversity.

> *As with many other food and drink sectors what would've started the sustainability agenda would've been regulation from government. Certainly on the processing the first thing that people would consider was reduction of energy [. . .]. Up until 2010 there was a big focus on energy and carbon and in the last few years we have started to look further into other issues. Water is coming up very fast. We are looking to start drawing a biodiversity code of practice so we have certainly broaden our perspective as to what counts as sustainability. But it's only been during the last 4 years that there has been a focus just beyond the bottom line. (FM12)*

When discussing the future of the sustainability agenda for the dairy industry, specifically in relation to the targets set for the Dairy Roadmap, it was argued some themes such as energy would continue to be a priority. And new areas of focus will be included, although at a very slow pace. Biodiversity is said to be difficult to incorporate into the industry's targets as the link to profitability is harder to establish and the business mindset is set to a shorter time span.

> *The biggest thing will continue to be energy because after you've bought your milk and you've paid your staff, energy is the biggest cost and thus it's what affects your margins the most. Water is going to be a far greater cost in the future so that will certainly gain attention, not as much as carbon, but it's on the way. Regarding biodiversity, you are probably looking at 5 to 10 years behind everything else. It's going to be a long way before it hits the general attention level because the connection between that and profits. In the long term they are very easy to see, but in the short term when the business plan is two years at most five years ahead, then it's difficult to get that link [. . .]. Beyond that, there is not really anything else on the agenda; I suppose you can relate biodiversity to this idea of ecosystem services that could bring everything into one umbrella but still*

we don't know where we are going with that, it's a very long-term view. (FM12)

In 2015 the Dairy Roadmap highlighted the following changes at the farm and processing levels against the 2008 baseline:

- 69% of farmland is managed under Environmental Stewardship Schemes (2015 target was 65%).
- Nutrient management plans are implemented by 77% of dairy holdings (2015 target was set at 90%).
- 78% of farmers have implemented water efficiency methods (the 2008 target of 5 to 15% reduction in water usage per liter of milk was reformulated in 2011 to 5 to 15% uptake of water use efficiency measures. Later in 2013 it was articulated as 70% uptake by 2015).
- Dairy processors achieved a 15% reduction in relative water consumption (target was set at 20%).
- 74% of liquid milk cartons are produced with Forest Stewardship Council certified fibers (2015 target was 80%).
- Factory waste to landfill has been reduced from 32 to 4% since 2008 (target was set at zero).
- Dairy UK developed a biodiversity strategy for dairy processing sites.

(Dairy UK, 2011,2013b,2015a; DSCF, 2008).

On the 2015 Dairy Roadmap report, goals for 2020 and 2025 were included and in some cases updated. These targets continue to focus on resource efficiency and recyclability, as well as reduction of waste and GHG emissions. Implementing actions to enhance biodiversity by 2025 is included as a target for farmers. Targets for processors in the coming years show emphasis on the same areas: resource efficiency, increased use of recyclable and responsibly sourced materials, and reduction of wasted and GHG emissions. In addition, 2025 targets for processors include the observable increase of biodiversity in production sites, and the development of sustainability training programs with the aim to incorporate sustainability into company cultures (Dairy UK, 2015a).

Since its inception, the Dairy Roadmap has incorporated retailers into the sector commitments. For the 2013 Dairy Roadmap report the target setting dynamic changed. Instead of having targets for retailers, what is now included in the report is a statement where they publicly voice their support for the aims of the roadmap (FM12). Some statements include specific actions they are undertaking through their dairy sourcing parameters, which reflects the increasing integration of retailers and dairy farmers through the dedicated supplier groups. However, the information about retailers' specific actions is not described at length on the last reports.[103] Three themes—carbon foot printing measures, farmer workshops on efficiency and environmental issues, and improving biodiversity on farms—are listed as an overarching introduction to the retailers' individual statements in the 2015 Dairy Roadmap. This is not a sign of lack of action from retailers; rather, it reflects the complexity of setting general retailer targets that are relevant to dairy (FM12).

Dairy UK also takes part in specific programs that support the achievement of its industry wide targets. Within their environment and sustainability portfolio, Dairy UK developed the Environmental Benchmarking tool (launched in 2009), which allows dairy companies to monitor their environmental performance (i.e., energy, water, waste, and packaging) and compare—anonymously—against others in the sector (Dairy UK, 2011). Other initiatives target the responsible use of antibiotics in agriculture, food safety, and animal health. More recently in March 2016, Dairy UK formed a partnership with WRAP (The Waste and Resources Action Program) and signed to the Courtauld Commitment 2015. This ten-year voluntary program aims to reduce the resources needed for food and drink production in the UK by 20% (i.e., reduction in waste, GHG, and water use)—goals that are aligned to the Dairy Roadmap (Dairy UK, 2016b).

First Milk

Sustainability programs are also articulated at the processing level. Before I present the First Milk case in detail, it is perhaps useful to briefly outline what some of the leading processors are doing under the sustainability umbrella. Arla Foods and Müller Milk and Ingredients are the top dairy processors in the UK. What can we find under their sustainable dairy programs? The sustainable dairy farming strategy of Arla Foods UK contains four focus areas: reduction of the carbon footprint of milk (i.e., 30% of 1990's levels by 2020), continuous improvement of animal welfare, increasing resource efficiency—namely, water, energy, and feed—and reduction of waste, as well as promotion of biodiversity (Arla Foods, 2016b). In operational terms, Arla UK rolled out Arlagården in October 2015. Arlagården is Arla's farm assurance scheme already in operation in Denmark, Sweden, Germany, Belgium, and Luxembourg. Arla's scheme was customized for the UK in order to ensure complementarity to the Red Tractor Assurance standards. Standards of both schemes are integrated in order to assess farmers on both Red Tractor as well as Arlagården's additional ones at the

[103] For the Dairy Roadmap report of 2013 a dedicated website was created (www.dairyroadmap.com). On it, a section on retailers' commitments offered a short description of the related initiatives each involved retailer was undertaking, as well as links to their respective websites where additional information was available (Dairy UK, 2013a). That website is no longer available and the 2015 Dairy Roadmap report did include the development of a similar dedicated website or any additional links to the related information on retailers' actions.

same time (Arla Foods, 2016a). The main additional requirement from Arlagården is on the responsible use of antibiotics—that is, for curative rather than preventive purposes (Durkin, 2015). For Müller Milk, efficiency appears to be the cornerstone of their sustainability work, as evidenced by this quote from their website: "Efficiency is hugely important to us [. . .]. Quite simply, we can operate a more sustainable business by constantly finding ways to use less scare resources like energy, water and plastics. For us, an efficient business is a sustainable business" (retrieved 2016). Further, from the section 'Being Sustainable' on the Müller UK's website, the environment emerges as the main focus of how they articulate sustainability (Müller UK, 2015a). Müller's environmental policy statement specifies the alignment of their environmental strategy to the Dairy Roadmap and lists goals related to resource efficiency, reduction of waste, assessing the environmental impact of their products across the supply chain, and raising awareness about environmental responsibility amongst employees (Kers, 2015). Müller Milk relies on compliance to Red Tractor standards for quality assurance of its member farms (Müller UK, 2015b). It can be observed that both Müller Milk and Ingredients and Arla's sustainability approach is aligned to industry standards. Arla's additional standards appear to be more ambitious, especially in terms of responsible use of antibiotics.

After having reviewed the main industry-led sustainability schemes and standards I will introduce First Milk (FM) as well as the development of their sustainability program. Earlier in this chapter I introduced how First Milk was formed out of the merger of Axis Milk—one of the offspring of Milk Marque—and Scottish Milk in 2001. First Milk is the only major dairy co-operative with 100% British ownership. Their membership in 2016 was around 1,300 farmers (Co-operatives UK, 2016). The co-operative produces cheddar and regional cheese, dairy ingredients (e.g., whey proteins), and fresh milk in four production sites: Torrylinn Creamery and Campbeltown Creamery in Scotland, The Lake District Creamery in the North West of England, and Haverfordwest Creamery in Wales. Their head office is located in Glasgow (First Milk, 2016f, 2016g). It is important to note that First Milk has made significant changes since 2013—when interviews were conducted for this study. During these last few years it has downsized considerably. I will include the main changes and events within First Milk along the description of the development and evolution of their sustainability engagement, which is the main focus of this research.

Sustainability program

Similar to what we saw in the other case studies, several initiatives that relate to the sustainability of the business predated the articulation of First Milk's sustainability strategy and commitments. I will present the development of their policy chronologically.

> *It goes back to 2006 when we started something called First Milk Academy and First Milk Academy was predominantly there to help our members*

> *with professional development. We recognized that dairy farmers, they may go to college or university, there may be some formal or informal training when they are young, but most of them don't do much about on-going career development. (FM2)*

This development scheme offered farmers two paths of continuous learning. First, the Academy Business Clubs; this format provided the forum for clubs (i.e., farmer groups) to share best practices with the facilitation and expertise of DairyCo—now the Agriculture and Horticulture Development Board for Dairy. The second path focused on the professional development of farmers. For these workshops First Milk partnered with the Royal Agricultural College, Kingshay Farming Trust, and Scottish Agricultural Colleges to offer academically accredited modules on herd fertility, lameness prevention, good environmental and agricultural practice, as well as business management (First Milk, 2008). A small fee for participation was required from farmers (£80 for 4 one-day workshops) to increase commitment. First Milk received funds from the Higher Education Funding Council for England (HEFCE) to cover around 40% of the development and delivery costs (FM2). First Milk's development scheme was offered between 2006 and 2011 and it is estimated that around 40% of farmers—around 2,500 in total at the time—where involved (First Milk, 2008; SAOS, 2011).

Another initiative to support First Milk members was to create a partnership between First Milk Direct—the purchasing arm of the co-operative—and the Anglia Farmers buying group in 2010. As a result, First Milk farmers have access to farm inputs (e.g., fertilizer, feed, farm machinery, animal health products, insurance, phones, and computers) sourced more competitively because of the larger scale negotiation strength (Farmers Weekly, 2010).

Another line of the sustainability trajectory for First Milk is their supply partnership to Nestlé. First milk has supplied to Nestlé's Girvan site since 2010 and to its Dalston factory since 2014. Part of this supply relationship has been the development of a sustainable supply program *The Milk Plan* through which around 60 First Milk farmers have worked on practices such as reduction of emissions, water use, animal health, increased use of forage, and developing action plans for diversity of farms, etc. (First Milk, 2014c). This process is argued to have been a learning experience for the co-operative and as we will see later there is alignment between this program and First Milk's own sustainability strategy.

> *We have learnt from that process about how to deliver a really good supply chain initiative where farmers link in with the local factory and that local factory—being owned by Nestlé—has global sustainability objectives which we then tap into and help the farmers to deliver. (FM2)*

Articulating a program: why and how

In 2011, when top management at First Milk decided to look at their sustainability related efforts they realized that until then their work had been quite ad hoc. There were several initiatives but all happening somewhat in isolation—outside of an overarching strategy (FM2). All internal interviewees identified the then Chief Executive Officer as the key driving force behind the efforts to outline a sustainability strategy for the business.[104]

> *A lot of what we are doing is being led by the top; I don't think that without [the CEO] we would have gotten the traction that the program has gotten. [The CEO] has driven it! (FM11)*

> *[The CEO] drove and has been driving people very cleverly into understanding that sustainability is the right thing to do [. . .]. I've seen [the CEO] bringing the sustainability agenda to the business—transforming the way people buy into sustainability and want to move towards it. (FM5)*

Interviewees argued that the internal motivation and conviction of the CEO about developing a sustainability strategy resonated with the executive team for its potential to create a relevant market advantage.

> *The whole piece around sustainability within First Milk was established a little bit because one or two people, in particular our chief executive. And [the CEO] has a real interest in this but then everyone in the executive team latched on to it quite quickly because there is very much a commercial rationale to it as well. Both in terms of our customer base and how it sells into the wider market, and equally in terms of the production side of it. (FM6)*

When looking at the reasoning behind the decision to develop a sustainability strategy, three central points emerged from the data. First, the economic benefit behind ethical and environmentally beneficial practices across different stages of the business (e.g., reduction of feed costs, improvement of cow health, and reduction of resource use and waste), which can deliver cost savings, a profitable market advantage, as well as a more secure supply into the future (FM8). Second, the recognition that engagement with sustainability issues is increasingly becoming part of the new business as usual.

> *Sustainability is going to become more and more part of the way that people do business. It wouldn't surprise me if to be a footsie [FTSE 100*

[104] The CEO the interviewees make reference to throughout the chapter stepped into the role in 2010 and left it (and the co-operative) in 2015.

> *index] company you had to have a sustainability agenda. It'll be part with dealing with the big retailers that have all these sustainably policies. You have to have accreditation. (FM5)*

Finally, the third point that was raised is the acknowledgment that dairy processors have a degree of influence in how dairy is produced. This is actually included on First Milk's sustainability report, "As a farmer-owned co-operative, we are *best placed to influence industry and individual* [emphasis added]. Our good practice actioned and communicated is infectious; it generates support in action and understanding"(First Milk, 2012c, p. 20). Additionally, external interviewees (i.e., external to First Milk yet involved in the dairy sector) argue that processors have a key role to play given the influence they have on farming and production practices and their position to connect to and satisfy market expectations (FM10).

For the purpose of developing a sustainability strategy, First Milk hired the Food Animal Initiative (FAI), a sustainability consultancy firm with active involvement in farming. They operate 7 km^2 of Oxford University farmland in which they manage a 120-cow suckler herd amongst other livestock (FAI, 2016a). FAI applied their 3Es framework of economic, environmental and ethical sustainability for the development of a program for First Milk. The 3Es approach guides the design of sustainability policies to drive economically viable, environmentally sound, and ethically acceptable practices across the areas of influence of the business (FAI, 2016b).

> *It's a relatively new process in the food industry I would say, because we define sustainability in a very particular way, which is under the 3Es. Everybody looks at economics, everybody looks at environment, and then most people define the other pillar in terms of social and animals are left out. Of course, if you are in the food industry, even if it's vegetables and fruits, there are massive impacts on animals. Our whole framework is about engaging in the animal issues as well as the others. That would be the biggest difference between what we do and what others do, and of course is very relevant to food. (FM4)*

During the 12-month development process, FAI carried out a mapping of existing sustainability-related actions within First Milk, surveyed programs from major dairy companies, engaged with stakeholders such as NGOs to identify their aspirations for the dairy industry, as well as costumers and consumers to better understand their interests and needs (FM11). FAI's stakeholder and business analysis was cross-referenced against a scientific review, which also served to inform the process with potential implementation paths for the program (FM, 2012).

The development process culminated with the publishing of First Milk's *First Things First* sustainability report in October of 2012. In that report, First Milk details the five program areas included in the overall strategy, as well as their respective objectives and relevant actions. The five programs as identified in the report are:

› Feed for the Future - sustainable rations
› Cow and Calf - long lived healthiest cows producing viable calves
› Wheels, Yields and Deals - efficient logistics and rewarding farmers for sustainable practices
› Reduce, Renew, Recycle - moving to all renewable energy
› Food for the Future - zero waste dairy company

(First Milk, 2012c, p.28)

In the report, the authors expand on each of the programs, including a list of sustainability issues to which the specific program area contributes. The complete list of sustainability issues is included as Table 6.2.

Table 6.2 List of sustainability issues included in First Milk's Sustainability Program

Ethics	Environment	Economy
Worker welfare	GHG emissions	Herd performance
Calf health and welfare	Soil quality	Profitability
Cow health and welfare	Waste	Capital reinvestment
Food safety	Biodiversity	Energy efficiency
	Land use	Labor costs
	Water use	

(First Milk, 2012c)

Before describing in more detail the five programs, one of the arguments given for the scope of the strategy is based on the recognition that farming practices make for the largest share of the negative impact for dairying; therefore, focusing on the impacts at farm level—while difficult due to the fact that farmers are a disparate group—is described as crucial for an ambitious sustainability program (FM2).

While all five programs are underpinned by the 3Es—economics, environment, and ethics—interviewees emphasize the weight that the economic impact has when assessing sustainability initiatives (FM8, FM11).

> *Because off the low profitability of dairy in the UK we first start with economics because if you don't have a business you can't possibly be sustainable in the other factors either. So everything we do, everything*

we introduce, [we think:] Will it benefit [farmers] economically? Will it help efficiency, margins? Before we can actually launch that initiative. (FM2)

Program areas

What is included in each of these five program areas? Feed for the Future is the first and several interviewees pointed to the relevance of this program area in connection to its potential economic impact on the farm (FM2, FM6, FM8). First Milk's commitment for 2020 is to ensure that the majority of milk production comes from forage and locally grown feed; "that needs to go from 30% of today to 50 or 55% by 2020. But we would actually want to take that further" (FM2). As part of that, the co-operative aims to drive the improvement of feed conversion efficiency from sustainable feed sources, as well as nutrient and waste management at farm level. According to the report this program impacts on several issues: calf and cow health and welfare, GHG emissions, soil quality, waste, biodiversity, land and water use, as well as herd performance and profitability (First Milk, 2012c).

The second program area is Cow and Calf. The 2020 commitment for this program is to ensure cows are at their healthiest and produce viable calves. First Milk seeks to accomplish this by promoting excellence in fertility and nutrition, by reducing the use of antibiotics, preventing lameness, mastitis and infectious diseases, and by designing an integrated solution for bull calves—that is, calves that are born into, but will not stay in the dairy herd. This is especially relevant if the longevity of cows is prolonged and there are more lactations (First Milk, 2012c; FM2)

Wheels, Yields, and Deals is the third program area. Its aim towards 2020 is increasing the efficiency with which all transport operations are carried out, as well as creating rewards for farmers that drive sustainable practices. This translates into incentivizing the production of higher fat and protein milk in order to create market opportunities for higher added value products such as cheese (First Milk, 2012c). While price schemes based on fat and protein are the norm in many countries (e.g. the Netherlands), for the UK—a market traditionally focused on liquid milk—the introduction of such a price scheme is quite novel (FM8).

The next program area is Reduce, Renew, Recycle and has as core target for 2020 a complete move to renewable energy. Also included are objectives to reduce water use on farm and factory, reach zero process and packaging waste to landfill, and reduce energy use while decreasing the share of fossil fuels (First Milk, 2012c).

Finally, Food for the Future is the last program through which First Milk aspires to be a zero waste dairy company by 2020. This means a commitment to the maximum utilization of milk (adding as much value as possible to their product portfolio), contributing to sustainable and healthy diets, as well as reducing food waste at home through improved product packaging. All objectives call for a careful balance, for example between increasing packaging and reducing food waste, satisfying consumer demand for traditional products while introducing new ones such as whey protein, a product previously seen as waste or animal feedstuff at best (First Milk, 2012c; FM2).

How were these program areas implemented? Before going into that, it is interesting to remember that sustainability-related initiatives were underway before First Milk officially published its sustainability program. Earlier examples were the First Milk Academy and First Milk Direct. There are other examples which chronologically speaking happened before the actual release date of the report (i.e., October 2012), yet are likely to have emerged as part of the overall strategic sustainability thinking process. With regards to animal welfare concerns, in 2010 First Milk established a partnership with ScotBeef in order to provide farmers with a market outlet for their bull calves. Through this initiative, the calves are reared for the beef market as opposed to lost shortly after birth (First Milk, 2014b). Another important development was the entrance of First Milk into the added value whey market. First Milk formed a strategic joint venture with New Zealand dairy giant Fonterra in September of 2011. The co-operative started to produce whey protein for Fonterra's functional nutrition products in Europe. In this way, it was able to add value to its whey stream—a byproduct of cheese production (First Milk, 2011). First Milk moved further into the whey market by acquiring the sports nutrition company CNP Professional in May of 2012. This move was made following growth forecasts for functional whey based dairy products and in line with their strategy to maximize the value of all components of milk and increase returns for farmer members (First Milk, 2012b). In early 2012, First Milk Energy was established with the goal of generating renewable energy, especially from wind, for manufacturing sites. Through the scheme, farmers can rent part of their land for a wind turbine to be installed (at no cost for them) and supply energy to the co-operative manufacturing sites (First Milk, 2012a). These examples can be seen as the operationalization of a business strategy that was increasingly responding to future viability issues (renewability of resources, waste reduction, profitability of dairy, etc.) and then fully articulated through the language of sustainability.

Implementation approach

The general implementation principle for First Milk's sustainability strategy within the co-operative management was to place the leadership of each of the program areas in a member of the operations board or one of the senior managers. Then five thematic working groups were set up to manage and deliver against the 2020 targets as well as intermediate objectives. The groups were cross-functional—namely, they included members from different departments. This is explained in First Milk's sustainability report as follows: "We deliberately chose not to have a sustainability team to lead this work, but rather we spread responsibility and accountability to ensure that it's an integral part of everyone's day job"(First Milk, 2012c, p. 29). In addition, there is a sustainability steering group, chaired by a non-executive director; the members include the CEO and directors from across the business functions (e.g., manufacturing, membership and strategy, communications, etc.). The steering group meets bi-monthly to review and discuss performance against the objectives of each program area as well as the input the five working groups might have decided to feed into the process (First Milk, 2014b). This is also reflected in the fact that the role of sustainability manager was gradually embedded into other functions such as communications. During fieldwork, the head of communications of First Milk was still carrying out some of the work related to sustainability:

> *I think in due course it will become more communication orientated, more corporate orientated, because our strategy as a business is to make sure sustainability is embedded across the departments and not to leave it with one, two, three individuals. (FM2)*

The implementation of First Milk's sustainability strategy materialized for farmers in several ways. Farmer involvement is voluntary; the incentive for engagement is the prospect of increased profitability and market access to specific supply agreements with customers or retailers that require compliance to certain sustainability criteria (FM4). Taking from the First Academy structure, the co-operative created farmer working groups (FM2). Each group works toward two-year targets based on a measurement of the groups' initial status with regards to that specific program area (FM11). After releasing their sustainability strategy and report, there were eight farmer groups. The groups worked on issues such as milk from forage, animal health and welfare, mastitis, fertility, diseases, water soils, water pollution, and nutrient use. The groups consist on average of 12 farmers meeting about six times per year. Within each group, two farmers work on a fast track and play a demo role for the rest of the members of the group. These farmers receive one-on-one advice from experts and implement pertinent changes, then they can share results with their working group or a larger audience of fellow First Milk farmers (FM2). An interviewee described that farmer working groups allowed for a more productive arrangement.

> *We are using [farmers'] expertise to guide the program rather than imposing our expertise onto them, which they appreciate. [. . .] Farmers learn from farmers so you need to have your innovators learning from your consultants. Then have farmers visit those farms to see how they do things and so on. You can't put a PowerPoint in front of a farmer and preach. You will lose them that way. Also, it's important to choose your facilitators; the wrong facilitator can also be bad for the process. (FM11)*

The degree of involvement ranges across members. Besides those farmers involved with the sustainability working groups, other forms of engagement include participating in business clubs—that is, farmer groups—run by AHDB

Dairy approximately three times per year, or attending First Milk open days which feature farmers showcasing a specific farm management practice. In 2013 when the memberships of First Milk was around 1,800 farmers, the share of farmers involved with sustainability in any of the aforementioned ways was calculated to be 40%. In addition, a quarterly newsletter is produced to update members on sustainability efforts, case studies, and achievement of targets. Finally, during the co-operative bi-annual members forum—which takes shape in a series of events across the country—an update on the sustainability strategy is provided to those in attendance (FM2).

Interviewees discussed what they perceived to be the most significant challenges of the sustainability program's implementation a year after its release. All interviewees mentioned that the biggest challenge was to drive farmer engagement.

> *When it's about the bits that First Milk directly controls like the transport of the milk into the cheese processing, you can move faster. Those are still challenging but you can move faster because it's less people. When you move out and you have 2,000 farmers that supply into First Milk, they are all individuals, even if they are a co-operative. [. . .] That is the biggest challenge, how do we galvanize [farmers]? (FM4)*

Interviewees described the economic rationale as playing a fundamental role in engaging farmers. In turn, they identified the need for clear communication as well as the strategic incentive design as accompanying challenges.

> *It's been a harder sell for the farmers because they think we are telling them how to farm and technically I suppose we are but it's trying to coach in a new way and it's not like that. [. . .] You have to be crystal clear in explaining it in terms of 'what's in it for me.' If you do it from that perspective you find that they'll buy into it. In other words, you have to put the right incentive in place and the farmers will then follow the incentive as opposed to follow the sustainability ethos. The fact that is sustainability isn't quite why they do it—one or two, don't get me wrong—but it's very much the economics. It's like one farmer said to me, 'I'm likely to die of starvation because I can't afford to buy food faster than I'm likely to be roasted from a warming climate,' so that is the starkness of it. [. . .] It's trying to get around that in a way so people can truly see what's in it for them. (FM6)*

> *It's a snowball thing you just have to prove the financial benefit and then hopefully it will keep growing. (FM8)*

Throughout this chapter, we have seen that given the economic context in which the British dairy sector has operated, especially in the last decade, the need to identify, communicate, and deliver on the short and mid-term economic benefits of any sustainability strategy is paramount for farmers and all involved actors.

In terms of implementation and results, First Milk conducted a review of their sustainability work during 2013 and released a report in early 2014. Some of the results highlighted in that report indicate progress made in all program areas.

- Under Feed for the Future, there were four working groups on milk from forage. Participating farmers were able to increase the share of milk from forage to almost 50% (compared to 30%) and increase the quality of milk. These results are based on the experience of 40 farmers, which means that the generalizability is low. Still the participation after the first run of the program increased to 100 farmers.
- The Cow and Calf working groups showed interesting results. More than 90% of farmers working on the mastitis group made it to the top cell count category, compared to 30% at the beginning of the period. In terms of a viable solution for bull calves, through the scheme established in 2010 it was reported that more than 7,000 calves had been directed to the beef sector.
- During the period under review, First Milk made revisions to its haulage scheme and made logistical arrangements with other companies to reduce the amount of transport needed for their operations. Also within the Wheels, Yields, and Deals work area First Milk was the first UK dairy to roll out (in October 2012) a solids price scheme to farmers near one of its production sites. As discussed earlier, this incentivizes farmers to focus on protein and fat as opposed to volume which in turn reduces the amount of milk used for cheese production. The price scheme was later also implemented for farmers near production sites in Wales and Scotland.
- Under the Reduce, Renew, Recycle program area, results included the switch from traditional boilers to clean-burn gas technology at the Lake District Creamery which reduced its carbon footprint by 35%. Water use was reduced by half at First Milk production site in Wales by introducing membrane technology which allows the recovery of water from milk during cheese production. Finally, the goal of zero process waste to landfill was achieved.
- Within the Food for the Future work stream, First Milk implemented three actions. First, it launched a quark product. Quark is a type of low-fat curd cheese that offers consumers a way to reduce their fat consumption. Secondly, it launched two fresh milk drinks made with natural quality ingredients (as opposed to artificial flavorings). The package allows these drinks to be frozen, which increases shelf life. Third, additional investments were made to allow whey production to happen at a second creamery (i.e., additional to the one producing for Fonterra) where it was previously handled as waste.

(First Milk, 2014b)

An interesting point to discuss is the effect that the sustainability strategy appears to have on the organization, its members, and the general operation of the business in the larger context of the dairy sector. I asked interviewees to describe the impact of having articulated and rolled out a sustainability strategy. Some illustrated through examples such as those in the progress report but most talked about the impact in terms of shared processes, development of credentials, and practices.

> *I suppose the most important way is that you have measured progress and you are able to prove what you have achieved to then go ahead and do more on some areas and less of on others. So when you have a fairly ad hoc process there is no sharing of success, but actually as importantly, there is no sharing of mistakes either. Because we have the work stream leaders coming together each quarter, I think we are able to keep focus, because it's easy to have a short-term approach and be totally wide with the targets. But if we keep the narrow targets and keep it to the five work streams, we know we will deliver what we said by 2020. And there might be things that we won't be delivering and we will have to recognize that and evaluate continuously whether or not they are relevant. [. . .] We have our five work streams, we are collecting the data, and those five work streams were put together in recognition of what our stakeholders told us when we started the process. The reason why we employ people like FAI is obviously to make us aware of new challenges and new pressures that we need to think about, but day-to-day we have to focus in what we set out to do. So that's the big benefit I think. (FM2)*

Others echoed this interviewee in mentioning the fact that establishing a process and creating a path of documented improvement is a big impact of having articulated a sustainability strategy. It has the potential to formalize linkages across the business, clarify overarching goals, and provide an additional frame to assess general performance (FM4).

The market impact as well as the general effect it has towards some of the stakeholders that the co-operative deals with was also discussed.

> *[It is] a very commercial and very focused program that distinguishes us as a business. [. . .] When we go out there we have a very strong sustainability program that stands behind you and gives you some power in the market place. (FM6)*

> *It shows that you are out there and it puts the issues in the public domain fairly and squarely. That is what I like about the whole process. It allows people to talk about this more openly and with confidence about the things that they are trying to improve. Whereas the old way of doing it*

was to not talk about it at all because we know we are not doing it, and we don't want to talk about it because it's bad for our business. (FM4)

For some, the work that is now embedded under the sustainability program areas was already engrained in the business and therefore the impact of having rolled out the sustainability strategy and targets is more difficult to identify.

To be honest a lot of the work that we do with Food for the Future has been engrained in the business as part of the job and not an added extra. [. . .] We have naturally focused towards the products and the developments that would match into the sustainability targets. So how do you improve the nutrition at the consumer end? How do you provide them with the product that is better in terms of shelf life and reduces waste on the consumer side without causing issues back in the rest of the supply chain? We started to develop those kinds of products anyway, so I find it difficult but I've actually ended up doing it the other way around. So we have carried on doing a lot of the innovation work and then I have stopped and gone, 'What do I need to capture to say that that actually is part of the sustainability plans?' rather than sustainability actually driving the decisions. [. . .] We set the strategic direction right and it will tick all the boxes on sustainability anyway, that has been the focus. The only side where we would put a specific direction on sustainability is going to be around some of the packaging. How do we reduce the waste from the packaging using recyclable products? Etc. But again, it's a sustainability target but it also is an economic target because if you can reduce the amount of materials and we buy recycled, that is often cheaper anyway. (FM7)

The impacts mentioned here are those that were identified in the short and mid term. The sustainability review report came out in March of 2014; by then the British dairy sector had entered a very critical period of continuous decrease in milk prices, a downward trend that continued well into the first half of 2016 (AHDB Dairy, 2016i). This price development was already discussed earlier; what I will describe next are the related events and changes within First Milk during these last few years.

Recent development at First Milk

As it has been described earlier, prior to 2014, the British sector had undergone challenging circumstances. The unusual weather of 2012 had a severe negative impact at farm level; the extremely wet summer affected cow performance and operation costs. During the second half of 2012 year, First Milk decided to support farmers by paying a milk price that was not entirely aligned to the market, causing financial pressure (First Milk, 2013). Although throughout 2013 market conditions improved and with them the milk price for member farmers—peaking at £32.50

pence per liter in December that year—increased volatility and milk production across the sector started to materialize (First Milk, 2014a). The situation in 2014 reached a critical point. First Milk's financial results were significantly affected by the rapid decline in market values. The reduction in the value of dairy products happened rapidly, which meant that milk prices being paid—which at the time could not be changed as quickly—were not in line with market returns. In addition, milk production significantly increased, which led to more milk being processed into products for which revenue was uncertain. Finally, there were other unexpected events that affected the stability of the business, such as the breakdown of the whey-processing unit, a performance of First Milk's nutrition company CNP that was below expectations, and the writing-off of a loan for First Milk Energy (First Milk, 2015a).

The co-operative designed an intervention plan and took several measures, amongst which were an increase in farmers' contributions to the business, and a two-week payment deferral in January of 2015. The decision for the deferral was explained as a measure to alleviate cash flow problems and improve the financial position of the co-operative. This created significant financial strain for farmers, some of which expressed feeling anxious about the future of the co-operative (Astley, 2015; BBC News, 2015b).

The circumstances in 2015 continued to be challenging; this was the first year without EU production quotas, which increased uncertainty and volatility. Tangibly milk prices declined further as global supply continued to increase outpacing demand (ZuivelNL, 2016). However, First Milk saw the results of its intervention plan, which led to a better financial performance compared to the previous year—namely, a net loss of £5 million for 2015 against £28 million net loss the year prior. The plan included a series of modifications in governance; several changes were made in the top management of the co-operative including a new CEO (in March 2015). The goal of a new governance structure—which was approved by members—was to create a more commercially focused organization. "This new governance structure gives members a stronger voice via the new Council and a more commercially focused Board. [. . .] Our new Chairman, whose commercial skills and experience will complement those brought in via the appointment of [the new CEO], [the new COO], and [the new non-executive director]." (First Milk, 2015b). The changes also mean a reduction of farmer representation on the board (from five to two) and the substitution of the 13-strong Area Representatives with a seven-member council (AHDB Dairy, 2016f). Additionally, some of the operational measures resulting from the intervention plan were the divestment from several business units as well as selling off the CNP nutritional food business—which was finalized in October of

2016 (Dean, 2016; First Milk, 2016b). In 2012 First Milk operated in eight processing and packaging sites across the UK compared to its current four (First Milk, 2012d).[105]

The average milk price in the UK continued to decrease until the summer of 2016, when it started to gradually recover (AHDB Dairy, 2016i). Within First Milk, this was also the case and the first price increases were announced for July (First Milk, 2016e). These were followed by several increases throughout the year amounting to 8 pence per liter and an increase of 2 ppl in January 2017 (First Milk, 2016a,2016c). A review of performance until September of 2016 revealed good financial results argued to have resulted from the transformation of First Milk into a more focused business (First Milk, 2016h).

There has not been another sustainability review report since the first one published in March of 2014. It would be imprecise to assume that First Milk's work on the different sustainability program areas has therefore stopped. There have been some developments connected to their sustainability ambitions. First Milk and Tesco confirmed a long-term cheese supply contract in April of 2016 as part of the new Tesco Cheese Group (TCG). The TCG builds on the work done through the Tesco Sustainable Dairy Group (TSDG) and ensures a price that reflects market conditions while including a bonus to reward farmers for the work of complying to the Red Tractor standards, as well as some additional animal welfare requirements that are exclusive to Tesco's groups (First Milk, 2016d). In addition, First Milk's supply relationship with Nestlé has continued. In 2015 the co-operative was awarded the 'creating shared value' recognition by Nestlé for its work on their joint sustainable supply chain relationship. In early 2016 and as part of their joint sustainability work, Nestlé and First Milk launched the Next Generation Dairy Leaders Programme. The two-year program will allow a small group of farmers to attend educational events about topics ranging from dairy industry politics, the dairy sector globally, farm and financial management, amongst others. The program will also provide tools on effective communication (Nestlé, 2016). Another development aligned to First Milk's energy goals is the setting up of an anaerobic digester at one of First Milk's processing sites—also one of the largest creameries in the UK. The digester will convert whey residue and other waste in to bio-methane, which will in turn supply with energy not only the site but the national grid. This development makes First Milk's production unit the first dairy processing site to supply into the national energy grid in Europe (NA, 2016c).

In this last section First Milk's trajectory articulating a sustainability framework and report has been described. I have presented the work areas in which First Milk

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[105] The fours sites from which First Milk divested between 2012 and 2016 are: Maelor packaging facility, CNP Professional, Glenfied Dairy processing soft cheeses, and Westbury Dairies which processed milk into skimmed milk powder, cream and butter.

has focused its sustainability work, as well as the most recent developments within the co-operative. The context in which British dairy operates has proven quite challenging for the whole sector with First Milk being no exception. In the last few years the co-operative has downsized considerably as part of their efforts to secure the financial viability of the organization. It has also made several changes of top managerial positions, and redrawn the strategic language from one that positioned sustainability at the core of their operational strategy (as articulated in their 2012 sustainability report) to one in which actions are guided by a rigorous commercial focus. While there is no explicit recent communication about their sustainability efforts as a co-operative (except those which involve their key customer Nestlé) there are some initiatives in place. In the next section I will analyze the evolution of the British dairy sector including the trajectory of First Milk in the last decade.

Analysis: development, change and dairy processors

This chapter features an account of how the British dairy sector developed in the post-war era given its background of producer-controlled national milk marketing. Entrance to the EU and the introduction of quotas had different effects compared to the previous cases; while modernization was accelerated after entrance, EU law forced the eventual dismantling of the milk marketing boards, which caused significant disruption in the sector. I describe the liberalization of the dairy market and its consequences in terms of intensification and distribution of power across the chain. Milk production was well under quota during the last decade of the scheme, therefore the impact of their removal is more relevant with regards to the changing market conditions. The chapter also covers the emergence of the conceptualization and regulation of animal health and welfare, as well as the key components of the regulatory framework on environmental aspects of dairy farming. The last section consists of a review of market-based responses that integrate food safety and basic environmental and animal welfare concerns. Lastly, I describe the industry-led sustainability initiatives including the efforts of First Milk. In the next section I will use transition theory concepts to analyze the development of the British dairy sector and discuss its viability given the challenges currently facing it.

I analyzed the data gathered on the British dairy sector to first identify the dairy regime in the post-war era and then characterize its evolution through today. As done in the previous two cases, the analysis rests on the regime concept as proposed by Geels and Kemp (2000), who argued that regimes are stable sets of dominant rules and practices around specific technological arrangements. Similar to the analysis done in the Dutch and Irish cases, I further unpack the regime and its development across time by referring to the different types of rules as defined by Geels (2004)—namely, regulative, cognitive and normative. The analysis sheds light into pressures affecting the regime, the changing selection environment, as well as the emergence of adaptation responses from actors in the British dairy sector.

Rules and the delineation of a regime

The British dairy regime in the post-war era is actually the continuation of the arrangement that emerged in the early 1930s—a regime dominated by producer-controlled Milk Marketing Boards. This regime surfaced when the Agricultural Marketing Act was passed in 1931 (regulative rule) and one of its key characteristics was that farmers were guaranteed the collection of their milk and corresponding payment of a basic price (regardless of their size or location). The MMB was already a key actor in the dairy regime at the start of WWII but during the war years it consolidated its role as it coordinated milk collection and distribution. During the post-war period the UK was—just as other European countries—working towards the restoration of social functions such as food provisioning (cognitive rule). Government policies and funding (regulative rule) were in place to support the modernization of agriculture through research, education, and on-farm development. The MMB coordinated and facilitated the process of modernizing dairy farming by introducing various technologies and practices (e.g., milking machine, artificial insemination, etc.) as well as policies to facilitate their adoption (regulative rule). The introduction and implementation of the bulk tank is an example of such development. It drove further the scaling up of dairy farming, as most of the farms that could afford the switch were the larger ones, this significantly reduced opportunities for systems of small production, processing, and doorstep delivery of milk. This can also be characterized as a shift in the dominant thinking in which the maximization of production scale is preferred over smaller units that deliver social and environmental values such as social contact, short distances between consumer and producer, easier succession and entrance to young farmers, and landscape preservation amongst others (cognitive rule).

Once the UK entered the EU, the British regime was affected in two important ways. First, the EU's modernization policies and support for further scaling up and intensification of farming aligned with those in the UK, which further accelerated the intensification path for the British dairy regime. The second way in which entrance affected the regime is that against this new EU regulatory framework the reproduction of the British dairy regime as it existed—namely, through the control of the Milk Marketing Boards—was suddenly not in full accordance to the rules, creating a point of high contention. The fact that the selection environment had changed due to accession created significant pressure for the British regime reproduction. The UK introduced amendments (adaptations in regulative rules) in order to align the MMB to EU regulations. The EU also made some changes to accommodate the existence of the MMB but it was not sufficient to reduce the MMB's monopolistic position.

While the contention about the MMB continued, quotas were introduced in 1984 (regulative rule). As explained in previous chapters, their introduction aimed to reduce the budgetary pressure of supporting the structural surplus of milk in Europe.

That is the quota policy was an adaptation needed to realign regime reproduction to a financially viable path. Production quotas had the desired effect of limiting milk production growth; in the UK quotas—aided by the ease of their trade—resulted in the scaling up of farming operations, further intensification of farming, larger herd size, but also a rapid decline of farmers and the eventual contraction of the sector.

A major regime change: the demise of the MMB

The regime shift that was germinating since the UK accessed the EU took a big step in 1993 when the MMB was dismantled. Its operation had become progressively problematic in the years prior—the UK's government privileged free market principles (cognitive rule), and in 1986 the Single European Act (regulative rule) was signed. This opened up the sector for a range of different milk trading arrangements: co-operatives, direct contracts between farmers and processors, and milk selling groups. Market dominance however, was secured again by a producer cooperative. Although the MMB in England and Wales had been dismantled, Milk Marque emerged and secured 65% of dairy farmers in the area. This represented too much concentration of control in the sector, which was deemed undesirable for competition purposes (cognitive rule). The final step into the abolition of the producer-controlled arrangement came when the Monopolies and Mergers Commission assessed the participation of Milk Marque as problematic and suggested its separation into smaller units. This represented a significant change in the British dairy regime. After six decades of guaranteed collection and payment of milk from farmers regardless their location or production scale, the stability of that arrangement disappeared. This change was a few decades in the making but eventually managed to fragment the producer base and coordination of the marketing of milk.

The dairy regime after the MMB

The regime after the dismantling of the MMB (and its successor Milk Marque) can be described as a liberalized market where regime tensions are primarily dealt via market-based schemes. Within this regime power has shifted away from milk producers to the hands of other actors in the chain, primarily retailers. The dairy sector's traditional domestic orientation compounded with the weakened market position of farmers as well as suboptimal farm structure and superfluous processing capacity, affect regime reproduction—these challenges are expressed as low farm profitability. The dominant approach to face this challenge has been through the further modernization and scaling up of farming (cognitive rule). For instance, the practice of increasing stocking rates, with the subsequent need for additional outside feed, has gradually gained popularity. The removal of quotas heightens the sector's exposure to market forces, which is argued to be a key challenge for farmers.

In addition to economic viability, other tensions affecting the regime have to do with the impact of the intensification of dairy farming on animal health and welfare as well as the environment. These have been addressed through public and private standards (regulative rules). I will analyze the emergence of these concerns as elements of the selection environment against which the regime operates.

Normative rules on the health and welfare of animals are argued to be well established in British society. Food scandals and animal health epidemics have amplified public concerns about the intensification of animal farming. These norms have made their way into the selection environment in which animal farming evolves through laws and private standards (regulative rules). The regulative framework around this theme has developed from public debate to a long-standing and ambitious animal health and welfare legal framework. Its emergence is underpinned by the animal protection law passed in 1822, and later by the consolidation of the framework through the Agriculture Act of 1968, the establishment of the Farm Animal Welfare Committee in 1979, the Animal Welfare Act of 2006, and the additional regulations derived from it. Private standards play a significant role regarding compliance to animal health and welfare norms and regulations. While the widespread Red Tractor Schemes ensure food is produced according to basic animal health and welfare indicators, the RSPCA Assured scheme works towards continuously improving market standards. According to animal health and welfare experts, the current reproduction of the dairy regime is far from trouble-free in this respect but there is little to no public attention to on-farm issues such as mastitis, lameness, or infertility. What is at the center of public debates is the social disapproval of permanent housed cow systems as well as mega dairies. These normative rules have become key pressure points for the regime, especially in the last decade. Public conversation and collective action has been largely facilitated by NGO actors. While these norms have not been translated into legal limits they exert a certain degree of influence when it comes to assessing the planning requests of large-scale farming projects.

Another gradually emerging pressure on the regime relates to the negative impact of dairy on the environment. Similar to what was observed in the Netherlands and Ireland, concerns about the environmental consequences of the intensification of dairy emerged as evidence of agricultural pollution became increasingly available in the 1970s and 1980s. The main actions for setting environmental limits have been governmental; it is primarily the EU's regulatory framework in its implementation by the national government that has set the environmental guidelines for dairying in the UK. The Nitrates Directive and the newly revamped Countryside Stewardship Scheme (regulative rules) are some examples. A debate in which the influence of non-governmental actors was observed pertained to climate change. The translation of social expectations about government action (normative rule) where translated into an unprecedented legislative piece: the Climate Change Act (regulative rule). Within the dairy sector this regulative change boosted the number of studies and carbon footprint measuring initiatives on the ground.

Responses and regime adaptations

We have analyzed the changing public expectations from dairy and how they have resulted in various legal and market based responses directed to limit the impact of dairy on animal health and welfare, as well as on the environment. I will now describe what could be argued to be more integrated responses in the sector—namely those that incorporate several sustainability concerns in one scheme.

It is maintained that within the current British dairy regime retailers are influential actors in the supply chain. I described that in the last two decades the four top retailers' market share has grown considerably. Civil society has identified retailers as influential actors in the dairy market and have exerted pressure on them to address the issue of low farm profitability through fair prices (normative rule). The main element of the direct dairy farm supplier groups that retailers have responded with is the cost-based milk price model used in contracts with a group of farmers large enough to supply the retailers' private label milk requirements (regulative rule). These direct supplying contracts have evolved to also include some additional (to Red Tractor standards) animal health and welfare standards. Drawing from the notion of obligatory passage points (Callon, 1986), direct dairy farm supplying groups could be conceptualized as nodes that embody the rules that dictate certain dairy farming practices. Further, these nodes reinforce certain themes or indicators related to sustainability over others and through their existence they condition market access (to a certain market distribution channel) to the compliance of a cluster of standards and render the actor facilitating this process even more indispensable for the reproduction of the regime.

Another integrated response that emerged out of food safety concerns and the need to safeguard consumer trust is the Red Tractor scheme (including its predecessors). The Red Tractor scheme (regulative rule), while voluntary enjoys widespread adoption (95% of milk in the UK is Red Tractor Assured). This makes it a de facto obligatory passage point for any farmer who wishes to sell milk in the conventional market channels. The scheme has a traditional focus on food safety and quality and has more recently added themes on animal welfare and the reduction of negative environmental impacts. The scheme is run by an organization owned by the food industry, which makes it a mechanism of self-regulation. Based on the assessments made of the Red Tractor Farm Assurance Dairy scheme against the goals of the UK's Sustainable Development Commission as well as other certification systems, it can be concluded that the scheme has played an effective role in ensuring regime reproduction. It has done so by successfully integrating concerns on food safety and basic animal health and welfare into the output the dairy regime is able to provide—it has facilitated alignment of regime performance to the changing selection environment. However, it has until now failed to drive the sector towards higher animal welfare and environmental standards, which is not inconsequential given that in the UK there is a tendency for minimal regulation and for voluntary standards to fill in the gaps.

An additional initiative to discuss is the Dairy Roadmap. This periodic process facilitates the communication of the dairy industry's commitments and achievements regarding the reduction of most of the negative impacts of dairy production and processing. The roadmap process was introduced by DEFRA but its implementation and continuation is in the hands of the trade association that represents the British dairy industry. Targets relate to the general priorities for the sector and the roadmap method serves to report on progress and ambitions; compliance to targets is not binding. The data showed how the regime market logic plays out in the agenda setting process for the dairy sector. Guided by market principles, actors in the sector are able or willing to address sustainability issues in which a clear link to profitability can be made (e.g., added value, market advantage, avoidance of future costs, etc.). This shows the effect of inertia in regime reproduction and the power of dominant cognitive frames to hinder progress in reducing the negative effects of dairy.

First Milk and the British dairy regime

Based on the analysis of the British dairy sector through a transition theory lens it can be argued that a significant regime shift came about as the Milk Marketing Board was dismantled and the control of producers over the marketing of milk was further fragmented. For a period of 60 years the sector developed around three constants: guaranteed milk collection, guaranteed payment, and uniform costs of haulage regardless of location or volume. The sector has had to adapt to operating in a liberalized internal market where farmers have a relatively less powerful standing. In addition, the removal of quotas highlights the challenges of increased exposure to market forces. In addition to identifying these regime changes another area of focus of this study was the ways in which dairy processors affected the regime through their sustainability programs. In this case study, I presented the case of First Milk, the development of their sustainability approach, and its trajectory in the last five years.

The articulation of First Milk's sustainability program was internally championed by the CEO. It was based on the recognition that as dairy processors, First Milk has a degree of influence to determine and improve how dairy is produced (normative rule) while driving the co-operative's competitiveness in the market (cognitive rule). The program was developed through an integrated framework in which economic, environmental, and ethical considerations are assessed across all functions of the company in order to find practices that maximize these dimensions (cognitive rule). Internally, the program gave continuation to initiatives that were already underway and provided a framework for further pursuing operational efficiency, added value product strategies, as well as animal welfare and environmental preservation.

The rolling out of the program was not always easy, as all initiatives are assessed against their economic potential in the short term and there is a lot of hesitation from member farmers if the link to profitability cannot be easily made. This can be explained as an impasse between the dominant market regime logic and its inability to more readily assign value to certain environmental and ethical outcomes. This is something that was observed in the other cases, which in turn explains why cost reducing feed programs are more popular than biodiversity ones.

In terms of impact, interviewees argued that the way the governance of the program was designed—namely across the organization as opposed to managed centrally by a few people—had a positive effect in organizational learning and effectiveness. In addition, and although limited to the share of participating farmers, the co-operative became further prepared for compliance to specific projects from retailers or other dairy processors in which sustainability claims are the basis of the market strategy. Having said this, the program, which was designed to safeguard the viability of the co-operative given the future challenges for the sector, was not able to fully avert the critical phase that First Milk underwent in the last few years.

The last five years have been particularly trying for the British dairy sector in general and for First Milk particularly. It falls outside of the scope of this study to investigate the precise internal and external drivers of First Milk's performance crisis. However, what can be argued is that the British regime appears to be still conciliating its reproduction between the structural legacy of the MMB regime and a competitive market context in which only the most efficient units can survive. Anticipating market value for sustainability-related attributes is a common business strategy to address future challenges, as seen in the Irish case study, and one that might prove its value for First Milk in the longer term.

Conclusion

This case study presented how the British dairy sector has evolved since the post-war era. The shift after the abolition of the Milk Marketing Board has proven challenging for the sector. While dairy farming has intensified and scaled up significantly, regime reproduction continues to be limited by structural features that are proving to be suboptimal against the liberalized market logic. Sustainability concerns and their integration to the regime rules guide dairy production along legal and social demands regarding the safety of food produces, the integrity of the environment, the adequate treatment of animals, and the preservation of the landscape. An additional challenge for the future of the sector is to counter the negative perception that has developed to some extent about the viability of the sector and its possibility to provide a fair and prosperous livelihood for farmers.

In the next chapter I present a discussion based on the findings of the three case studies presented here. I contrast the cases and discuss shared development traits, context-specific features of the sectors, as well as approaches to sustainability responses and programs and their relation to regime change.

Discussion and conclusion

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Introduction

This study provides a detail description of how the dairy regime in three European countries has evolved since the post-war era, with special emphasis on the sustainability programs of leading processors in each sector. The purpose of this chapter is to answer the research questions posed at the beginning of this project by drawing from the analysis of the three case studies presented in the previous chapters. Additionally, I will reflect on the theoretical framework and discuss how these findings contribute to the literature on, and understandings of sustainability transitions and agri-food systems transitions, as well as European dairy. The last sections in this chapter are dedicated to the reflection on the methodological approach, a discussion about implications for current and future research agendas.

Research findings

I will present the findings by first answering the four secondary research questions and then conclude by addressing the main research question in this study.

RQ1. How has the dairy sector developed since the post-war era?

Modernization, specialization, and intensification
While every case showed specificities in the way the dairy sector's development progressed, based on the data and analysis presented here, it can be argued that the intensification of farming is a common trait to the post-war development of the dairy sector in the three countries under study. Modernization, specialization, and increased productivity of farming were the dominant cognitive and normative rules guiding post-war agricultural policy at the national and supranational level. In every country, the scale enlargement of farm operations—increase in dairy herd size and growth in milk yield per cow—as well as the reduction in the number of farms was observed as a dominant trend. These developments have been accompanied by the increased use of inputs (e.g., fertilizer, feed, machinery, and fuel) in dairy farming.

Limits to growth
The post-war goal of recovery and food security was not only achieved by the early 1970s, but it quickly resulted in the structural overproduction of milk in Europe. In the Netherlands and Ireland, surplus production reinforced their export orientation. The export of dairy products as an economic engine was well aligned to the post-war regulative and cognitive rules. When overproduction reached critical levels however, milk production quotas were introduced. The growth in total milk production volume was effectively stopped and the continuous expansion of the sector slowed. The logic of continuous growth and expansion that had guided the development of the

sector until then shifted towards a focus on production efficiency. This significantly drove cost reduction and labor productivity efforts.

Negative externalities

The increase in efficiency was not the only result of such development approach; negative externalities gained visibility through the increase in water and soil pollution by excess farm nutrients as well as the increased scale in animal farm epidemics and food health scandals. While the expression of these negative effects took varied shapes on the ground (e.g., farm epidemics had a larger impact on the British dairy sector than in other countries), responses emerged at the supranational level, impacting all sectors under study. Policy development has been incremental and core aims are to control and prevent water pollution, ensure food safety and quality, and incentivize the environmentally friendly management of farmland (e.g., Nitrates directive, CAP reform, etc.).

Access to market

Regarding the marketing of dairy, another development observed in all cases is the increasing concentration of dairy processing and food retailing, which in turn has reinforced scale enlargement and intensification of dairy related operations. Dairy market dynamics, however, cannot be further generalized. The Dutch dairy sector has a strong export orientation and a significant share of its milk is destined to the production of cheese. While milk is processed by only a handful of organizations—with one dominant market leader—there is a strong co-operative tradition. Therefore, dairy production and processing is still, strictly speaking, in the hands of farmers. In the United Kingdom, the market conditions for dairy have followed a different path. The sector has been traditionally focused on the production of fresh liquid milk for domestic markets. After having a centralized marketing board, which guaranteed milk collection and a pooled price for six decades, the collective organization of farmers is now more fragmented and the sector faces significant structural challenges. Private companies have a strong standing on the processing side, still, access to the (domestic) market is mediated by a handful of powerful retailers. Similar to the Netherlands, Ireland has a long tradition of dairy exports and most of its milk production is destined to foreign markets. Top Irish dairy products for export are butter, cheese, infant formula, and skimmed milk. Cooperatives are also the dominant form of dairy production and processing organization and the sector plays a key role in the Irish economy. A market-related challenge is that of increased price volatility, which has impacted dairy in all countries, especially the UK. While the increased volatility in milk price is multifactorial, EU policy changes are key drivers as they seek to reorient dairy towards the (global) market—namely, the removal of quotas which increases the exposure of European dairy to market forces.

Public debates: environment and animal welfare

It becomes increasingly clear that the dairy sector develops in a specific socio-economic, cultural, and geographical context. The particularities of the Netherlands, Ireland, and the United Kingdom are visible as public debates around the impacts of dairy farming emerge. These debates—mostly facilitated by non-government environmental and animal welfare organizations—articulate some shared and some distinct issues. The debate about the negative impacts of dairy in the Netherlands has evolved gradually since the 1960s. Given the degree of intensification of Dutch agriculture and the move away from grazing towards extended housing, a normative rule shaping the societal debate is the protection of animal welfare, especially expressed as cows grazing outside. The strong rejection of mega farms is connected to animal welfare concerns—regardless of the degree to which cow welfare can be ensured in such farming systems—as well as the preservation of the traditional rural Dutch landscape.

As explained earlier, while the dairy sector in all countries can be characterized by a degree of intensification and automatization, the have all intensified and scaled up at different levels. The Irish sector operates at a relatively smaller scale in comparison to the Netherlands and the UK. The societal debate about dairy in Ireland has only gained momentum in the last seven years. The main line of debate is the environmental impact that significant expansion of the sector could have, with especial emphasis on the GHG emissions from the sector and the inability for the country to comply with agreed reduction targets. This does not entail that there is a lack of sympathy for animal welfare; rather it should be interpreted as the sector not having reached problematic levels of intensification.

Although the majority of dairy farming in the United Kingdom is still pasture based—taking advantage of the natural conditions—there is an emerging trend towards intensive housing systems. In parallel, there is a longstanding societal tradition of animal health and welfare protection dating back to the 1800s. As a result and in connection to this strongly held normative rule, there is opposition to permanent indoor housing and mega farms, as it is believed that these systems heavily compromise the ability of cows to engage in natural behavior and in consequence its animal welfare. In addition, the British dairy sector has endured steep price volatility and periods of continuous price decrease. The problematic has gained attention in the societal conversation through farmers' demonstrations and calls from civil society organizations for fair milk prices.

Regulating environmental impacts and safeguarding animal welfare

Earlier I mentioned the supranational policy responses to some of the negative impacts of dairy farming. For each case I have also observed specific public and private approaches to address such externalities. In the Netherlands, regime tensions connected to environmental impacts of dairy are addressed through legislation and, as the phosphate debate and policy development process illustrates, a leading actor is the national government. Ensuring better conditions for animals is mostly subject of private market-based standards (e.g., Beter Leven), which aim to incentivize the market development of animal friendly products. On the subject of grazing, which as you have read in the Dutch case has high public priority, the dairy industry has developed standards and slowed down the decreasing trend of the practice through price premiums for farmers.

The responses to animal welfare concerns in the United Kingdom have been articulated via national legislation as well as certification standards implemented with varying degrees of ambition by non-government organizations, retailers, and industry certification platforms. The main response to addressing food safety concerns and general lack of trust—especially after the animal epidemic and food scandals of the 1980s and 1990s—has been through quality assurance schemes established by the food industry and agricultural sector. The schemes, which have unified under the Red Tractor certification, have extended coverage in all sectors—for dairy they have practically sector wide coverage. Lastly, retailers have addressed claims of unfair milk prices for farmers by setting direct farmer supply groups in which prices are based on production cost-models.

While not directly a response to the debate articulated by environmental NGOs, in Ireland the government in collaboration with the dairy industry has devised a sector-wide platform to document the credentials of Irish dairy as one of the lowest impact dairy production systems in the world. The program also aims to incentivize processors to identify improvement areas, create programs, and to document the increase of their efficiency. These efforts are accompanied by government extension services, which also focus on increasing the resource efficiency and reduce the emission intensity of Irish farming.

In each of the cases, specific regime tensions can be identified at the crossroads between rooted societal values and expectations for dairy farming, the development trajectory of the sector, and the prospects of post-quota growth to capture global market demand. For the Netherlands, prospects of future growth bring up the tension between increasing environmental control of dairy operations in order to comply with legal environmental limits (i.e., nutrient), while fulfilling normative expectations on animal welfare (i.e., grazing). For the UK, and given the economic struggle of the sector, the key pressing issue is to increase scale of production to ensure economic viability while still operating within normative rules regarding animal welfare. Lastly, when considering ambitious growth targets for the Irish dairy sector the clash between the expansion of dairying and the implied environmental impacts of such growth is at the core of debates about the future development of the industry.

RQ2. What do actors in the dairy sector perceive to be sustainability challenges for the sector?

With some tensions and tradeoffs rising to the surface, actors in the dairy sector articulate what they perceive to be the key sustainability challenges for dairy in their country. The dominant formulations in the Netherlands have as departing point the goal to grow to capture global dairy demand and ensure economic viability. This aim is legitimized by the high level of productivity of Dutch dairy production. The challenge, actors argue, is to achieve growth within the increasingly strict environmental limits and the boundaries of normative rules social acceptability (i.e., animal welfare, and the preservation of the landscape).

The sustainability challenge that actors most often identify for the Irish sector is to successfully manage the financial demands that price volatility entails while increasing milk production to capture a share of the global market demand. Additionally, the sector has the challenge to continue to systematically document and measure the low impact production of dairy in Ireland in order to substantiate future market claims and increase their competitiveness in the global dairy market.

In the case of the British sector, the challenge is seen mostly as the economic survival and revitalization of the sector. This includes restructuring production and processing to more efficient scales, reducing costs and increasing cost control of farm operations, as well as improving terms of access to the market. The emphasis that actors place on the economic viability of the sector does not mean that other aspects such as environmental limits and animal welfare criteria are not considered. Rather, it reflects that these aspects are considered to the degree that they contribute to economic stability and prosperity of the sector.

When contrasting the findings from each case, we see market challenges accompanied by the gradual realization of evident environmental limits, as well as the strong articulation of normative expectations about the role of dairy in society across cases. Interestingly, these dairy sectors that have operated largely under the same (supranational) regulative framework find themselves facing differentiated expressions of these challenges.

RQ3. What challenges are sustainability programs of conventional dairy processors addressing and how?

The three sustainability programs studied here share some common traits. First, in spite of employing different implementation approaches, a fundamental goal is for these programs to be widely adopted by all member farmers and become a stable operating rule. Further, they explicitly build on the practice of farmers' learning groups, in which a moderator with relevant expertise facilitates peer-to-peer knowledge exchange. While these programs are all comprehensive in their delineations of themes related to the sustainability of the sector, in practice some sustainability issues are more promptly or directly addressed than others. This is related to how evident the economic benefit of acting on them is, as seen through the lens of the dominant cognitive rules.

CONO

Caring Dairy was developed based on the sustainable agriculture code from Unilever and a study of sustainability indicators germane for dairy farming. This resulted in eleven themes: energy and climate, biodiversity, social and human capital, farm financials, soil health, soil loss, nutrients, water, local economy, pest management, and animal welfare. Before 2017 when minimum performance requirements were set for supplier farmers, the program's approach was voluntary and rewarded with a price premium. The implementation was based on attendance to workshops (selected by the farmer) and the development of farm-specific improvement plans. In that regard the program could be defined as outcome based where the outcome is set by the farmer herself/himself. Monitoring tools were also developed in order to monitor farm performance and feedback into farm action plans.

The program reformulated its implementation to include dedicated two-year thematic learning trajectories in which farmers commit to one theme of their choice and develop a more deep engagement with it. There are no specific co-operative-wide farm performance targets connected to these sustainability themes. For the last 15 years there has been a clear emphasis on maintaining high levels of grazing; the practice is rewarded by a price premium. Based on the data and analysis presented in chapter four, it can be argued that the Caring Dairy program addresses a key normative concern in the Dutch context: the negative trend in grazing. CONO has also actively engaged with a broader range of sustainability issues and that signals their attempt to address the challenge for Dutch dairy to operate within environmental and social limits as they become increasingly embedded in the regime's selection environment.

Glanbia Ingredients Ireland

The Open Source Sustainability and Quality Assurance code of Glanbia Ingredients Ireland offers a different illustration of dairy processors developing sustainability programs. GIIL's approach was to develop carbon and sustainability modules covering the themes of soil and grassland management, water use and conservation, energy use and conservation, waste management, biodiversity, economic sustainability, social sustainability, health and safety, and milk suppliers' health, as part of their already existing third-party certified quality assurance scheme. The implication of this approach is that participation is required for all member farmers. At this stage, there are no overall performance goals and sustainability and carbon parameters are monitored but not assessed—certification is only dependent on compliance to the quality standards.

Key customer requirements as well as best farm and processing practices were taken into account when developing the code. A range of programs on farm practices and financial support mechanisms supports its implementation. Through the sustainability code, GIIL is addressing the challenge to continue the path towards resource efficiency and reduction of carbon footprint at farm and processing levels. It also addresses the challenge of farm expansion in times of price volatility through their innovative price and loan mechanisms. Lastly, they are responding to the challenge of increased documentation and systematization of monitoring in order to supply (global) key customers with substantiated market claims and reliable product tracing systems.

First Milk

In the case of First Milk, its sustainability program was developed through a framework based on economic, environmental, and ethical considerations. It resulted in a comprehensive set of working themes with corresponding targets. First Milk's five working programs covered issues related to feed, animal health and welfare, resource efficiency, improved logistics, energy efficiency and renewability, processing and household waste, and human health. The program operates on a voluntary basis through farmers' discussion groups and exemplary farms. The incentive to participate is the potential economic reward through the acquisition of special supplying contracts based on sustainability credentials. Because of the low profitability experienced by farmers there is unequivocal emphasis on the economic benefit of any program related initiative. Therefore, the focus is on actions that can reduce costs and improve general productivity and profitability (e.g., increased and effective use of forage, and increased animal health to boost milk yield, etc.). In this regard the main challenge addressed by the program is the economic viability of dairy.

RQ4. How are sustainability programs from conventional dairy processors affecting the dairy sector?

To answer this question, I reflected on how the development and implementation of the programs under study has contributed to the changes observed at the regime level. The program with the longest history and therefore most suitable to explore this question was CONO's sustainability program. If we look at the trajectory of the themes that now are at the core of the sector wide sustainability agenda or incorporated into dominant dairy standards we can see that grazing has gained increased attention and stability as a dominant regime practice in the last decade. As the first processor to financially compensate farmers for grazing, CONO set a precedent for grazing as a desirable practice associated with high animal welfare and quality dairy products, as well as for dairy processors as the actors tasked with incentivizing grazing through price premiums. While grazing is not legally enforced it has become a stable feature in Dutch dairy standards. Another area where CONO's actions could be argued to have influenced the sector is the mere fact of adopting a sustainability program and placing dairy processors as the actors to manage and coordinate related work.

While GIIL's open code also has a short trajectory in its definition and implementation approach it can be seen that the program reinforces the dairy sector's definition of sustainability (i.e., smart green growth) and is aligned with the dominant cognitive rules. Moreover, the program contributes towards the systematic documentation of Irish dairy credentials. Given GIIL's size and position in the Irish sector, this is a key contribution to the effective development of a competitive advantage as a global supplier of dairy products. The Irish dairy sector is moving towards further intensification and GIIL's programs are reinforcing that by assisting farmers in effectively weathering the financial challenges attached to such growth. As such, the implementation of the code further solidifies the sector-wide approach of intensification of production as a way to ensure the future viability of dairy.

In the case of the United Kingdom, it is challenging to identify the role of the program in the changes at the sector level not only because of its short history but also because of its reduced visibility (at least to external audiences). Based on the data gathered, I conclude that developing and documenting sustainability related attributes is in line with the sector's practices of assurance-based market access (e.g., retailers' direct farm supply groups). In this regard First Milk's program is reinforcing this practice, which could potentially retrieve some market power to First Milk's farmers.

Having answered the four secondary questions, I will now address the main research question.

How is the European dairy sector changing to ensure future viability, and how are dairy processors' sustainability programs a part of this change?

This is the question that inspired and guided this study. Based on the data and analysis presented earlier I will outline the most significant changes that characterize the cases under study and in turn contribute to our understanding of the development and viability of the dairy sector.

The first change to discuss is the removal of quotas—a key change in regulative rules. The decision to remove milk production quotas was based on the argument that the abolishment of production limits would increase the market orientation of dairy sectors in Europe allowing farmers and other actors in the industry to react to market signals, such as increased global demand for dairy products, without interference. While allowing the sector to access new market opportunities, this policy change was also expected to bring about higher price volatility and generally expose European dairy actors to an increasingly competitive dairy export market.

The second change was observed most clearly in the Netherlands and the UK. This change—not new but certainly intensified given the juncture created by the quota abolition—is the increased awareness and articulation of societal norms and expectations on the further intensification of dairy. There is public concern about the detriment of the environment and traditional landscape, as well as the compromise of animal welfare through the move towards more intensive housing systems. Related to this change was the increasing involvement of environmental and animal welfare non-government organizations in the governance of dairying. The introduction of NGO-led market-based animal welfare schemes was observed in the British and Dutch dairy cases.

In anticipation to the removal of quotas another important change that was observed was the development of sustainability programs. These are awareness-raising and monitoring systems designed to increase the profitability of dairy production by improving resource efficiency in dairy farming and processing and boosting the legitimacy and credentials of dairy in the market. While the framing for this programs in both the UK and the Netherlands could be argued to be that of a path towards increasing sustainability of dairy production and processing, in Ireland the sector-wide sustainability platform departs from the assumption that Irish dairy is already quite sustainable (i.e., low-carbon). The scheme is then designed to help maintain and further drive that inherent competitive advantage of the country, which is used to advocate for more relaxed binding GHG emission targets. These programs are found to be more aligned to the dominant regime logic than they significantly challenge it.

As the quota abolition neared and production limits were removed, the sector responded by increasing milk production, expanding dairy herd, and scaling up of farming operations. I argue that this was the continuation of the post-war regime intensification logic but now with the aim to ensure economic viability of the sector. This has resulted in clear regime tensions. In the Netherlands, this resulted in phosphate limits for dairy being surpassed in 2014, 2015, and 2016. In 2015 in Ireland, where the dairy sector is a significant contributor to national GHG emissions, it was announced that the country would fail to meet its 2020 binding reduction targets. As for the UK, the increased exposure to market forces amplified their structural challenges and led to a period of significant financial struggle for farmers as average milk price had a continuous fall between 2014 and 2016.

It is still early to fully articulate the upcoming changes, that is, the ways in which the dairy sector will change to respond to the apparent need for oversight and try to ensure future viability. In the Netherlands, the return of a production cap via phosphate limits has been confirmed, and a system of incentives to reduce the number of farms is part of the new policy measures.

After having outlined the most visible and dominant regime changes, let us discuss what part dairy processors' sustainability programs have played. Every case illustrated a somewhat specific dynamic. In the Dutch case, the sustainability program connected with the increasing rise in awareness about animal welfare and positioned grazing as a best practice to safeguard it. Although the decreased grazing trend has not been reversed it has slowed down. In the case of Ireland GIIL's code, the program is fully aligned with the dairy sector's approach to increase of scale and productivity as a path to ensuring future viability of the sector. The program reinforces this approach by enhancing the tools available to farmers (i.e., price instruments, finance, resource efficiency training, etc.) as well as practices at the farm and processing levels. Because the program is part of the obligatory quality scheme it is expected to have significant impact. Finally, the sustainability program of First Milk, which focuses on cost reduction and retrieving some of the market power farmers once had, cannot be argued to have already played a role or contribute to the changes in the sector.

While it is true that the dairy sector in the Netherlands, Ireland, and the United Kingdom has undergone many rapid changes in the past few decades, this research reveals that there has been little change at a more fundamental level. The dominant dairy regime, which centers on the intensification of dairy operations, has continued to guide the development of dairy in all three countries. The increase of scale and efficiency as a way to reduce production costs and impact per unit continues to be at the center of the selection environment and of how performance is internally measured. This study shows that the emergence of sustainability programs can be argued to be an additional step (to environmental and animal welfare legislation) in the alleviation of negative side effects of the intensification logic and the more explicit delineation of operation limits for the regime, but one that until now, in its relatively short life span, has been unsuccessful in preventing the dairy sector from operating outside established environmental limits and societal expectations, as well as in ensuring a stable livelihood for a significant share of farmers.

Theoretical reflection and contributions

In this section I reflect upon the theoretical choices made for this study. I also identify and discuss the contribution that this research has made to the understanding of, and academic literature on sustainability transitions and agri-food systems transitions.

This study was approached through a transition theory lens; more specifically, it draws from the multi-level perspective framework and its conceptualizations of transition dynamics and change. The focus of this study was the dairy sector and the socio-technical regime concept was useful to unpack and understand the sectors' main characteristics and long-term development in all countries. I departed from the concept of socio-technical regime as defined by Geels (2002, 2004, 2011) which refers to the stable rule sets and established practices that guide the fulfillment of societal functions. The further distinction of rules as cognitive, regulative, and normative, as well as the conceptualization of the regime having diverse dimensions—namely, policy, culture, market, science, and technology—provided the model to identify and explore the key components of the dairy regime in each case study (Geels, 2004,2005a).

Because this study was designed to inform a discussion on regime change in the light of emerging sustainability challenges for dairy, the regime was studied comprehensively and in its complexity. This implied moving beyond monolithic depictions and into the nuances of actors' perspectives and agency. In the literature, it is accepted that the regime represents a stable and dominant logic and as such it can be seen as both medium and outcome (Giddens, 1984). This was a core notion upon which, in this study, the influence that actors can have to change the regime was further problematized by drawing on the notion of obligatory passage point (OPP)(Callon, 1986). The notion of OPP provided a relevant lens through which the influence of actors was identified and studied on an empirical basis. In the Irish case, we observed a clear example of an OPP introduced by the Irish Food Board. Because of its sector-wide coverage, the Origin Green farm scheme represents a node in which certain practices become a de facto requisite for any farmer wishing to gain access to the market. In turn, the Irish Food Board reinforces specific cognitive frames about sustainability and its position as core to regime functioning and stability. This study has shown the usefulness of the OPP concept for identifying the actor(s) facilitating or controlling the practice(s) (and whose involvement is becoming indispensable); the cognitive, normative, and regulative rules underpinning it; and the potential implications of the existence of such an obligatory passage point regarding future regime reproduction. This study contributes to the body of research focusing on the regime as it shows a conceptual tool to unpack the mechanism through which the regime adapts to the changing selection environment. This generates a more empirically driven understanding of actors' agency and ability to create change.

This study adds to the debate about the role that regime actors can have in sustainability transitions. Geels (2010, 2011), as well as Westley and coauthors (2011) argue that on the one hand, incumbent firms possess relevant assets which, if put towards pursuing a sustainability transition, can significantly accelerate the process. On the other hand, these authors clarify that it is unlikely that incumbent actors will actually engage in such a process, as there are not enough incentives in the institutional framework in which they operate. Loorbach and Wijsman (2012) argue that while there has been an emergent trend of firms engaging with the general societal goals related to sustainability, in practice their engagement only centers on working towards efficiency gains and general improvements on exiting practices. Moreover, they maintain that in order to play an innovative and leading role in the process, firms need to structurally incorporate societal and environmental goals into the core of their business. This research contributes to this debate first by showing that, in the case studies, involvement of dairy processors that is explicitly articulated under the heading of sustainability indeed focuses on reducing negative impacts and increasing efficiency and productivity of the business. This signals that their development is locked in to the current structure (David, 1985 in: Berkhout, 2002) and continues to be aligned to their established operating (market) logic (Geels, 2004). Second, through the exploration of internal perspectives of dairy processors as a way to contrast and compare against official sustainability codes and programs, this research shows that both discursively, but most importantly practically, sustainability issues are only addressed once the economic benefit of acting on them can be fully identified and modeled. Ultimately, the projects that get chosen and funded are the ones that have significant and immediate financial benefits. Third, the implication is that dairy processors, despite their best intentions, are mostly tied by the dominant market regime logic and its inability to incorporate environmental and ethical outcomes in a structural way. If performance markers for the sector continue to revolve around economic profitability in the traditionally defined way—without considering the environmental and social dimensions of business sustainability in relevant ways—the extent to which regime actors can actually incorporate sustainability into their core logic will be limited. What is more, if the dominant regime rules continue to rest on the constant scale enlargement of dairy farming operations as the only drivers for profitability, the sector will not be able to ensure its long-term sustainability.

To help clarify the contributions of this study to the debate about regime actors in sustainability transitions, it is important to address two questions: Is there an implicit definition of *sustainability* in this discussion? And, would the larger implication of these findings be that as long as they are embedded in a traditional market economy, incumbent firms or actors are absolved from responsibility when it comes to sustainability transitions? I will address the first question. As explained in chapter two, this study draws from Stirling (2014), as well as Geels and coauthors (2015) and their conceptualizations of societal change to inform how transitions were conceptualized in this research—namely, fundamental changes in socio-technical systems. I then argued that I would let any further distinctions be empirically based. Grounded on the findings of this study, viability and sustainability can be useful in a discussion on dairy transitions. In fact the use of these terms throughout the study is related to this debate. First, the dairy sector is currently not performing to existing standards determined mostly by regime actors. In the Netherlands phosphate limits have been repeatedly surpassed, in Ireland—where dairy is a relatively significant contributor of GHG emissions—binding reduction targets will not be met for 2020, and in the United Kingdom the dairy sector has gone through a prolonged period of low profitability.[106] These tensions related to regime performance challenge the sector's present-day viability, meaning its basic reproduction within legal limits in the short and medium term. Secondly, discussing the sustainability of dairy or a sustainable transition of the sector requires a longer time perspective and a more plural conceptualization to be incorporated. Precise definitions of sustainable dairy are contested but this study has shown that there are certain environmental and societal standards that have been clearly articulated by actors in the sector and that fall outside of the current regime rules and practices. For example, animal welfare through ensuring cows can sufficiently graze outside and be comfortable when housed inside, diligence regarding animal health and responsible use of antibiotics, systematic assurance of food safety, protection of the integrity of natural resources, biodiversity, and the climate, as well as safeguarding of traditional landscapes and family farming culture. So if these standards are made explicit, it could be argued that the preservation of environmental quality and traditional (cultural) landscapes, the protection and fostering of animals' quality of life, and fair and prosperous livelihood for rural families need to be additional outputs of the dairy sector.

To further expand I will now answer the second question posed above: Would the larger implication of these findings be that as long as they are embedded in a traditional market economy, incumbent firms or actors are absolved from responsibility when it comes to sustainability transitions? Transitions, according to the multi-level perspective, occur through the interaction of changes happening between radical innovations (niche), established rules and practices (regime), and the macro material and social backdrop (landscape). While the weight that cognitive frames and rules have on the regime has been previously discussed (e.g., Geels, 2004,2005a,2014b; Geels et al., 2015; Penna & Geels, 2015) and empirically observed as a hindrance to more fundamental change, actors that dominate the reproduction of stable rules and practices, are key to any transition. Therefore, the implication is that dominant and established actors are involved in the transition but do not guide it.

Markard and colleagues (2012) called for the advancement of empirical ground in sustainability transition studies by focusing on other domains besides (renewable) energy, which has been the most dominant topic in the field. This study extends the empirical ground in sustainability transitions by exploring and documenting the development of dairy—a socio-technical system in the agri-food domain. Darnhofer

[106] As it was stressed before, dairy is not the only contributor to GHG emissions in Ireland and this refers to its proportional responsibility only.

(2015) argues that sustainability transitions within agriculture are less likely to be technology-driven and that instead, change at the social level—cognitive and normative rules—is likely to have a more important role in processes of fundamental change. This study adds to this debate through the tensions between technology and social norms that emerged when discussing the challenges of intensification. This point can be more specifically illustrated through the debate about mega farms. While there are certainly many ways to build and operate a mega farm, there have been proposals for large-scale, high-tech housing that because of the high level of control of operations promise to curb the environmental impacts of dairy farming while maintaining animal welfare. This study shows how these proposals have been met with stark opposition in the UK and The Netherlands, which illustrates that regardless of the technological credentials and guaranteed level of performance of certain solutions, there are certain rooted values attached to dairy (i.e., animal welfare, cultural rural landscapes, family farm culture, etc.) that offer resistance for technologically driven change. In addition, innovation and change in the dairy sector is (still) bounded by the time lags connected to natural processes (e.g., growth rates of grass and other inputs, animal breeding cycles, etc.).

This research presents a detailed exploration of dairy in three different countries, which further expands the empirical ground of sustainability transition studies by highlighting common traits in the sectors' development trajectories as well as discussing how the manifestation of certain phenomenon varies across contexts. Bryman (2001) and Stake (2000) argue that it is more challenging to preserve contextual insights in comparative than in single case studies as unique elements and complexity can be underrepresented because of the more dominant focus on comparison (as cited in Lewis, 2003). In this study the emphasis on process tracing and narrative explanation of transition theory was useful to maintain the complexity and uniqueness of each case, and enhance the capacity to understand the phenomena and potential similarities too. A particular example revealed by this study is that dairy processors, who were initially hypothesized as influential actors in the supply chain based on their scale and direct contact with farmers, were not found to play similar roles across contexts.

Lastly, one of the intended contributions of this study was to connect past development, current challenges, and present engagement in a discussion about the future development of the dairy sector in these three countries. The longitudinal nature of transition studies was a useful tool for this purpose. This research has added to the discussion of the sustainable development of dairy by offering three comprehensive cases where the development of the sector is questioned in light of current challenges for change, and where current initiatives that explicitly position themselves under the sustainability umbrella are analyzed for their observed and potential impact in dairy.

The European dairy sector is currently at a point at which reflection on the sustainability debates and responses needs to be fostered in order to understand the directionality and speed of emerging changes.

Methodological reflection

I will now reflect on the effectiveness of the operational approach chosen for this study. In hindsight, some aspects of the chosen research design and operationalization worked better than others.

Regarding the research design, one challenge that was present throughout this research project was that of setting time boundaries for the case studies. When I designed this research, it was clear that the longitudinal aspect of the study was important and that the removal of quotas was a key—then future, now past—event to cover. Due to the dynamism and emergence of new measures and changes in the dairy sector in all three countries, significant updating was needed in order to provide as complete of a picture as possible. And even after the update was done, some issues still remained outside of the study of this project, such as the EU voluntary milk reduction scheme and aid packaged that was confirmed in the summer of 2016 and implemented towards the end of the year and the beginning of 2017 (European Commission, 2016g). This illustrates how challenging the study of current phenomena is, especially when it is moving at a very fast pace and the purpose of the study is to capture the main ways in which things are changing. While the analytical relevance is not directly threatened by the fact that this research covers a discrete period of time, perhaps a series of periodic research projects on the evolution of the European dairy sector could enhance the understanding of changing regimes.

The cases that were sampled and studied allowed for an exploration of the dairy sector in countries with shared features relevant for the questions posed in this study. In Ireland, the Netherlands, and the United Kingdom, the dairy sector has a significant economic and socio-cultural role. Also, dairy farming in these countries was impacted by WWII and the post-war recovery European policy and development framework. Another feature is that these three sectors operate under the same supranational regulatory dairy framework and the removal of quotas created a window and a point of reference against which several debates and diverse perspectives about the development of dairy in the future emerged and could be mapped. Those characteristics were fundamental and valuable to the exploration of the research questions across cases. The development of sustainability programs for dairy is a relatively recent phenomenon, especially when compared to other products like coffee, cacao, or eggs. As such, the history of the Irish and British programs studied here is still limited. While unavoidable and not fully problematic for this project, it made the cases slightly more diverse than desired and the information of sustainability program results somewhat limited.

Data collection for this study was carried through document analysis as well as in-depth semi-structured interviews. This was a very productive combination of data collection, since secondary data also served to verify and complement data from the interviews; similarly, data gathered through interviews served to expand or emphasize certain aspects of the development of the sector in that country. In-depth interviews are certainly resource intensive for the interviewee and the time requirement made it harder to enlist participants. However, given the aims of this study, interviewing proved to be a valuable data gathering technique. This confirmed, as argued by Rubin and Rubin (2005), that this method is useful for a study that wishes to explore perceptions, understandings, and judgments from actors on a given topic—in this case the past and future sustainability of the dairy sector.

Except for a few instances, interviews were conducted face to face. This allowed me to create a certain degree of familiarity or comfort, especially as often, there was some settling time (i.e., the time when the interviewee would welcome me into their farm or office, or while we would recognize each other at the meeting point and take a moment to find a seat, order a coffee, etc.). On the very few occasions when interviews were conducted over the phone the exchange was slightly shorter. While the quality the information was still high and it was better to involve actors this way compared to not involving them at all, there was less room for exploring additional topics. The use of face-to-face interviews is deemed to have been very fruitful.

Access to internal interviewees—namely farmers or those working for the co-operative—was heavily mediated by the sustainability managers. Is this problematic? In general terms, gatekeeper bias raises questions about the degree to which a gatekeeper can hinder access to potentially relevant information (Groger et al., 1999) and it is a valid point of reflection. In this specific case where, as explained in chapter three, there was only one of each type of actor (e.g. one operations manager, one sales manager, one farm development manager, etc.) the result of the mediation was more transparent—that is, I know which data and perspectives were inaccessible to me and overcame the omission accordingly. For the most part, the sustainability managers gave me access to a range of different internal perspectives including a diverse set of farmers—some of who were critical of the co-operative's sustainability efforts. Within the scope of this study I would not assess the role of the sustainability managers as problematic. However I would argue that it is important, given that sustainability is related to organizational reputation and brand value, to reflect upon the sampling of interviewees and the role of gatekeepers in data access.

Sampling of actors related to the dairy sector but not part of the co-operative was done directly by me in all three cases. The stage and tenor of the debates on the viability of dairy was somewhat different per case country. In the Netherlands, given the intensity of dairy farming and the issue of phosphate limits, the debate about growth and how to approach a post-quota market was already quite developed in the early stages of this study. Sampling and securing participation was, in consequence, comparatively easy. As the removal of quotas neared and passed, these debates gained attention in all cases, which facilitated the mapping of societal debates, especially in the case of Ireland.

The use of coding software—in this case Atlas.ti—provided a systematic way to code all primary data. This was extremely useful, especially the ability to easily manage such an amount of transcripts (e.g., group, retrieve, isolate, etc.). It also creates a more accessible and transparent data set should anything need to be verified by an external reviewer.

Generalizability and scope

In chapter three I discussed issues of generalizability and scope related to this study. I described that empirical generalizability was not an applicable feature of the study and the aim was to establish analytical relevance. It is perhaps useful to further clarify these features now that the study has been presented. First, the description of how the dairy sector developed, important events, as well as the main lines of debate on the future of dairy do represent the dominant rules, practices, and discussion threads for the period under study in the respective case study countries. Does this mean this is an all-encompassing picture of the sector? By definition it is not; the study focuses on the mainstream and dominant features of the sector, which by default only deals with emergent norms and practices as they relate to the regime but leaves out a full description of emergent niche innovations.

In addition, the debate portrays the main lines of discussion as they were unfolding during data collection. Given the dynamism of the sector in the last five years, we see changes in the debate and the regime even within the time scope of this study. For example, in 2013 the debate on the future of dairy in the Netherlands was a discussion centered mostly on growth, market opportunities, as well as general environmental and societal limits; in 2016 the debate was very much focused on phosphate rules and strategies to reduce it. Similarly in Ireland, the debate about emission reduction targets was active but only gained momentum in 2015 when the European Commission released its draft country report on Ireland. In the report it was stated that Ireland was not going to come close to reaching its 2020 GHG emission reduction targets. It is expected for these debates to continue unfolding and for different aspects to gain or loose attention.

The geographical scope of the study could raise questions as to the extent to which the findings represent the circumstances of the dairy sector in other European countries. While the study includes extensive data on European legislation and describes trends that are shared across the case countries, it would be imprecise to extend these characteristics to dairy sectors in the region. A feature that has been emphasized throughout the study is how each context is shaped by its specific socio-economic history, geography, and culture. This does not mean that this analysis cannot serve as input or inspiration to generate probing questions for dairy sectors in other regions.

Another issue to which I dedicated significant reflection throughout this project is its scope. I was never unaware of the comprehensive nature of the problem definition and guiding research questions or, more importantly, the challenges attached to such delineation. Having a background in sustainability science, my choice reflected the ambition to deal with problems that involve nature and society interactions in their complexity (Kates et al., 2001). This is the reason why I avoided a reductionist approach in which a situation is narrowed down to single issues, for example the response from dairy processors to climate change. This study instead dived into the range of challenges facing dairy at a point in time (removal of quotas) where their interconnection seemed to become more apparent in the public debate. Moreover, dealing with the already fluid term of sustainability and only addressing—for instance, water pollution from dairy farms or energy efficiency in dairy processing—would contribute to further reducing the debate about sustainability in the food industry.

Opportunities for further research

One of the hopes I have for this research is that it is received as an invitation to think further about sustainability transitions in agriculture and food systems. There is more territory to chart and the work done in this study has uncovered some opportunities for future research endeavors.

This study documented the development of three sustainability programs from the earliest stages to their implementation; the different sustainability framings, themes, tools, and approaches (e.g., voluntary or mandatory) were described in detail. It was observed that sustainability programs are often developed as the articulation of pre-existing efforts and established rules into an integrated code but they do not necessarily represent a radical change in dairy processors' operating logic. What is more, the analysis showed that the programs are framed through the current market logic in which sustainability issues or themes are only identified and addressed when they can offer a clear opportunity for profit (including reduction of risk). In addition, some programs opted for voluntary schemes while others approached program implementation as a mandatory supplier requirement. There is much to be discovered and understood about the medium and long-term evolution and performance of these programs. In a follow up study, or a series thereof, two angles could be further explored. First, an assessment of each program in relation to the attainment of its own targets as well as those set at the sector-wide level (if applicable). This would allow a discussion in which results and performance of the programs can be considered in the light of their original setup. A second (and complementary) angle for a follow up study would be to assess the extent to which the programs' impact contributes to the sustainability of dairy as a societal function, that is moving beyond the targets set at the program of industry level but incorporate societal norms and expectations in a discussion of governance of dairy. These two lines of inquiry would be highly valuable for the sustainability transitions field and discussions about causality and impact. This study has identified some milestone events; future exploration could confirm the degree of relevance and influence in change that those events actually had.

Another opportunity for further work would be to replicate this study in other European countries. This research showed how across cases some sustainability issues were more prominent than others. Also the more nuanced effect of quotas—beyond limiting milk production expansion—were observed. Gathering data on the post-war development of dairy sectors in other European countries including the main sustainability challenges and responses, and specifically tracing the response from dairy processors would deepen our understanding of the degree to which the context mediates what is considered to be a sustainability challenge as well as the extent to which it influences the implementation of supranational policy. The results of such research would be valuable insights into the design of private and public policy for sustainability and the role of influential (regime) actors in such processes.

This study found evidence of the involvement and influence of key customers—namely, transnational food companies—in the development of sustainability programs. In the Netherlands, Unilever developed the Caring Dairy program for their ice cream brand Ben & Jerry's and it was later adopted by CONO. In the United Kingdom, we observe how First Milk and Nestlé collaborate on bespoke sustainability initiatives, even if for a small share of First Milk farmers. Lastly, in Ireland we learned that although much of what is now included in the sustainability code of GIIL was already underway, the need to integrate and define it under a sustainability code came from a request from one of their key renowned customers. In all of these instances transnational food companies have had an existing sustainability agenda in place. Therefore, research is needed to explore the role of transnational food companies in the definition of sustainability programs and their local operationalization.

Based on the exploration of the dairy sector in three European countries, this study argues that dairy processors are ill-placed to lead a sustainability transition in dairy as the weight of the cognitive frames and the current institutional architecture make it counterintuitive to internalize values that sit outside the market logic. This does not mean that their involvement cannot be pivotal. It does mean that a reflection about a change in cognitive frames, incentive systems, and most importantly the need for oversight is needed. This debate would benefit from further problematizing the role of government policy in guiding the reproduction of the European dairy sector given environmental, societal, cultural, as well as rural and landscape factors.

Final reflections

While further research would be needed to develop specific policy recommendations, this study has shown that the current and likely development of the sector without production quotas might in fact be in conflict with the values of family farming, rural vitality, environmental protection, and animal welfare. The removal of quotas, which was intended to increase the market orientation of the sector, represented also the abolishment of production oversight. Two years after their abolishment, the need for some degree of oversight is evident. Voluntary reductions and environmental quotas are quickly making their way back into the dairy sector. This creates a degree of policy incoherence, which exacerbates opportunities for free-riding behavior and fails to address the reality and implications of accumulation, which are fundamental factors for the prosperity of the sector.

Based on this study it seems vital to create a system of incentives that is aligned to the desired outcomes for dairy in Europe. It also calls for policy, with an active involvement of supranational and national governments, that creates opportunities for actors in the sector to effectively contribute to the successful development of dairy as a societal function embedded in a specific context.

Sustaining dairy hinges on the willingness and ability of societies to engage in a conversation about *what* is to be sustained and *how*. The degree to which these questions can be answered in a representative way that is fair across generations and safeguards the integrity of the planet’s ecosystems will determine the extent to which we as a society can meet our hardest development challenges.

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Appendix 1

Participant Consent Form

PUREFOOD

MARIE CURIE ACTIONS

Research Consent Form – Sustainability in Food Supply Chains

About the Study

This research is for academic purposes only. It investigates how leading food manufacturers approach sustainability issues in the primary production stage of the food supply. For that purpose, the study will look at sustainability programs initiated by European dairy food processors.

Data will be kept on a server of Wageningen University. The researcher will also keep data on two portable storage drives, and on the hard drive of a personal computer. It is obligatory to store research data for at least five years.

Participation

This research is for academic purposes and is not being undertaken for the benefit of any commercial companies. The researcher will take pains to respect any needs for commercial confidentiality. Please make clear to the researcher if there are issues or statements of a sensitive commercial nature or that should be off the record. The researcher will honor those requests. Please discuss any concerns about these issues with the researcher.

You may choose to stop participation at any moment during the study without consequences of any kind. Completion of the interview and signing the consent form will constitute consent to participate in this study. In the case of recorded interviews, consent may also be indicated verbally on the recording.

Funding

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Results

The answers you give may be analyzed by a software program and/or interpreted to address research questions. Analyzed data will be used for scientific outputs such as articles, book chapters, and a doctoral thesis.

If you have any questions about this study, feel free to ask Georgina Villarreal (the principal investigator) or to contact the project leader Han Wiskerke (RSO group).

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Participant: ____
(First and last names, date, signature)

PLEASE indicate your willingness to be identified by title/function and affiliation in the study.
_____ Yes _____ No (Choose one.)

Appendix 2

List of interviewees' organizational affiliations

Please note that the numbers on the list indicate the number of interviews (i.e., a total of 55). The numbers are not linked to the codes used in the text to reference direct quotes from interviews.

	The Netherlands
1	Ahold
2	Boerenverstand Advies
3	Centraal Bureau Levensmiddelenhandel
4	CLM Onderzoek en Advies
5	CONO Kaasmakers
6	CONO Kaasmakers
7	CONO Kaasmakers
8	CONO Kaasmakers
9	CONO Kaasmakers
10	CONO Kaasmakers
11	CONO Kaasmakers
12	CONO Kaasmakers
13	CONO Kaasmakers
14	CONO Kaasmakers
15	Courage 2025
16	FrieslandCampina
17	Global Dairy Farmers
18	Independent Dairy consultant
19	Independent Dairy consultant
20	Landbouw Economisch Instituut
21	LTO Noord
22	Natuur & Milieu
23	Nederlandse Zuivel Organisatie
24	Productschap Zuivel
25	Unilever
26	Wageningen University
27	Wageningen University

Ireland

28 BordBía Irish Food Board
29 BordBía Irish Food Board
30 Glanbia
31 Glanbia
32 Glanbia
33 Glanbia
34 Glanbia
35 Glanbia
36 Glanbia
37 Glanbia
38 Glanbia
39 Glanbia
40 The Irish Agriculture and Food Development Authority
41 Researcher and Environmental Policy Advocate

United Kingdom

42 Arla-MilkLink
43 Compassion in World Farming
44 Dairy UK
45 AHDB Dairy
46 First Milk
47 First Milk
48 First Milk
49 First Milk
50 First Milk
51 First Milk
52 First Milk
53 Food Animal Initiative
54 National Farmers’ Union
55 Tesco

Summary

On March 31st of 2015 the European milk quota scheme came to an end. After thirty years of operation, its abolition represents a significant change for the dairy sector in Europe. The removal of milk quotas has been surrounded by debates about the future of European dairy. New market opportunities—especially the anticipated growth in demand for dairy in Asian countries—and the corresponding expansion of the sector are considered against the negative impacts that significant production growth would impose on the environment, animals, and society. While the elimination of quotas has brought additional attention to these issues, they are not new. The post-war development of European dairy has centered on the intensification of dairying through the modernization and specialization of farming practices. In parallel, evidence of the ways in which intensive dairy farming practices are taxing for the environment, animal welfare, and the traditional rural landscape has been mounting. While EU and national policies have gradually emerged to regulate the negative externalities of dairy production, the abolition of quotas raises questions about the extent to which the dairy sector can continue its development within environmental and societal limits.

A related development has been the growing market concentration at processing and retail levels. Within this context, dairy processors have introduced sustainability programs in the last few years, designed to reduce the negative impacts of dairy farming and processing, as well as safeguard the sector's reputation and legitimacy. This is the empirical background against which this dissertation seeks to examine its main research question:

> How is the European dairy sector changing to ensure future viability, and how are dairy processors' sustainability programs a part of this change?

This research question was approached with the help of the following secondary questions:

1. How has the dairy sector developed since the post-war era?
2. What do actors in the dairy sector perceive to be sustainability challenges for the sector?
3. What challenges are sustainability programs of conventional dairy processors addressing and how?
4. How are sustainability programs from conventional dairy processors affecting the dairy sector?

These research questions are addressed by studying three dairy processors located in different European countries, their sustainability programs, as well as the development of the dairy sector in which they operate. This study is approached through the lens of transition theory, drawing specifically on the conceptual work on sustainability transitions. Unpacking this question through a sustainability transitions lens allows for a discussion about how dominant arrangements of rules and established practices—through which we fulfill societal needs, such as transport, energy, and food—change into more sustainable ones. What is more, it facilitates the analysis of key actors, like dairy processors, and the part they have in such fundamental change. Transition theory is also characterized by its problem orientation and a strong sensibility for the longitudinal development of complex coevolutionary processes, which proves especially relevant when considering a legacy of past development paths, as well as present and future sustainability challenges.

Within transition theory the established rules, norms, and practices are conceptualized as the socio-technical regime. Regimes are also characterized as medium and outcome of mainstream societal functions and while not static they seek a stable reproduction (Geels 2004; Giddens 1984). Transitions are in turn defined as the fundamental changes in rules, norms, and practices that emerge out of the interaction between the regime as it is challenged by radical innovations and faces pressure from changes in macro-level phenomena (e.g., environmental, material, social, and technological change). Within sustainability transitions there is strong emphasis on the normative expectations and directionality of innovation, as well as the agency of actors in facilitating change towards more sustainable societal functions. In this study the notion of obligatory passage points (Callon 1986) is used to explore the influence of dominant actors and the mechanisms through which they make certain actions mandatory and reify their status as indispensable to the operation of the system. These are the core theoretical principles underpinning the operationalization of the study.

Methodologically, this study uses a case study research design. Case studies are suitable to explore complex, non-linear processes such as transitions, especially as these entail a focus on process-tracing, context mapping, and exploration of patterns. I conducted three case studies focusing on the dairy sectors in the Netherlands, Ireland, and the United Kingdom. Multiple case studies allowed me to explore the research questions in depth through each single case, and also to compare findings across cases. I selected European countries where the dairy sector has played a significant economic and socio-cultural role. I identified a dairy processor in each country that had articulated or was in the process of articulating a sustainability program. For each case I traced the development of the sector since the post-war era, the perceptions of actors about the challenges facing the sector, as well as the development process of the corresponding three sustainability programs. Document analysis and semi-structured interviews were the primary data collection methods used for this study.

All research questions are explored through the three case studies. In each empirical chapter (i.e., chapters four through six) I present the analysis of that particular dairy sector and dairy processor. The findings are then contrasted to identify relevant insights that can inform our understanding of how the dairy sector is changing, what part dairy processors are playing in that change, and how this relates to the sectors' future viability. I discuss the findings per case study and then share the general discussion by drawing on the overall case studies' results.

In chapter four I trace the post-war development of the Dutch dairy sector and examine the key challenges and responses related to its future. The dominant regime logic described above has guided its development, with an emphasis on efficiency gains and the reduction of production costs during the quota regime. Structurally, this has resulted in the scaling up of farm operations, increase in milk yields, reduction of number of farms, and further automatization of dairying. The analysis reveals that prominent in the public debate are issues related to animal welfare, specifically to cows grazing outside. When post-quota growth is discussed, concerns are raised about irreconcilable tensions between growth—specifically increase in herd size—and grazing, which is not only perceived as fundamental to animal welfare but also at the heart of traditional Dutch dairy farming systems and its cultural landscape. This is also why there is substantial opposition to large-scale dairy operations (mega farms). Further tensions emerge as the sector struggles with issues of nutrient management and solutions that promise more effective control of environmental impacts usually compromise on grazing. Therefore, the main perceived post-quota challenge for the dairy sector is to increase milk production and capture a share of the global demand, while operating within the national environmental and social limits. Most dairy processors have articulated sustainability programs. CONO, in particular, has set a precedent for Dutch dairy processors by identifying them as actors who have the interest and mechanisms to incentivize grazing and to facilitate the compliance of legal environmental targets and social concerns related to the performance of the sector. While some of the societal demands for dairy have been incorporated into the selection environment, the main regime logic continues to be centered on production growth and efficiency as key drivers for the continued viability of the sector.

Chapter five focuses on the Irish dairy sector. Since Ireland had a later entrance to the EU in 1973, Irish dairy had a shorter run under EU price and production supports before quotas were introduced in 1984. The traditional grass-based dairy systems—enabled by the country's mild temperatures and plentiful grasslands—are still relatively small in scale. As a result, tensions between dairy production and the integrity of the environment have not reached critical levels. However, the sector has a strong long-standing export orientation and the removal of quotas creates opportunities for substantial growth. The ambitious growth targets set by the sector do face challenges. Coping with amplified price volatility while financing the expansion of Irish dairy is widely identified by actors in the sector as one of those challenges. Additionally, a recent yet increasingly articulated public debate raises questions about the impacts of unrestrained growth on the quality of the environment and the ability of Ireland to reduce its greenhouse gas (GHG) emissions. Ireland has so far failed to meet its binding GHG emission reduction targets. The analysis shows how the sector-wide sustainability approach frames Irish dairy as inherently sustainable and as such its program prioritizes the documentation and maintenance of these credentials in order to support the expansion of the sector. Through its sustainability program, Glanbia Ingredients Ireland (GIIL) shows alignment to the regime logic of further intensification and growth. GIIL seeks to ensure the continuity of dairy within this frame. Through its sustainability code and related initiatives, it offers a range of opportunities for farmers to equip themselves to confront these challenges. GIIL appears to be anticipating changes in the regime selection environment more proactively than could be said for the sector in general.

In chapter six I present the case study of the dairy sector in the United Kingdom. While I observe the same intensification logic across cases, the UK dairy sector is also strongly shaped by another force, namely the sixty years that producer-controlled milk marketing boards (MMB) have existed, up until 1993. The key challenge going forward is, above all, the economic survival and revitalization of the sector. First, after the demise of the MMB, the structural features of the sector are proving to be suboptimal for the increasing liberalized market logic. Second, the domestic orientation of the sector, as well as the increased market concentration in food retail, are factors that put dairy producers in a relatively weak market position. Given the contraction of the sector in the last decade, the removal of quotas has less significance in terms of production limits. Rather, the challenge of price volatility that will affect European dairy in general is expected to have an amplified effect for British farmers, due to the low current profitability of the sector. While economic viability is a crucial present concern, strong societal norms regarding animal welfare as well as the negative experiences with farm animal epidemics have highlighted tensions between dairy production on the one hand and animal welfare and food safety on the other. These concerns have been addressed through EU and national regulations as well as widespread private food assurance schemes. Issues related to the environmental impact of dairy, including its carbon footprint, have been addressed through a mix of public and private responses. The analysis reveals that when it comes to sustainability programs, the role of dairy processors is relatively less prominent in the UK. For the last decade, retailers have addressed concerns about the economic sustainability of British dairy by developing direct supply contracts based on production cost models. The requirements to join direct supply groups, mandated by retailers, have increasingly incorporated environmental indicators and animal welfare related practices. The sustainability program of dairy processor First Milk, focuses on addressing the economic challenges facing farmers by developing and documenting sustainability related attributes, which can be argued is in line with the generalized practices of assurance-based market access.

Chapter seven describes the main findings of the study. It includes a reflection on its general approach and the contributions to the literature on, and understanding of, sustainability transitions and agri-food systems transitions. By contrasting the findings from the three case studies, I argue that the post-war regime rules for dairy have continued to shape its development through today. While I show how the increasingly visible impacts of intensive dairy farming systems have led to adaptations to the dominant dairy rules and practices, these changes have not been fundamental in nature. The increase of scale and efficiency as a way to reduce production costs and impact per unit continues to be at the center of the selection environment and of how performance is internally measured. The analysis of dairy processors and their sustainability programs revealed that sustainability programs can be an additional tool for compliance to legal standards and the alleviation of pressing societal concerns. However, they have been unable to ensure that the dairy sector operates within established environmental limits and societal expectations, while providing a stable livelihood for farmers.

This study adds to the theoretical discussion about regime change in the light of sustainability transitions in several ways. First, it focuses on regime change as opposed to studying change emerging through radical niche innovations. While doing that, it shows the usefulness of mobilizing the concept of obligatory passage points to identify and conceptualize the mechanisms through which the regime adapts to the shifting selection environment and dominant actors strive for their own continuity. Secondly, it adds to the debate about the role that regime actors can have in sustainability transitions. In this respect, I argue that the involvement of dominant and established actors in transitions towards more sustainably organized societal functions is key. However, I postulate that the weight of the established cognitive and, to some extent, normative rules is such that these actors are unable to guide such processes. Third, this study advances the empirical ground in sustainability transition studies by focusing on another domain besides energy, adding to the understanding of processes of change of societal functions in a situation that is less likely to be technologically driven and where social change plays a larger role. Finally, this study connects past development, current challenges, and present engagement in a discussion about the future development of the dairy sector in three European countries. Altogether, this adds to the further conceptualization and understanding of the complexity and co-evolutionary nature of sustainability transitions.

Samenvatting

De Europese melkquota zijn per 31 maart 2015 opgeheven. Na dertig jaar van quota is dit een belangrijke verandering voor de Europese zuivelsector. Deze opheffing is aanleiding geweest voor talrijke debatten over de toekomst van zuivel in Europa. Nieuwe marktmogelijkheden—met name de verwachte stijging van de vraag naar zuivel uit Aziatische landen—en de bijbehorende uitbreiding van de sector worden afgezet tegen de negatieve effecten die deze significante groei zou hebben op het milieu, dierenwelzijn en de samenleving. Hoewel de afschaffing van quota extra aandacht heeft gevestigd op deze afwegingen, zijn ze niet nieuw. De naoorlogse ontwikkeling van de Europese zuivelsector is gedreven door toenemende intensivering van productie middels modernisering en specialisatie. Tegelijkertijd is er toenemend bewijs dat de intensieve melkveehouderij een belasting vormt voor milieu, dierenwelzijn en landschap. Terwijl gaandeweg EU- en nationaal beleid is ontwikkeld om de negatieve externe effecten van zuivelproductie te reguleren, roept de afschaffing van quota de vraag op of de zuivelsector haar ontwikkeling kan voortzetten zonder over milieu- en maatschappelijke grenzen heen te gaan.

Een gerelateerde ontwikkeling is de toenemende marktconcentratie op verwerkings- en detailhandelniveau. Tegen deze achtergrond hebben zuivelonderneming de afgelopen jaren duurzaamheidsprogramma's geïntroduceerd. Daarmee beogen ze de negatieve gevolgen van de melkveehouderij en zuivelverwerking te verminderen en tevens de reputatie en legitimiteit van de sector te waarborgen. Dit is de empirische achtergrond voor de hoofdvraag van dit proefschrift:

> Hoe verandert de Europese zuivelsector om toekomstige levensvatbaarheid te waarborgen en hoe zijn duurzaamheidsprogramma's van zuivelondernemingen onderdeel van deze verandering?

Deze onderzoeksvraag is benaderd met behulp van de volgende deelvragen:

1. Hoe heeft de zuivelsector zich ontwikkeld sinds de Tweede Wereldoorlog?
2. Wat zien actoren in de zuivelsector als uitdagingen voor de duurzaamheid van de sector?
3. Op welke uitdagingen richten de duurzaamheidsprogramma's van conventionele zuivelondernemingen zich; en hoe?
4. Hoe beïnvloeden duurzaamheidsprogramma's van conventionele zuivelondernemingen de zuivelsector?

Deze vragen worden onderzocht door drie zuivelondernemingen in verschillende Europese landen, hun duurzaamheidsprogramma's en de ontwikkeling van de zuivelsector waarin ze actief zijn, te bestuderen. De theoretische lens waarvan deze studie gebruik maakt is transitietheorie, specifiek het conceptuele kader van duurzaamheidstransities. Door de onderzoeksvraag te deconstrueren middels begrip van het werk over duurzaamheidstransities, kan een discussie worden gevoerd over hoe dominante structuren van regels en gevestigde praktijken—door middel waarvan we in sociale behoeften zoals transport, energie en eten voorzien—veranderen in meer duurzame structuren. Bovendien ondersteunt deze benadering de analyse van sleutelactoren, zoals zuivelondernemingen, en de rol die zij spelen in dergelijke fundamentele verandering. Transitietheorie wordt gekenmerkt door zijn probleemgerichtheid en gevoeligheid voor longitudinale ontwikkeling van complexe co-evolutionaire processen. Dit, zo blijkt uit dit onderzoek, is erg relevant gezien de erfenis van vroegere ontwikkelpaden en huidige en toekomstige duurzaamheidsuitdagingen.

Binnen het veld van transitietheorie wordt een set van regels, normen en praktijken geconceptualiseerd als een socio-technisch regime. Regimes zijn zowel middel als resultaat van de uitoefening van maatschappelijke functies. Hoewel ze niet statisch zijn, neigen ze naar stabiliteit (Geels 2004; Giddens 1984). Transities worden op hun beurt gedefinieerd als fundamentele veranderingen in regels, normen en praktijken die voortkomen uit confrontaties van het regime met radicale innovaties en veranderingen op macro-niveau (bijvoorbeeld omgevings-, fysieke, sociale en technologische verandering). Bij de studie van duurzaamheidstransities ligt veel nadruk op normatieve verwachtingen en de richting van innovatie, en daarnaast op het handelingsperspectief van actoren. In deze studie wordt het begrip "obligatory passage points" (Callon 1986) gebruikt om de invloed van dominante actoren en de mechanismen waarmee ze zichzelf onmisbaar maken te onderzoeken. De hierboven genoemde begrippen zijn de belangrijkste theoretische principes die ten grondslag liggen aan de operationalisering van deze studie.

De onderzoeksvragen worden beantwoord door gebruik te maken van casestudies. Casestudies zijn geschikt om complexe, niet-lineaire processen—zoals transities—te onderzoeken, met name omdat ze zich lenen voor procesverkenning, contextualisering en het verkennen van patronen. Ik heb drie casestudies uitgevoerd die zich richten op de zuivelsectoren in Nederland, Ierland en het Verenigd Koninkrijk. Met de input van meerdere casestudies kon ik de onderzoeksvragen diepgaand verkennen, zowel per case als vergelijkend tussen cases. Ik heb Europese landen gekozen waar de zuivelsector een belangrijke economische en culturele rol speelt. In elk land heb ik een zuivelonderneming geïdentificeerd die al een duurzaamheidsprogramma had geformuleerd of bezig was dat te doen. Per land heb ik de naoorlogse ontwikkeling van de sector, de percepties van actoren over uitdagingen voor de sector en tenslotte de totstandkoming en de betekenis van de corresponderende drie duurzaamheidsprogramma's ontrafeld en beschreven. Documentanalyse en semi-gestructureerde interviews zijn de primaire bronnen die voor deze studie zijn gebruikt.

De onderzoeksvragen worden allemaal onderzocht door middel van de drie casestudies. Elk empirisch hoofdstuk (te weten hoofdstukken 4 tot en met 6) bevat de analyse van één specifieke zuivelsector en zuivelonderneming. Mijn bevindingen worden daarna met elkaar vergeleken om tot relevante inzichten te komen die ons leren hoe de zuivelsector verandert, welke rol de zuivelondernemingen in die verandering spelen en hoe dit verband houdt met de toekomstige levensvatbaarheid van de sectoren.

In Hoofdstuk 4 beschrijf ik de naoorlogse ontwikkeling van de Nederlandse zuivelsector en onderzoek ik de belangrijkste uitdagingen voor de sector en reacties daarop. De aan het begin benoemde dominante regimelogica—toenemende intensivering van productie door modernisering en specialisatie—blijkt daarin leidend, waarbij er tijdens de quotaperiode een nadruk lag op efficiëntieverhoging en de vermindering van productiekosten. Dit heeft geleid tot het structureel vergroten van boerderijen, het verhogen van de melkopbrengsten, het verminderen van het aantal boerderijen en verdere automatisering van de zuivelproductie. Uit de analyse blijkt dat van alle mogelijke uitdagingen dierenwelzijn het meeste aandacht krijgt in het publieke debat, in het bijzonder de weidegang van de koeien. Wanneer postquota groei ter sprake komt, worden steevast zorgen geuit over een onverenigbaar geachte spanning tussen groei—specifiek de toename van de kuddegrootte—en weidegang, wat niet alleen wordt gezien als essentieel voor dierenwelzijn, maar ook het hart is van de traditionele Nederlandse melkveehouderij en het Nederlandse cultuurlandschap. Dit is ook waarom er stevige tegenstand is tegen grootschalige zuivelproductie ("mega farms"). Verdere spanning ontstaat doordat de sector veel voedingsstoffen moet importeren en (onder andere daardoor) vervuiling veroorzaakt en doordat oplossingen die effectieve beheersing van milieueffecten beloven juist vaak de weidegang verder beperken. De zuivelsector ziet daarom als haar belangrijkste uitdaging sinds de opheffing van de melkquota om de melkproductie te vergroten—en daarmee een aanzienlijk deel van de wereldwijde zuivelmarkt in handen te houden—terwijl tegelijkertijd binnen nationale milieu- en maatschappelijke grenzen te opereren. De meeste zuivelondernemingen hebben duurzaamheidsprogramma's. CONO in het bijzonder heeft een precedent geschapen voor Nederlandse zuivelondernemingen door hen aan te wijzen als actoren die de belangen en middelen hebben om enerzijds weidegang te stimuleren en om anderzijds de naleving van wettelijke milieudoelstellingen en goede omgang met maatschappelijke zorgen door de sector te stimuleren. Terwijl sommige van de maatschappelijke aandachtspunten via deze weg onderdeel zijn geworden van de marktselectiecriteria voor succesvolle ondernemingen, blijft de dominante logica van het regime gericht op productiegroei en toenemende efficiëntie als kernelementen voor de toekomstige levensvatbaarheid van de sector.

Hoofdstuk 5 richt zich op de Ierse zuivelsector. Aangezien Ierland pas in 1973 is toegetreden tot de EU, heeft de Ierse zuivelsector korter gebruik kunnen maken van de EU-ondersteuning voor productie en prijs van zuivel tot de invoering van de quota in 1984. De traditionele zuivelproductie op basis van buiten grazend vee—aantrekkelijk door de milde temperaturen en de overvloedige graslanden in het land—is daardoor nog steeds relatief kleinschalig. Als gevolg daarvan hebben spanningen tussen de zuivelproductie en het milieu nog geen kritiek niveau bereikt. De sector is al lang sterk gericht op de export en de opheffing van de quota creëert kansen op substantiële groei. De ambitieuze groeidoelstellingen die de sector formuleert leiden echter ook tot uitdagingen. Voorbeelden hiervan, die door de actoren in de sector zelf worden gezien, zijn het omgaan met grotere wisselvalligheid van de melkprijs en de financiering van de groei. Daarnaast trekt een recent, maar steeds luider publiek debat de houdbaarheid van ongeremde groei in twijfel, gezien de impact daarvan op het milieu en de haalbaarheid voor Ierland om diens bindende klimaatdoelstellingen te halen. Tot op heden loopt Ierland achter met deze klimaatdoelstellingen. Uit de analyse blijkt dat de sectorbrede duurzaamheidsprogramma's de Ierse zuivelsector als inherent duurzaam beschouwen en zich daarom vooral richten op documentatie en bestendiging van dit beeld ten bate van de uitbreiding van de sector. Glanbia Ingredients Ireland (GIIL) toont in haar duurzaamheidsprogramma dat ze de regimelogica van verdere intensivering en groei onderschrijft. GIIL tracht de continuïteit van zuivel binnen dit kader te waarborgen. Door een duurzaamheidscode en aanverwante initiatieven biedt GIIL een groot aantal kansen voor boeren om deze uitdagingen aan te pakken. GIIL lijkt actiever te anticiperen op veranderingen in de markt dan de rest van de sector.

Hoofdstuk 6 beschrijft de zuivelsector in het Verenigd Koninkrijk. Terwijl ik bij alle cases dezelfde regimelogica zie, is de Britse zuivelsector ook sterk gevormd door een andere dynamiek, namelijk de door zuivelondernemingen gedomineerde "milk marketing boards" (MMB) die zestig jaar bestonden, tot 1993. De belangrijkste uitdaging is met name het economisch overleven en vernieuwen van de sector. Ten eerste blijkt dat de sector na de ondergang van de MMB suboptimaal georganiseerd is voor de geliberaliseerde marktlogica. Ten tweede hebben zuivelondernemingen een relatief zwakke onderhandelingspositie door de binnenlandse oriëntatie in combinatie met de grote marktconcentratie in de levensmiddelendetailhandel. Door de krimp van de sector in de afgelopen tien jaar, heeft de afschaffing van quota minder gevolgen voor de productiegrenzen. De toegenomen prijsfluctuaties die de Europese zuivelsector in het algemeen zal beïnvloeden, zullen naar verwachting echter juist een grotere impact hebben op de Britse boeren, aangezien de sector nu al kampt met lage winstgevendheid. Sterke maatschappelijke normen inzake dierenwelzijn en de negatieve ervaringen met epidemische veeziekten hebben daarnaast de aandacht gevestigd op de spanning tussen zuivelproductie enerzijds en dierenwelzijn en voedselveiligheid anderzijds. De maatschappelijke zorgen worden aangepakt door EU-brede en nationale regelgeving en door wijdverbreide kwaliteitskeurmerken voor voedingsproducten. Milieugerelateerde uitdagingen, waaronder de klimaatimpact, worden aangepakt door middel van een mix van publieke en private initiatieven. Uit de analyse blijkt dat bij duurzaamheidsprogramma's de rol van zuivelondernemingen in het Verenigd Koninkrijk minder prominent is. De afgelopen tien jaar heeft de detailhandel de economische levensvatbaarheid van de Britse zuivelproductie verzekerd door middel van directe inkoopcontracten op basis van de kostprijs. De detailhandel heeft haar leveranciers gaandeweg strengere eisen opgelegd op het gebied van milieu en dierenwelzijn. Het duurzaamheidsprogramma van zuivelonderneming First Milk richt zich op het aanpakken van de economische uitdagingen waarmee boeren worden geconfronteerd en op het ondersteunen van boeren bij het voldoen aan specifieke duurzaamheidscriteria. Dit sluit aan bij de marktaanpak waarbij kwaliteitskeurmerken een belangrijk middel zijn om maatschappelijke zorgen het hoofd te bieden.

Hoofdstuk 7 somt de belangrijkste bevindingen van de studie op. Het bevat een reflectie op de onderzoeksaanpak van deze studie en op haar bijdragen aan de literatuur over en begrip van duurzaamheidstransities en transities van landbouw- en voedingsystemen. Op basis van een vergelijking van de drie casestudies beargumenteer ik dat de naoorlogse regimeregels voor de zuivelsector tot op de dag van vandaag leidend zijn bij verdere ontwikkeling van de sector. Ik laat zien dat, hoewel de in toenemende mate zichtbare gevolgen van de intensieve melkveehouderij hebben geleid tot aanpassingen aan de dominante regels en praktijken in de sector, deze veranderingen niet van fundamentele aard zijn. Schaalvergroting en efficiëntie blijven centraal in de selectieomgeving en in de manier waarop prestaties intern gemeten worden. Mijn analyse van zuivelondernemingen en hun duurzaamheidsprogramma's toont aan dat duurzaamheidsprogramma's een aanvullend instrument kunnen zijn voor de naleving van wettelijke normen en om dringende maatschappelijke zorgen te verlichten. Zij hebben er echter niet voor kunnen zorgen dat de zuivelsector binnen vastgestelde milieugrenzen en maatschappelijke verwachtingen opereert, noch dat zuivelboeren er stabiel mee in hun levensonderhoud kunnen voorzien.

Deze studie voegt op meerdere manieren iets toe aan de theoretische discussie over regimeverandering binnen duurzaamheidstransities. Ten eerste richt het zich op de regimeverandering zelf in tegenstelling tot het bestuderen van veranderingen die voortkomen uit radicale niche-innovaties. Daarbij blijkt dat het concept van "obligatory passage points" nuttig is om de mechanismen te identificeren waarmee het regime zich aanpast aan veranderingen in de selectieomgeving en waarmee dominante actoren streven naar hun eigen continuïteit. Ten tweede geeft deze studie nieuwe inzichten voor het debat over de rol die van regime-actoren verwacht mag worden in duurzaamheidstransities. In dat opzicht beargumenteer ik dat het betrekken van dominante en gevestigde actoren bij duurzaamheidstransities essentieel is. Daarbij stel ik echter vast dat de gevestigde cognitieve en, tot op zekere hoogte, normatieve regels zodanig in deze actoren verankerd zijn, dat zij niet in staat zijn zelf richting te geven aan duurzaamheidstransities. Ten derde verstevigt deze studie de empirische ondergrond waarop de kennis over duurzaamheidstransities gestoeld is, door zich te richten op een ander domein dan energie. Dit vergroot het begrip van veranderprocessen in situaties die minder technologisch gedreven zijn en waarin sociale verandering een grotere rol speelt. Tenslotte verbindt deze studie de geschiedenis, de huidige uitdagingen en de duurzaamheidsprogramma's van zuivelondernemingen in een discussie over de toekomst van de zuivelsector in drie Europese landen. Samenvattend stelt dit werk ons in staat om de complexiteit en co-evolutionaire aard van duurzaamheidstransities verder te conceptualiseren en te begrijpen.

Resumen

El 31 de marzo de 2015 el régimen europeo de cuotas de producción de leche llegó a su fin. Después de treinta años en vigor, la abolición de las cuotas representa un cambio importante para el sector lácteo en Europa. La decisión de eliminar las cuotas de producción de leche ha desatado debates sobre el futuro de los sistemas de producción de lácteos en la región. Las nuevas oportunidades de mercado, especialmente el crecimiento proyectado de la demanda de productos lácteos en los países asiáticos, y la correspondiente expansión del sector que esto implicaría, se evalúan paralelamente con los impactos negativos que un crecimiento significativo de la producción tendría para el medio ambiente, los animales y la sociedad. Este debate, aunque ha ganado prominencia en los últimos años debido a la eliminación de las cuotas, no es nuevo. El desarrollo de la industria láctea europea después de la segunda guerra mundial se ha centrado en la intensificación de la producción lechera mediante la modernización y la especialización de los sistemas de ganadería lechera. Paralelamente, la evidencia sobre el impacto que la intensificación de la producción de leche tiene en el ambiente, en el bienestar animal, y en la configuración del paisaje rural tradicional, crece. En las últimas décadas, la Unión Europea y los gobiernos nacionales han establecido regulaciones para controlar los efectos negativos de la producción lechera. Sin embargo, existen cuestionamientos sobre la medida en que el sector lácteo Europeo puede continuar su desarrollo sin sobrepasar los límites ambientales y sociales una vez que las cuotas de producción sean abolidas.

Un fenómeno relacionado es la creciente concentración de mercado en la industria procesadora de lácteos, así como el sector de venta al menudeo (supermercados). Dada su posición de mercado, en los últimos años los procesadores de lácteos han desarrollado programas de sostenibilidad diseñados para reducir los impactos negativos de la ganadería lechera y del procesamiento de leche, así como proteger su imagen y reputación, así como la legitimidad del sector. Este es el contexto partir del cual se formuló la siguiente pregunta de investigación:

> ¿De qué forma está cambiando el sector lácteo europeo para garantizar su viabilidad futura, y qué rol tienen los programas de sostenibilidad de los procesadores lecheros en los cambios del sector?

Esta pregunta de investigación se abordó a través de las siguientes preguntas secundarias:

1. ¿Cómo se ha desarrollado el sector lácteo desde la segunda guerra mundial?
2. ¿Qué retos de sostenibilidad para el sector son percibidos por los actores del sector lácteo?
3. ¿Qué desafíos tratan de abordar los programas de sostenibilidad de los procesadores lecheros y cómo lo hacen?
4. ¿Cómo afectan los programas de sostenibilidad de los procesadores lecheros convencionales al sector lácteo?

Para responder estas preguntas de investigación se estudiaron tres procesadores lácteos ubicados en diferentes países europeos. Esto incluyó estudiar sus programas de sostenibilidad así como el desarrollo desde la posguerra del sector lácteo en el que operan. El marco teórico que guía este estudio tiene base en la teoría de transiciones socio-técnicas y en particular, hace uso de los conceptos sobre las transiciones socio-técnicas hacia la sostenibilidad. El análisis de las preguntas de investigación a través de este marco teórico permite generar un debate sobre la forma en que los sistemas a través de los cuales satisfacemos necesidades sociales (p.ej. alimenticias, de transporte, y energía) y que están basados en reglas y practicas bien establecidas, se puede trasformar en sistemas más sostenibles. Además, facilita el análisis de los actores clave, como los procesadores lecheros, y su rol en un cambio tan fundamental. La teoría de transiciones socio-técnicas se caracteriza también por su enfoque en retos de sostenibilidad y por su atención a la dinámica temporal de los procesos de transformación de largo plazo. Estas características son especialmente relevantes en un estudio como este, donde se reflexiona sobre el pasado de los sistemas lácteos, así como sobre los desafíos actuales y futuros relacionados con su sostenibilidad.

Dentro de la teoría de transiciones socio-técnicas, el conjunto de reglas, normas y prácticas establecidas se conceptualizan bajo el termino de régimen socio-técnico. Los regímenes se pueden conceptualizar también como 'medio y resultado' a través de los cuales se reproducen los sistemas dominantes que ayudan a satisfacer las necesidades sociales. Por ende estos sistemas no son estáticos pero si buscan una reproducción estable (Geels, 2004; Giddens, 1984). Las transiciones socio-técnicas se definen como los cambios fundamentales en las reglas, normas y prácticas que surgen cuando el régimen es cuestionado por las innovaciones radicales, así como las presiones relacionadas con cambios a nivel macro (p.ej. cambios en el medio ambiente, sociales, y tecnológicos). Dentro de las transiciones hacia sistemas sostenibles, se hace hincapié en las expectativas normativas y en el rumbo de la innovación, así como en la capacidad de los actores para facilitar el cambio hacia sistemas sociales más sostenibles. En este estudio se utiliza la noción de puntos de paso obligatorios (Callon 1986) para explorar la influencia que los actores dominantes y los mecanismos a través de los cuales imponen acciones obligatorias que a su vez los mantienen como actores indispensables para el funcionamiento del sistema. Los principios teóricos mencionados brevemente aquí son los que sustentan la instrumentalización del estudio.

En cuanto a la metodología, este estudio se desarrolló a través del método de estudio de caso. Los estudios de casos son adecuados para explorar procesos complejos y no lineales tales como las transiciones socio-técnicas, especialmente porque estos implican un enfoque en la identificación de procesos, el mapeo del contexto y exploración de patrones. Llevé a cabo tres estudios de caso sobre los sectores lecheros de los Países Bajos, Irlanda y el Reino Unido. Realizar múltiples estudios de caso me permitió explorar las preguntas de investigación en profundidad a través de cada caso individual, y también comparar los resultados de los diferentes casos. Seleccioné países europeos en los que el sector lácteo ha desempeñado un papel económico y sociocultural importante. Identifiqué organizaciones procesadoras lecheras que hubieran desarrollado (o empezado a desarrollar) un programa de sostenibilidad y seleccioné una en cada país. Para cada caso, estudié y describí el desarrollo que tuvo el sector lácteo desde la posguerra, la percepción de los actores sobre los desafíos que enfrenta el sector, así como el proceso de desarrollo del programa de sostenibilidad en cuestión. Los métodos principales de recopilación de datos utilizados en este estudio fueron el análisis de documentos y las entrevistas semi-estructuradas.

Todas las preguntas de investigación fueron respondidas en cada uno de los tres estudios de caso. En cada capítulo donde se presentan los estudios de caso (capítulos cuatro a seis), muestro el análisis de ese sector lechero y del procesador lechero en cuestión. Los hallazgos de cada caso fueron comparados con el fin de identificar los puntos de vista relevantes que pueden contribuir a nuestra comprensión de cómo está cambiando el sector lácteo, qué función desempeñan los programas de sostenibilidad de los procesadores lecheros en los cambios del sector y cómo se relaciona todo esto con la viabilidad futura de los tres sectores. Analicé los hallazgos de cada estudio de caso y a partir de este análisis también presento un debate general sobre el sector lácteo Europeo.

En el capítulo cuatro describo el desarrollo que ha tenido el sector lechero holandés desde el fin de la segunda guerra mundial hasta hoy y examino los retos y respuestas clave relacionados con su futuro. Durante la vigencia de las cuotas de producción, el régimen dominante enfocado en la intensificación de la producción de lácteos, fue dominado por un principio de escala y eficiencia. Estructuralmente esto ha resultado en la ampliación de las operaciones ganaderas, el aumento de la producción de leche por vaca, la reducción del número de granjas y la automatización de la producción lechera. El análisis de este estudio de caso revela que en el debate público predominan temas relacionados con el bienestar animal, específicamente con las vacas pastando libres en los pastizales. Cuando se debate el tema del crecimiento del sector post-cuota, se plantean preocupaciones sobre la incompatibilidad entre el crecimiento, específicamente aumento del tamaño del rebaño de vacas lecheras, y la posibilidad de que las vacas pasteen en el campo. El pastoreo no sólo es percibido como fundamental para el bienestar de los animales, sino también para la conservación de las áreas rurales. Esta es también la razón por la que hay una oposición importante en contra de las operaciones ganaderas de gran escala (mega granjas). Otro tema que agrava este debate es el exceso de nutrientes relacionado a operaciones ganaderas muy intensivas y el hecho que las soluciones que prometen un control más efectivo de los impactos ambientales usualmente implican una reducción en el pastoreo. Por lo tanto, el principal reto percibido para el sector lácteo es aumentar la producción de leche y capturar una parte del mercado lechero mundial, y al mismo tiempo respetar los límites ambientales y sociales. La mayoría de los procesadores de productos lácteos han desarrollado programas de sostenibilidad. CONO, en específico, ha creado un precedente para los procesadores lecheros holandeses ya que a través de sus acciones dejó claro que son los procesadores lecheros los actores que tienen tanto el interés como los mecanismos para incentivar el pastoreo y para facilitar el cumplimiento de los objetivos ambientales reglamentados, así como las preocupaciones sociales relacionadas con el desempeño del sector. Si bien algunas de las demandas sociales sobre la producción de productos lácteos han sido incorporadas en el mercado, la lógica dominante en el sector sigue enfocada en el aumento de la producción lechera y la eficiencia como factores clave para la viabilidad del sector.

En el capítulo cinco se presenta el estudio de caso sobre el sector lácteo irlandés. Irlanda tuvo un ingreso tardío a la Unión Europea ya que fue hasta 1973 que formo parte de ella, esto significó que el sector lácteo irlandés gozo de los subsidios y apoyos a la producción por un periodo más corto que los demás miembros antes de que se introdujeran las cuotas de producción de leche en 1984. Los sistemas lácteos tradicionales en Irlanda son aun relativamente pequeños en escala y se basan en pastizales ya que las temperaturas y la geografía son muy favorecedores para este tipo de ganadería lechera. Como resultado, las tensiones entre la producción lechera y la conservación del ambiente no han alcanzado niveles críticos en este país. Sin embargo, el sector tiene una fuerte orientación hacia la exportación desde hace mucho tiempo y la eliminación de cuotas crea oportunidades para un crecimiento substancial. Los objetivos de crecimiento establecidos por el sector son ambiciosos y para lograrlos el sector se enfrenta a retos importantes. Los actores del sector lácteo identifican la volatilidad en los precios de la leche y el financiamiento de la expansión del sector como dos de los desafíos más importantes. Aunque el debate público sobre la expansión del sector es relativamente reciente, en él se definen claramente interrogantes sobre los impactos que puede tener el crecimiento desenfrenado de producción láctea sobre la calidad del medio ambiente así como la capacidad de Irlanda para reducir sus emisiones de gases de efecto invernadero (GEI). Hasta ahora, Irlanda no ha cumplido sus objetivos de reducción de emisiones GEI. El análisis de este caso muestra que la posición del sector lácteo sobre el tema de sostenibilidad es que la producción láctea irlandesa es naturalmente sostenible y, como tal, el programa del sector prioriza la documentación y el mantenimiento de estas credenciales para apoyar la expansión del sector. A través de su programa de sostenibilidad, Glanbia Ingredients Ireland (GIIL) se puede ver que este procesador está alineado con la lógica dominante en el sector que busca mayor intensificación y crecimiento de la producción. GIIL busca asegurar la continuidad de los productos lácteos dentro de este marco. A través de su código de sostenibilidad así como de las iniciativas relacionadas al tema, GIIL ofrece una variedad de oportunidades para que los agricultores se preparen para hacer frente a los desafíos del futuro. Podría decirse que GIIL parece anticipar los cambios en el mercado lácteo más proactivamente de lo que se observa en las acciones del sector en general.

El estudio de caso sobre el sector lácteo en el Reino Unido se presenta en el capítulo seis. Si bien se observa la misma lógica de intensificación en todos los casos, el desarrollo del sector lácteo del Reino Unido también ha sido fuertemente influenciado por los sesenta años (hasta 1993) en los cuales la comercialización de leche fue completamente controlada por los productores. El reto clave en este caso es la supervivencia económica y la revitalización del sector lácteo inglés. Después de la desaparición de la comercialización de leche centralizada, el sector se enfrenta a que su estructura es de menor alcance bajo la lógica del mercado liberalizado. Además el sector ha estado tradicionalmente enfocado al mercado de consumo interno y el aumento del poder de negociación de los supermercados son factores que ponen a los productores de lácteos en una posición de mercado relativamente débil. Dado que el sector se ha contraído en la última década, la eliminación de cuotas tiene menos importancia en términos de límites de producción. Se prevé que la volatilidad de los precios, que afectará a los productos lácteos europeos en general, tenga un efecto más agudo para los agricultores británicos, debido a la baja rentabilidad actual del sector. Si bien la viabilidad económica es una preocupación fundamental, también se han manifestado tensiones entre la producción lechera, por un lado, y el bienestar animal por el otro. Esto se debe a las arraigadas normas sociales acerca del bienestar animal que han sido reforzadas a través de las experiencias negativas con epidemias animales en el Reino Unido. Estas preocupaciones se han abordado a través de las regulaciones de la UE, del marco regulatorio nacional, así como de esquemas privados de certificación de calidad de los alimentos. Las cuestiones relacionadas con el impacto ambiental de los productos lácteos, incluida su huella de carbono, se han abordado mediante una combinación de iniciativas públicas y privadas. El análisis revela que cuando se trata de programas de sostenibilidad, el papel de los procesadores de productos lácteos es relativamente menos prominente en el Reino Unido. Durante la última década, las cadenas de supermercados han respondido a las preocupaciones sobre la sostenibilidad económica de los productos lácteos británicos mediante el desarrollo de contratos directos de suministro basados en modelos de costos de producción. Los requisitos para unirse a estos grupos de suministro directo son establecidos por los supermercados y han incorporado cada vez más indicadores ambientales y prácticas relacionadas con el bienestar de los animales. El programa de sostenibilidad del procesador de lácteos First Milk, se centra en los desafíos económicos que enfrentan los agricultores. El programa busca que mediante el desarrollo y documentación de atributos relacionados con la sostenibilidad, surjan oportunidades de mercado. Esto está alineado a las prácticas generalizadas en el sector donde el acceso al mercado está basado en las garantía y certificaciones que ofrece el producto.

En el capítulo siete se describen los principales hallazgos del estudio. Se incluye una reflexión general sobre el enfoque del estudio así como de las contribuciones del mismo a la literatura y al entendimiento de las transiciones de la sostenibilidad, en particular a las transiciones de los sistemas agroalimentarios. Al contrastar los hallazgos de los tres estudios de caso, sostengo que las reglas del régimen que guía la producción de lácteos desde la posguerra se han mantenido vigentes hasta hoy. Si bien demuestro cómo los impactos negativos de los sistemas intensivos de producción lechera, que son cada vez más visibles, han resultado en adaptaciones a las reglas y prácticas dominantes, estos cambios no han sido fundamentales. El aumento de la escala y la eficiencia como una forma de reducir los costos de producción y el impacto por unidad sigue siendo el criterio clave de selección y de cómo se mide el rendimiento internamente. El análisis de los procesadores de productos lácteos y sus programas de sostenibilidad reveló que los programas de sostenibilidad pueden ser una herramienta adicional para el cumplimiento de las normas legales y contribuir a resolver preocupaciones sociales apremiantes. Sin embargo, estos programas no han podido asegurar que el sector lácteo opere dentro de los límites ambientales establecidos y las expectativas de la sociedad, ni que proporcione un medio de vida estable para los agricultores.

Este estudio contribuye de varias maneras al debate teórico sobre el cambio en los sistemas agroalimenticios dominantes en el contexto de las transiciones hacia la sostenibilidad. En primer lugar, el estudio se centra en el cambio del régimen establecido en lugar de estudiar el cambio que surge a través de innovaciones radicales de nicho. Al hacerlo, se demuestra la utilidad de usar el concepto de puntos de paso obligatorios para identificar y conceptualizar los mecanismos a través de los cuales el régimen se adapta al entorno cambiante y los actores dominantes luchan por mantener su posición y asegurar su continuidad. En segundo lugar, este estudio contribuye al debate sobre el papel que los actores con influencia en el sector pueden tener en las transiciones hacia sistemas más sostenibles. En relación con este punto, sostengo que la participación de actores dominantes y establecidos en los procesos de transición hacia sistemas socio-técnicos más sostenible, es clave. Sin embargo, también sostengo que el peso de las reglas cognitivas establecidas y, en cierta medida, de las reglas normativas es tal, que estos actores no pueden guiar estos procesos de transformación. En tercer lugar, a través de este estudio se avanza el terreno empírico en los estudios de transición hacia la sostenibilidad, ya que se enfoca en un sector diferente al de la energía, lo cual contribuye a la comprensión de los procesos de cambio de funciones sociales en una situación donde el cambio social, no la tecnología, juega un papel importante. Por último, este estudio conecta el desarrollo histórico, los retos actuales y el compromiso actual en un debate sobre el futuro desarrollo del sector lácteo en tres países europeos. En conjunto, esto aporta a la conceptualización y comprensión de la complejidad y la naturaleza co-evolutiva de las transiciones hacia la sostenibilidad.

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About the author

Georgina Villarreal Herrera (1982) was born in Mexico City. She studied business management at Instituto Tecnológico de Monterrey. During her education, she completed an exchange year in France at CERAM Business School (now SKEMA). As an extramural activity, Georgina developed a groundbreaking open schooling program for university janitorial, cafeteria, and security campus staff. This program remained in operation after her graduation in 2006, when she obtained a degree with cum laude honors, for her Business Administration and Marketing major.

Georgina started her professional career at SCA, a global hygiene and forest products company. While still at university, she was selected for their Young Professionals program. She then went on to work as part of the strategic planning team in which she assisted in the design, implementation and follow up of the business development strategy portfolio for their consumer division. Georgina also worked on the consumer marketing side, developing and implementing strategies to support brand performance. During her time at SCA, Georgina had the valuable opportunity to be at the center of a fast moving consumer goods company, understanding the challenges it faces to be profitable and innovative, while continuously reflecting about the role of businesses in social development and their responsibility towards ethics and the environment.

In 2008, Georgina started the two-year International Master of Science Program in Environmental Studies and Sustainability Science at Lund University in Sweden. Through this interdisciplinary program, she explored questions about consumption and sustainability, discovering food and agriculture as critical cross-cutting areas in sustainable development challenges. Her thesis work focused on the interaction between science, society and policy-making within research efforts related to agriculture.

Georgina started working at the Rural Sociology Group (RSO) of Wageningen University in June of 2011 after being awarded the renowned Marie Curie Fellowship by the European Union. Her doctoral research work was conducted as part of the EU-funded project PUREFOOD, a comprehensive project exploring the socio-economic and spatial dynamics of (peri-)urban and regional foodscapes. In 2014, Georgina continued her work at RSO as lecturer in several courses and researcher on TRANSMANGO, a research project funded by the EU that focused on the effects of global drivers of change on European food and nutrition security.

In the future Georgina wishes to continue her work on sustainability, ethics and policy while incorporating her curiosity about empowering social flourishing and justice.

Georgina Villarreal Herrera
Wageningen School of Social Sciences (WASS)
Completed Training and Supervision Plan

Name of the learning activity	Department/Institute	Year	ECTS*
A) Project related competences			
PUREFOOD general introduction course	WASS	2011	1
Food and the City: a historical and conceptual introduction	WASS	2011	1
Contemporary sociological theories of food dynamics	WASS	2011	1
Contemporary economic theories of food dynamics	WASS	2011	1
Contemporary food policy and governance theories	WASS	2011	1
Contemporary food planning theories	WASS	2011	1
Theorising contemporary food dynamics: towards interdisciplinarity	WASS	2011	1
STEPS Centre Summer School	Sussex University	2012	3
International Winter School and Forum on Contemporary Agri-Food Issues	PUREFOOD	2012	4
Theories of Sustainable Transitions	Aalborg University	2013	5
B) General research related competences			
Proposal Writing	PUREFOOD	2011	6
Research methodology course	PUREFOOD	2011	1
Scientific Writing	PUREFOOD	2012	1
Presentation Skills	PUREFOOD	2012	1
Project and Time management	PUREFOOD	2012	1
Atlas.ti	WASS	2012	0.5
'Sustainability in the Dairy Food Industry: a Co-evolutionary Perspective'	Agriculture in an Urbanizing Society (1st Edition). Wageningen, The Netherlands	2012	1
'Transformation in the Food System: Sustainability Initiatives in the Conventional Food Supply Chain'	Conference on Systemic Sustainability Management. Vienna, Austria.	2013	1
Organisation & facilitation of several presentation panels	PUREFOOD International conference. Utrecht, The Netherlands	2014	1

Name of the learning activity	Department/Institute	Year	ECTS
C) Career related competences/personal development			
Translating empirical findings and theory into recommendations for practitioners	PUREFOOD	2012	1
Translating empirical findings and theory into policy recommendations	PUREFOOD	2012	1
Dutch Language course A1	Volksuniversiteit Wageningen	2011-2012	3
Dutch Language course A2	Volksuniversiteit Rotterdam	2015-2016	3
Adobe InDesign course	WUR Library	2013	0.5
Teaching (RSO 55806, ENP 31806, RSO-21806)	WUR	2013-2016	2
Secondment at Except Integrated Sustainability	PUREFOOD	2013	6
Supervising of Master Student	RSO	2015-2016	2
Total			51

*One credit according to ECTS is on average equivalent to 28 hours of study load.

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