Towards Sustainable Dairy Farming

The impact of societal pressure on sustainable transitions: the case of the Dutch dairy farming sector.

12-10-2012

Master Thesis

Science and Innovation Management

Annotation: Sustainable entrepreneurship & innovation

Utrecht University

Supervisor: E.H.M. Moors

Co-Supervisor: H. van Lente

ECTS: 45

Henriët Vrijs 3253600

h.vrijs@students.uu.nl

Europaplein 67

3526WC Utrecht

Universiteit Utrecht

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Summary

The agro-food sector is one of the most important sectors of the Dutch economy. In 2011, this sector was responsible for almost 10% of the Dutch economy and employment (Boone & Dolman, 2010). Sustainability is an important topic of concern in the agricultural sector. Topics of concerns are among others related to the effect of agriculture on animal welfare, the environment and human health. This study focused upon the dairy farming sector, as currently this sector is subject to changes that are likely to negatively influence the public image of the sector. Changes are for example an increasing amount of dairy cows which is kept inside year round, which is perceived to worsen animal welfare; up-scaling of farms, etc. This study investigates how these societal concerns, in the form of normative pressure, influence the transition of the dairy farming regime towards sustainability.

It is expected normative pressure is very important in order to stimulate sustainable innovations, because sustainable innovations often do not offer clear economic benefits for market parties. Insights from the multi level perspective are used to describe the transition of the Dutch dairy farming regime. The regime level in this study is represented by three streams. A normative pressure or problem stream, which represents societal pressure; a political/regulatory stream, which represents political and regulatory influences; and a market stream, which represents all market related impacts. The niche level is represented by a technological stream which includes among others new knowledge and technological developments. To study normative pressure, social movement theory is incorporated. The investigated period is from 1990 until now, because after the appearance of the Brundtland Report (1987) and the Rio Declaration (1992) attention for sustainability increased worldwide. The main research question is:

How does normative pressure influence the transition towards sustainability of the Dutch dairy farming regime from 1990 until now?

The research consists of two phases, a descriptive phase which describes the developments in the dairy farming sector until now; and an exploratory part in which two cases of sustainable innovations are studied. The cases studied are Cow-Compass, which aims to monitor and manage welfare of dairy cows; and RTRS (Round Table Responsible Soy), which aims to increase use of responsible produced soy.

It can be concluded that normative pressure on dairy farming to produce more sustainable increased over the past decades. The topic of concern, however, changed over time. In some cases societal organizations directly influence sustainable dairy farming, an example is the involvement of societal organizations in the development of RTRS. However, more often societal organizations influence market parties (market stream), via normative pressure, who in turn influence sustainable dairy farming. Market parties develop sustainable innovations under pressure of societal organizations; to

avoid the attention of societal organizations; or for their own reasons, for example to guarantee enough raw materials in the future. Sometimes, societal organizations also try to have an impact via the political/regulatory stream. Nonetheless, in the dairy sector, international policy makes it very hard to take actual measures, as the Netherlands have to commit to EU regulation. Therefore, Dutch policy makers have mainly an impact by stimulating market parties. This support consists of monetary resources and advice. New knowledge, for example of sustainability effects of dairy farming, or external events, such as outbreaks of animal diseases, trigger societal organizations to act, which increases normative pressure. All in all it seems in dairy farming normative pressure plays an important role to stimulate sustainable innovation.

Samenvatting

De landbouw en voedsel sector is één van de belangrijkste sectoren van de Nederlandse economie. In 2011 was de sector verantwoordelijk voor bijna 10% van de Nederlandse economie en werkgelegenheid (Boone & Dolman, 2010). Duurzaamheid is een belangrijk onderwerp van bezorgdheid in de landbouw sector. Onderwerpen waar bezorgdheid over is, zijn onder meer gerelateerd aan de effecten van landbouw op dierenwelzijn, het milieu en volksgezondheid. Deze studie focust op de Nederlandse melkveehouderij, omdat deze sector momenteel aan veel veranderingen onderhevig is die waarschijnlijk een negatieve invloed hebben op het publieke beeld van de sector. Veranderingen zijn bijvoorbeeld het opstallen van melkkoeien (verminderd dierenwelzijn), schaalvergroting, etc. In deze studie is onderzocht hoe maatschappelijke zorgen, in de vorm van normatieve/maatschappelijke druk, de transitie van de Nederlandse melkveehouderij naar duurzaamheid beïnvloeden.

Er wordt verwacht dat druk vanuit de maatschappij erg belangrijk is om duurzame innovaties te stimuleren, omdat duurzame innovaties vaak geen economische voordelen voor marktpartijen met zich mee brengen. Inzichten van de 'multi-level perspective' theorie worden gebruikt om de transitie van de Nederlandse melkveehouderij te beschrijven. Het regime niveau in deze studie wordt gerepresenteerd door drie stromen: Maatschappelijke druk of probleem stroom, deze stroom vertegenwoordigd druk vanuit de maatschappij; Politieke/regulerende stroom, die de invloed van politieke en regulerende activiteiten vertegenwoordigd; en een markt stroom die de invloed van alle marktpartijen vertegenwoordigd. Het niche niveau wordt vertegenwoordigd door een technologische stroom, die nieuwe kennis en nieuwe technologieën bevat. Maatschappelijke druk is gedefinieerd door 'social movement theory' toe te voegen. De onderzochte periode is van 1990 tot nu, omdat het Brundtland rapport (1987) en de Rio verklaring (1992) hebben geleid tot meer aandacht voor duurzaamheid wereldwijd. De hoofdvraag van dit rapport is:

Hoe beïnvloed maatschappelijke druk de transitie naar duurzaamheid van de Nederlandse melkveehouderij van 1990 tot nu?

Het onderzoek bestaat uit twee fases: een beschrijvende fase, die de ontwikkelingen in de melkveehouderij tot nu toe beschrijft; en een verkennende fase waar twee cases van duurzame innovaties bestudeerd worden. De onderzochte cases zijn het Koe-Kompas, wat tot doel heeft om welzijn van melkkoeien te monitoren en managen; en RTRS (Round Table Responsible Soy) wat het gebruik en de productie van duurzame soja wil stimuleren.

Er kan geconcludeerd worden dat maatschappelijk druk op de melkveehouderij om duurzamer te produceren over de afgelopen decennia is toegenomen. Het onderwerp van discussie is wel steeds veranderd. In sommige gevallen hebben maatschappelijke organisaties een directe invloed op een duurzame innovatie, een voorbeeld is de betrokkenheid van maatschappelijke organisaties bij de ontwikkeling van RTRS. Echter, vaker hebben maatschappelijke organisaties invloed door druk uit te oefenen op marktpartijen. Marktpartijen ontwikkelen duurzame innovaties onder invloed van druk

van maatschappelijke organisaties; om aandacht van maatschappelijke organisaties te voorkomen; of om eigen redenen, bijvoorbeeld om beschikbaarheid van grondstoffen in de toekomst te garanderen. Soms proberen maatschappelijke organisaties ook invloed uit te oefenen via politieke of regulerende instanties. Echter, in de melkveesector belet internationaal beleid het nemen van concrete maatregelen, aangezien Nederland moet voldoen aan EU regelgeving. Daarom hebben Nederlandse beleidsmakers vooral invloed door het stimuleren van marktpartijen. Deze invloed bestaat vooral uit financiële steun en advies. Nieuwe kennis, bijvoorbeeld over de effecten van de melkveehouderij op het broeikaseffect; of externe gebeurtenissen zoals uitbraken van dierziektes, activeren maatschappelijke organisaties, wat maatschappelijke druk verhoogd. Al met al lijkt het erop dat maatschappelijk druk een belangrijke rol speelt in het stimuleren van duurzame innovaties in de melkveehouderij.

List of abbreviations

BBP	Bruto Binnenlands Product
BGP	Bedrijfs Gezondheids Plan (Company Health Plan)
CDA	Christen-democratisch Appél
CLM	Centrum voor Landbouw en Milieu (Centre for Agriculture and Environment)
CSF	Critical Succes Factor
CSR	Corporate Social Responsibility
D66	Democraten 66
DSC	Dutch Soy Coalition
EL&I	Economie, Landbouw & Innovatie (Economics, Agriculture and Innovation)
GLB	Gemeenschappelijk Landbouw Beleid (Common Agricultural Policy)
IDH	Initiatief duurzame handel (Sustainable trade initiative)
LEI	Landbouw economisch instituut (Agriculture economic institution)
LTO	Land- en tuinbouw organisatie (Agriculture and horticulture organization)
MINAS	Mineralen aangifte systeem (Minerals accounting system)
MLP	Multi-level Perspective
Nevedi	Nederlandse vereniging voor diervoerers
NZO	Nederlandse Zuivel Organizatie (Dutch dairy organization)
PBB	Periodiek Bedrijfs Bezoek (periodically company visit)
PvdA	Partij voor de Arbeid
PvdD	Partij voor de Dieren (Party for the Animals)
PvdD	Partijd voor de Dieren (Party for the Animals)
RTRS	Round Table on Responsible Soy
RTRS	Round table responsible soy
SMT	Social Movement Theory
TSS	Taskforce Sustainable Soy
VVD	Volkspartij voor Vrijheid en Democratie
WQS	Welfare Quality System
WUR	Wageningen University

Content

1. Introduction

1.1 Background

The agro-food sector is one of the most important sectors of the Dutch economy. In 2011, the Netherlands had 70392 agricultural firms (CBS, 2011), which were responsible for almost 10% of the Dutch economy and employment (Boone & Dolman, 2010). The sector generates €48 billion in added value. According to 't Hart et al. (2011), The Netherlands is the number one innovative country in this sector, with international leading knowledge institutions like Wageningen University (WUR); a leading role in several innovation programs, such as 'Food for Life' (Hart, et al., 2011); and high R&D intensity (0,06% of BBP) compared to other countries. In addition The Netherlands are the second largest exporter of agro and food products after the USA (‘t Hart et al., 2011). Recently, the Dutch government marked the agro-food sector as one of the nine 'topsectors', which will receive extra attention and support from the government (Rijksoverheid, 2011). Through this topsector policy, the Dutch government stimulates sustainability in the agro-food sector by supporting research and innovation (Rijksoverheid, 2011b). Furthermore, the government provides financial support to investments in sustainable innovations (Rijksoverheid, 2011b).

Sustainability is a big issue in the agro-food sector; macro trends show the world population will grow to around nine billion people in 2050 (Timmermans, 2011; ‘t Hart et al., 2011). Rising welfare will change food consumption patterns, and it is expected that the intake of dairy products and meat will increase (Timmermans, 2011). At the same time, the availability of clean fresh water, fertile soils and fossil fuels will be under pressure. The combination of these factors induces the need for innovations that make food production chains more sustainable (Timmermans, 2011; ‘t Hart et al., 2011). Beers et al. (2010) describe the problems of agriculture in metropolitan regions, like the Netherlands. The agro-food sector is confronted with rising demands in quantity and quality of food. At the same time, land prices increase and concerns about environmental quality and animal welfare gain more attention. Policy makers, farmers and consumers increasingly regard agriculture as an unsustainable sector, which stresses the need for a structural change towards a more sustainable agricultural sector (Beers et al., 2010). Structural, long-term changes of complex systems, like the agro-food sector, are also called transitions (Geels, 2002).

One problem that hinders the agro-food sector in their transition towards sustainability is caused by the complexity of the sector. The agro-food sector consists of many heterogeneous actors such as science labs, farmers, manufacturers, food retailers, distributers, consumers, and many intermediary organizations (Kinsey, 2001). Because of this complexity, Lowe et al. (2008) suggest that integrated social and technological research approaches should be used in research to agri-food systems. Issues like farming crises, chronic health risks, food safety and resource and habitat depletion lead to mistrust of science and the technologies underpinning the food systems (Lowe et al., 2008). It is often perceived that scientific institutions working on agri-food systems are only driven by disciplinary or commercial motives, and that they have lost any connection with public concerns

(Lowe et al., 2008). According to Wolfert et al. (2010), correct and complete information delivery is an important competitive factor, because consumers should be able to base their choices on food safety, quality, sustainability etc. Supply chains have to become more demand oriented, and the food-producing sector needs to become more responsive to feedback signals from the market and consumers (Lowe et al., 2008). This implies that society has a very important role in the transition towards a more sustainable agro-food sector.

There is no consensus yet about what a sustainable agricultural sector should look like. A general accepted definition of sustainable development is that of the Brundtland report*: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs"* (WCED,1987, pg. 43) A definition of sustainable agriculture, as defined in the 1990 US Farm bill is: *"an integrated, site specific system of plant and animal production practices that will meet food needs, protect and enhance the environment and contribute to their communities' quality of life*" (US Congress, 1990, pg. 101). From these definitions it becomes clear that there should be a good balance between economic, environmental and social concerns. This can be expressed as the three 'P's': People, Planet and Profit. According to the Dutch Social Economic Council, sustainability in chains is determined by two aspects: the deliberate focus on value-added activities within an economic, socio-territorial and agri-environmental dimension; and the continuous relation with relevant stakeholders on the principles of transparency and dialog (SER, 2000). This definition shares the values of the other definitions presented, but adds the importance of interaction between different stakeholders and transparency. For this study, this latter SER definition of sustainable agriculture is used.

1.2 Problem definition

In this study, the focus is on the Dutch dairy farming sector. In December 2011, the Dutch dairy farming sector covered 2.689.000 milking cows (CBS, 2011) who together produced 11.627.340.000 KG milk in 2011 (CBS, 2012). The dairy sector uses about 825.000 hectare of agricultural soils (Boone & Dolman, 2010) which is almost 20% of the total surface of the Netherlands. This implies that dairy farming has a large impact on the appearance of the Dutch landscape. Since 1990, the amount of dairy farms is rapidly decreasing, while the amount of cows per company is increasing (Boone & Dolman, 2010). According to research of Calker (2005) and Boone & Dolman (2010) all three 'P's' of sustainability are under pressure in dairy farming.

Concerning ecological sustainability (Planet), dairy farming has relatively high discharges of nitrogen and phosphate, which leads to pollution of ground and surface water (Calker, 2005). Nonetheless, the surplus of nitrogen and phosphate have decreased since 1990, which can be explained with the introduction of the minerals accounting system (MINAS) (Boone & Dolman, 2010). Recently this decrease is stabilizing (Boone & Dolman, 2010). This might imply that current environmental regulations are not adequate anymore, and new innovations are required. Additionally, dairy farming

contributes to global warming due to emission of methane, nitrous oxide and carbon dioxide (Calker, 2005; Boone & Dolman, 2010).

Regarding economic sustainability (Profit), income of dairy farmers fluctuates a lot recently due to fluctuations in the milk price (Boone & Dolman, 2010). Calker (2005) expects that production costs will continue to rise caused, among others, by the need to realize environmental and other objectives. On top of that, in 2015, the milk quota will be dropped (ING Economisch Bureau, 2010). It is therefore expected that the amount of fluctuations of milk prices will increase even more, and make economic sustainability of dairy farming unsecure (Boone & Dolman, 2010).

Relating to social sustainability (People), dairy farming used to have a positive public image among consumers concerning sustainability (Boone & Dolman, 2010). However, recently one can identify trends that negatively influence this image. Firstly, the safety of food is becoming increasingly important; diseases like the mad cow disease, foot-and-mouth disease and (over)use of antibiotics raise concerns among society (Calker, 2005). Another issue is non-grazing of dairy cows and/or young stock. This influences the image of dairy farming and is related to lower animal welfare (Boone & Dolman, 2010; Calker, 2005). In 2011, 26% of all dairy cows were kept inside year round (Keuper et al., 2011). Also, the up-scaling trend worries society. Up-scaling of dairy farming is expected to lead to an increase of mega-stables. This reminds society of the growth of the poultry and pig farming industry from the sixties and seventies. This growth had devastating effects on animal welfare and the environment (Booij et al., 2010). The Dutch foundation 'Wakker Dier' states that time is running out in the Dutch dairy farming sector, by which they focus solely on animal welfare (Wakker Dier, 2010).

Hence, dairy farming currently has to deal with many problems relating to sustainability which encourages public concerns. The sector seems to be aware of what this implies. In 2011, the Dutch Agriculture and horticulture organization (LTO) stated in a vision of the future of dairy farming that support and acceptation from society are essential for developments in the dairy sector. Lack of acceptation from society can lead to obstructive regulations. Transparent communication from the sector to consumers and society is crucial (LTO Nederland, 2011). LTO strives for a sustainable dairy farming sector in 2020. LTO suggests that farmers should cooperate more with regional partners, and development will come from co-creation between farmers and their environment (LTO Nederland, 2011). All in all, society, as it is part of the environment, is very important for developments in the Dutch dairy farming sector. Figure 1 presents an oversight of manifestations of societal concerns related to sustainability in dairy farming. This figure shows Dutch societal concerns related to sustainability problems in the Dutch dairy farming sector.

Figure 1: societal attention for sustainability in dairy farming

1.3 Aim and research questions

The aim of this research is to study the role of societal pressure in the transition of the Dutch dairy farming sector towards sustainability. As described above, the Dutch dairy farming industry is subject to many changes. These changes are expected to have an impact on the sustainability of the sector, and especially on how the sustainability of the sector is perceived by society. Transitions are long-term structural changes in the way societal functions are fulfilled (Geels, 2002). These changes are not just technological in nature, but also involve changes in user practices, regulation, industrial networks, infrastructure and symbolic meaning or culture (Geels, 2002). Elzen et al. (2011) describes how societal pressure or normative contestation can influence the orientation of transitions in the making. According to Elzen et al. (2011) in some cases the initial impulse for change comes from regime outsiders, like social movements, who find some aspects of the regime normatively unacceptable. These outsiders put pressure on the regime in order to change. Transitions in the making are defined as transitions that are not yet completed. This is applicable on the case of the Dutch dairy industry. Several changes have already made the sector more sustainable, but more is needed in order for the sector to be completely sustainable (Van der Schans et al., 2005).

To study transitions or transitions in the making, the multi-level perspective (MLP) approach can be used (Geels, 2002; Markard & Truffner, 2008). This approach has been developed to understand the complex dynamics of socio-technical change in transitions. The strength of the MLP approach is that

innovation and transition processes can be explained by the interplay of developments at the regime level, pressures from the landscape level and emerging innovations from the niche level (Markard & Truffer, 2008). Elzen et al. (2011) distinguish several streams which influence a transition at the regime level. These streams are based on Kingdon's multiple stream model (Kindon, 1984). There are distinguished a market stream that entails suppliers, milk processing companies and consumers; a political and regulatory stream; and a problems/normative pressure stream that involves society. At the niche level al a technological stream is distinguished which entails knowledge institutions etc. Interplay between these different streams makes it more likely that a regime is going to change (Elzen et al., 2011). According to Elzen et al. (2011), an innovation will be more successful if the different streams align. This means activities in the different streams have the same goal. In this study, the focus is mainly on activities in the problem/normative pressure stream.

In existing transition research, commercial motivations or pioneers and entrepreneurs were seen as the main drivers of change (Elzen et al., 2011). In the case of dairy farming, society (represented by social movement groups) is expected to play a significant role in the orientation towards sustainability. Earlier mentioned trends, such as up-scaling, are expected to increase the pressure of this societal stream towards change in the dairy farming sector even more. To gain more insight in how this normative pressure influences the transition of the dairy farming industry, the MLP approach will be complemented with insights from social movement theory (SMT). Generally, SMT is used to describe conflicts between the established order and groups that aim to correct what they perceive unfair (Elzen et al., 2011). Recent literature shows that it can be applied to study the relation between technological innovations and social movements as well (Hess, 2005; Smith, 2005). SMT is further explained in Chapter 2. The main research question to be answered in this study is:

How does normative pressure influence the transition towards sustainability of the Dutch dairy farming regime from 1990 until now?

The focus is on the Netherlands, because, first of all it has a world leading position considering innovation in the agro-food sector ('t Hart et al., 2011). The dairy sector is interesting to study, because currently this sector is subject to changes that are likely to affect the public image of the sector. Some examples are: the disappearance of the milking quota in 2015, what is expected to lead to up-scaling of dairy farms (Booij et al., 2010); the increasing amount of dairy cows that is kept inside year round; and the increasing concerns about food safety of dairy products (antibiotics in food, etc.) These changes negatively affect the relatively positive public image of the dairy sector in the Netherlands (Calker, 2005; Booij et al., 2010), and might increase the need for a transition of this sector towards sustainability. Furthermore, Dutch consumers tend to have an increasing preference for sustainable products. According to market research of Schuttelaar & Partners (2011), 29% of Dutch consumers base their food purchase decisions on the sustainability of a product. They prefer sustainable products concerning the well-being of future generations and contributing to a better world (Schuttelaar & Partners, 2011). Another trend that makes a focus on the Netherlands

interesting is the increasing amount of attention for animal welfare. Since 2002 the Dutch animals have their own political party called 'Partij voor de Dieren' (PvdD) who are concerned about animal welfare. Since 2011, animals even have their own police department. The focus of the study will be on the period from 1990 until now, because several changes started around 1990; since 1990, the amount of cows per company has been increasing and important environmental regulations such as MINAS were introduced (Boone & Dolman, 2010). Furthermore, general attention towards sustainability increased due to publication of the Brundtland report in 1987 and the Rio declaration in 1992. In order to provide an answer to the main question the following sub questions are formulated:

Sub question 1: *How has the Dutch dairy farming regime developed considering sustainability from 1990 until now?*

The answer to this question will be a description of developments concerning sustainability in the Dutch dairy farming sector. An example is the stricter environmental policy, which already led to a decrease in phosphate and nitrogen emissions (Boone & Dolman, 2010). The required data will be obtained through literature study complemented with interviews with experts from the field. This question will provide insight in the transition in the Dutch dairy farming regime until now. The level of analysis will be the regime level.

Sub question 2: *What public concerns regarding sustainability in dairy farming have come up from 1990-now?*

This question helps to identify what normative oriented problems are at stake in the sector. To provide an answer to this question, media databases will be searched for articles about the dairy farming industry. From these articles, the concerns of society will be described. Again, this data will be complemented with expert interviews, because they may give additional insights into the problems related to their position in the field.

Sub question 3: *How did public concerns influence the development of sustainable innovations in the Dutch dairy farming sector via normative pressure?*

The information obtained from the first two sub questions will be used to select two cases from the dairy sector, in which a particular innovative product or process provided a solution for a normative-oriented problem. These cases will be studied using the MLP approach combined with SMT as described by Elzen et al. (2011). Based on the results, the approach of Elzen et al. (2011) will be refined and adapted to the dairy farming industry. The answer to this question is a description of how pressure from society influenced the development of the sustainable innovation.

Sub question 4: *What role played actors from the market, political & regulatory and technological streams in the development of sustainable innovations in the Dutch dairy farming regime?*

Although the focus of this research is on the influence of normative pressure on the transition of the Dutch dairy sector towards sustainability (society stream), the other streams within the regime also play a role. Corresponding with the study from Elzen et al. (2011), three other streams are taken into account. These are the market stream, the political & regulatory stream, and the technological stream. The roles of actor groups from these streams are also discussed in the case studies. According to Elzen et al. (2011), an innovation will be more successful if the different streams align.

1.4 Relevance

1.4.1 Scientific relevance

This research contributes to the existing scientific literature in several respects. In most regime/transition research commercial motivations or pioneers and entrepreneurs are seen as the main drivers of change (Geels,2002; Verbong & Geels, 2007; Markard & Truffer, 2006). The approach with a focus on society as change agent is relatively new. In addition, a normative focus on innovation problems is an underexposed field in the field of innovations studies (Elzen et al., 2011). Instead, most available research focused on economic and competitive factors that influence innovativeness or the speed of technological trajectories (Stirling, 2009). Furthermore, the combination of MLP with SMT is quite new in the field of innovation studies. Elzen et al. (2011) already stated that further investigation is necessary to elaborate the perspective and make the findings more generalizable.

1.4.2 Societal relevance

Sustainability in the dairy farming sector and sustainability in general is increasingly seen as important by society and policy makers. Therefore, studying the transition of a sector towards sustainability , and how to influence this, will be interesting for different social groups. For society it might be interesting to see how big a role they can play in changing an industry. This might also motivate social movement groups, because they see their work can have an effect. Furthermore, this research can provide policy makers and innovators with insights about how to deal with normative pressure. For the dairy farming industry it is important to be aware of the role of society. This can increase their awareness about the importance of communication between the dairy sector and society.

1.5 Outline

This report is built up as follows. Chapter 2 presents the theoretical framework the research will be based upon. This theory leads to a conceptual framework that provides a preliminary answer to the research question. Chapter 3 operationalizes the conceptual framework and Chapter 4 explains the research methods used. Because the dairy farming sector contains many different actors, the most important actors are presented in Chapter 5. An oversight of the developments and public concerns

concerning sustainability in the Dutch dairy farming sector, and thus an answer on sub question one and two is presented in Chapter 6. Chapter 7 and 8 discuss the two case studies, and Chapter 9 compares the cases. With these case studies sub questions three and four are answered. Chapter 10 presents the conclusions of this research and gives an answer to the main research question followed by a general discussion and some policy recommendations in Chapter 11.

2. Theory

This Chapter presents the theoretical framework of the research, which leads to a conceptual framework providing a preliminary answer to the research question.

2.1 Theoretical framework

The theoretical foundation of this study is based on the multi level perspective (MLP) approach of Geels (2002), complemented with insights from social movement theory (SMT) (Lounsbury et al., 2003) and Kingdon's (1984) multiple stream model. The application of this combination of theories has been earlier described by Elzen et al. (2011). Elzen et al. (2011) studied how normative pressure influenced the transition towards more sustainable pig farming. This method is suitable for this research, because dairy farming has to deal with similar problems pig farming had to deal with in the past. Both sectors are subject to concerns from society and problems relating to environmental sustainability (Boone & Dolman, 2010). The MLP has been frequently used to describe how technological transitions come about (Geels, 2002). Recent research shows that the MLP is also applicable to study socio-technical transitions towards sustainability (Geels, 2011). Elzen et al. (2011) show that the MLP can also be applied to transitions in the making. To incorporate the influence of society, SMT (social movement theory) is included. This makes it possible to describe how social movements can cause change in existing regimes. Besides social movements, other regime actors play a role in regime change too. Therefore, four streams are included, based on Kingdon (1984). According to Elzen et al. (2011), there is a bigger chance of a successful transition when these streams align with each other.

2.1.1 Multi-level perspective

The multi level perspective (MLP) is used to study technological transitions. These transitions are major, long-term technological changes in the way societal functions are fulfilled. Examples of societal functions are transportation, communication, housing, and feeding (Geels, 2002). In this view, technology in itself does nothing, only in association with human agency, social structures, and organizations, technology fulfills functions (Geels, 2002). The multi level perspective distinguishes three levels (Geels, 2002): technological niches, socio-technical regimes, and a socio-technical landscape. Transitions are defined as changes from one socio-technical regime to another (Geels & Schot, 2007).

The socio-technical regime or meso-level can be seen as an extended version of the technological regime described by Nelson and Winter (1982). The socio-technical regime accommodates all social groups that contribute to technological developments. Social groups can be scientists, policy makers, producers, users, special-interest groups, etc. (Geels & Schot, 2007). Socio-technical regimes stabilize existing trajectories in several ways; for example by cognitive routines that narrow the focus of engineers, so they miss developments outside their focus (Nelson & Winter, 1982); regulations and standards; adaption of lifestyles to technical systems; sunk investments; infrastructures and competencies (Geels, 2002; Geels & Schot, 2007). This leads to barriers for the diffusion of an

innovation if it does not align with the regime. Innovation at the regime level is mainly incremental. In technological niches, or the micro-level, radical innovations emerge (Geels & Schot, 2007; Markard & Truffer, 2008). First, these innovations often have low performance, but the niche functions as an 'incubation room' that protects the innovation from mainstream market selection (Geels & Schot, 2007). Niches are crucial for technological transitions, because they are the seeds for change (Geels, 2002). The socio-technical landscape, or macro level, forms an exogenous environment that is not directly influenced by the niche or regime level (Geels & Schot, 2007). The socio-technical landscape is among others formed by macro-economics, cultural patterns, and macro-political developments. Changes of socio-technical landscape usually take place slowly (Geels & Schot, 2007).

Processes at these three levels can lead to a transition. At the niche level, innovations have built up internal momentum through learning processes and price/performance improvements. Changes at the landscape level can put pressure on the existing regime. This leads to destabilization of the regime, and creates opportunities for innovations from the technological niches to break through (Geels & Schot, 2007; Markard & Truffer, 2008). When this happens, we can speak of a transition. Transitions are not simply technological changes, but also involve changes in user practices, regulation, industrial networks, infrastructure and symbolic meaning or culture (Geels, 2002). Change is not easy, because existing regimes are oriented towards incremental innovation (Elzen et al., 2011).

To conceptualize the relations between the different actors in the regime, Elzen et al. (2011) distinguished two different environments in which the industry simultaneously operates. First, they distinguished a task environment, which entails all relations considering economic exchanges and transactions. In this environment, economic competitiveness, efficiency, and financial performance are the dominant criteria that determine success. Secondly, they distinguished an institutional environment which contains all social groups that affect companies in non-commercial ways. Examples are policy makers, social movements, the ‘wider public’, media, public opinion, etc. In this environment, regulatory legitimacy and cultural-normative legitimacy determine success (Elzen et al., 2011). Figure 2 provides a visualization for the dairy farming industry of how these different environments fit in the MLP.

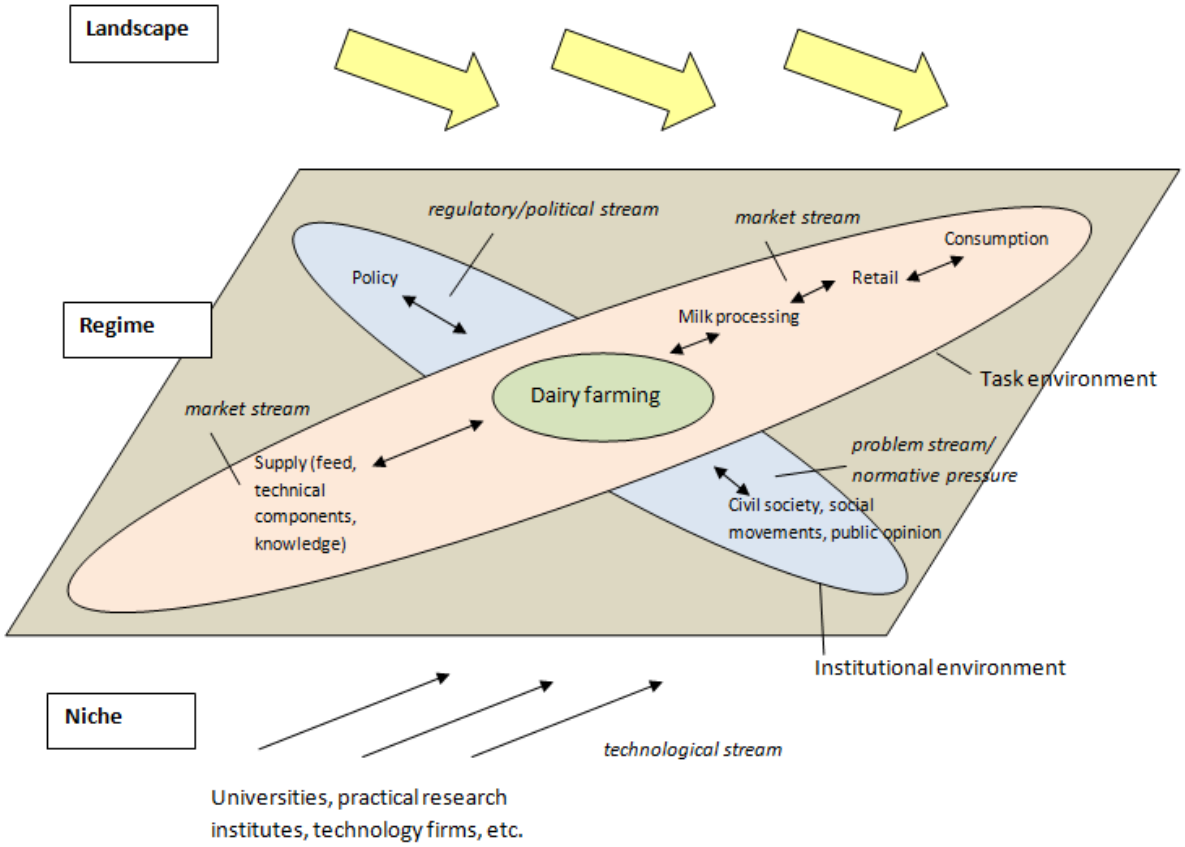

Figure 2: A multi-level representation of dairy farming

The goal of change in this research is a more sustainable dairy industry. Transitions towards sustainability are in some respects different from many historical transitions (Geels, 2011). Sustainability transitions are goal-oriented, in the sense that they address predetermined problems. Most historical transitions were emergent (Geels, 2011). The goal of sustainable transitions is related to a public good (sustainability), and private actors might have limited incentives to address sustainability transitions. Therefore, public authorities and civil society are crucial in the process to change economic frame conditions and support 'green' niches. Furthermore, sustainable solutions often do not offer clear user benefits and score lower on price/performance dimensions than existing technologies (Geels, 2011). The advantages of the sustainable solutions are nonetheless a public good, and users of the solution will benefit as much as non-users. Therefore, it is unlikely that environmental innovations will be able to replace the existing system without changes in economic frame conditions (Geels, 2011). This implies that sustainability transitions are necessarily about interactions between technology, policy/power/politics, economics/business/markets, and culture/discourse/public opinion (Geels, 2011). In this research the focus is on the role of society, because it is expected this is very important in order to realize change. In the next section, social movement theory will be used to explain how society can influence existing regimes.

2.1.2 Social movement theory

In figure 2, normative contestation or pressure from society on the existing regime is represented in the institutional environment (problem stream/normative pressure). Insights from social movement theory (SMT) are used to conceptualize this concept. SMT is generally used to describe conflicts between the established order and groups that aim to correct some perceived injustice. In this case, the industrialized dairy system can be seen as the established order, and society's demand for a more sustainable approach as the goal of change. Lounsbury et al. (2003) used SMT to describe institutional change and related socio-economic processes. Traditionally, SMT focused on labor movement, civil rights movements, etc. (Elzen et al., 2011). However, recent literature shows that SMT can be applied to study the relation between technological innovations and social movements as well (Hess, 2005; Smith, 2005). In this research, SMT will be used to describe how groups from society can increase their influence. From SMT literature three processes can be identified that are useful for social movements to communicate their message in order to change the existing regime (Benford & Snow, 2000; Elzen et al., 2011). These processes are resource mobilization, framing processes, and political opportunity structures.

Resource mobilization - Availability of resources and the mobilization of these resources is very important for a social movement. Resource mobilization theory assumes there is always enough grievance in a society to support a social movement, if this has the availability of enough resources (McCartney & Zald, 1977). Organizations can acquire and then deploy their resources to achieve a well-defined goal. Resources are crucial for engagement in social conflicts (McCartney & Zald, 1977). This plays a role in the internal development of a social movement, and the external influence on other actors like public opinion and policy makers. Edwards and McCartney distinguish five types of resources: material, moral, social-organizational, human, and cultural resources (Edwards & McCartney, 2004). These different types are further explained in the Operationalization (Chapter 3). If a social movement is capable of mobilizing enough resources, their ability to create normative pressure increases (McCartney & Zald, 1977).

Framing processes - Issues or problems generally do not have meaning by themselves. Meaning arises from the frames in which issues are placed. *'Framing is the process through which actors define problems, attribute causality and responsibility, and generally influence the meaning of issues or problems*' (Elzen et al., 2011, pp. 265). Framing is important because collective constructions of reality influence the likelihood of certain actions and responses. Social movements use this by framing problems in ways to enhance their appeal to wider publics, and to shape the cognitive space in which issues are debated (Benford & Snow, 2000). When the public opinion matches the preferences of the social movement, this increases their credibility and puts more pressure on the existing regime.

Political opportunity structures – Political opportunity structures are determined by the strength of the state against civil society, the constellation of political parties in power, the structure of the

political agenda, etc. (Elzen et al., 2011). According to Meyer (2004), political opportunity structures gained increasing prominence in research to examine how social movements respond to and influence the world around them. These structures influence the opportunities for social movements to be effective in bringing about political change. Elections, shifts in coalitions, and the rise of new political parties may create a more or less favorable political opportunity structure.

All three processes described above are important for a social movement to increase its influence. These processes are however not completely independent from one another. The political opportunity structure can hinder or help framing processes and vice versa (Benford & Snow, 2000). Furthermore, frames can help social movements to mobilize resources (Benford & Snow, 2000). When all these three sub-processes grow stronger, the normative pressure on existing regimes increases (Elzen et al., 2011). This increase depends on many changing circumstances and events (landscape changes). Major shocks or incidents (disease, disaster) can push issues higher on the political agenda and increase empirical credibility. Also, media attention and other problems that compete for attention influence normative pressure of a certain issue. Elzen et al. (2011) hence assume that increasing normative pressure has a larger effect on transitions when it coincides with other socio-technical developments. To describe these developments, four streams are distinguished, based on Kingdon's (1984) multiple stream model.

2.1.3 Multiple streams

Elzen et al. (2011) state that in order to bring about substantial regime changes, normative pressure should coincide with other socio-technical developments. Examples are regulations, consumer demand, market pressure from retailers, niche innovations, etc. As stated before, social movements try to influence these developments. However, they also have their own dynamics. From the SMT perspective, changes in other domains can form opportunity structures to which normative pressure can be linked or not. To describe the other socio-technical developments Elzen et al. (2011) distinguish four streams. These streams all have their own dynamics, but also partly interact. These streams are based on research of Kingdon (1984) on policymaking. The four streams that can be distinguished are: problem/normative pressure stream, regulatory/political stream, market stream, and technology stream. In figure 2, these streams are indicated to show their position in the MLP. The market stream is positioned in the task environment and the regulatory/political stream and the problem stream in the institutional environment. The technological stream represents developments from the niche level.

1) Problem stream/normative pressure - This stream comprises the normative orientation in the pressure by social movements as described in the previous section (2.1.2).

2) Regulatory/political stream - In order to grasp the activities from both politics and policy, this stream merges the policy and politics stream from Kingdon's (1984) model. This stream includes all activities that are related to politics or policy which have an effect on sustainable dairy farming.

3) Market stream - Consumer preferences (households and businesses) can have an impact on the system. Normative concerns and cultural discourses can change consumer preferences and make a transition more likely. A problem might be that consumers do not always act as they tell they will act (Vermeir & Verbeke, 2004). For example, consumers state that they are concerned about animal welfare and sustainability, but in the supermarket still buy the cheapest products. For social movements it might therefore be more effective to focus on supermarkets and other retailers, because they are generally more concerned about legitimacy and reputation effects (Elzen et al., 2011). Changes in retailers policies are expected to have substantial effect on dairy farming practices.

4) Technological stream - Mainstream research tends to generate mainly incremental innovations due to their close ties with the existing regime. Outside professionals, researchers that deviate from the existing regime, often focus more on radical innovations. Generally, they operate at the niche level, and generate potential solutions.

All four different streams create opportunities that can change the existing regime. As explained in section 2.1.1, opportunities can arise, because of crises and disasters, elections, national mood swings, the appearance of new political parties, or technological breakthroughs. However, these opportunities also disappear. When that happens, problems that have risen on the agenda, due to social movement activities and normative pressure, fall down again if they cannot be linked to a concrete solution. This implies that timing is very important. The streams should not be seen as acting completely independent. Actors from the different streams can actively work together in order to form a 'package'. A package is defined as a combination of the different streams, also called alignment. An example can be social movement organizations that support innovation projects (technological stream) that aim to address their problems. Or, researchers, designers and firms who work on an innovative project and follow and anticipate on what happens in civil society, markets, and regulations. If various streams can be combined, the opportunities for normatively-oriented transitions greatly increase (Elzen et al., 2011).

2.2 Conceptual model

The insights described above are summarized in figure 3. Figure 3 visualizes how all four streams can have an effect on sustainable dairy farming. The different streams can have a direct effect, or influence sustainable dairy farming indirectly via one of the other streams. Furthermore, the different streams can interact with each other. It is assumed by Elzen et al (2011) that if more streams at the same time undertake activities in favor of an innovation, this will stimulate sustainable dairy farming. This means that this innovation will be more successful in penetrating the existing regime, and thereby causing a change towards sustainable dairy farming. Normative pressure increases if resource mobilization, framing processes, and political opportunity structures are used by societal organizations. In the following Chapter, the concepts from this will be further operationalize. As mentioned before, the focus of the research is on how normative pressure influences the transition towards sustainable dairy farming. The other streams are incorporated in

the model to provide an integral picture of reality. The model provides a preliminary answer on the main research question by showing how normative pressure can influence sustainable dairy farming. As stated before this can be direct or indirect.

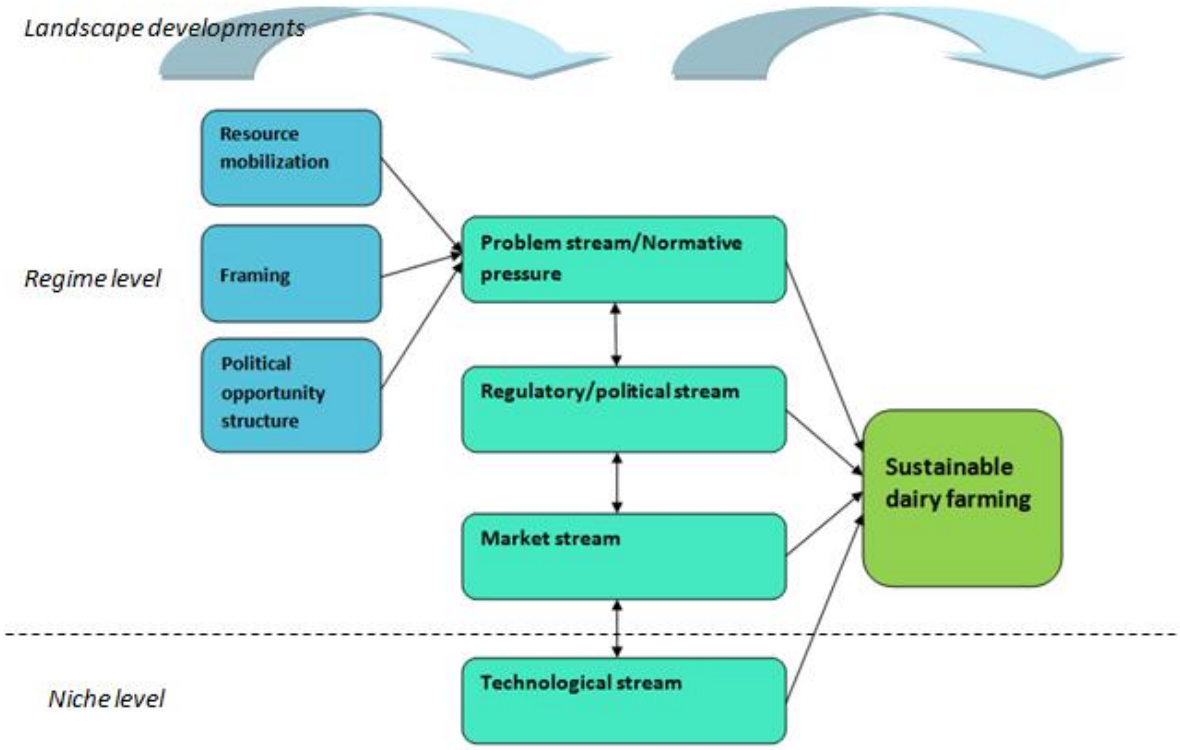

Figure 3: Conceptual framework

3. Operationalization

In this section, the concepts from the conceptual model are operationalized. First, if possible, they are divided in several dimensions and then indicators are provided to enable measuring the concepts (table 1). The operationalization of the dependent variable 'sustainable dairy farming' is based on research of Calker (2005). The operationalization of the independent variables is based on insights from SMT and multiple stream literature as described in Chapter 2.

3.1. Sustainable dairy farming

The dependent variable of this research is 'sustainable dairy farming'. This concept involves the improvements of the dairy farming sector towards a more sustainable system. To enable judging the contribution to sustainability of a new product or process, it is important to know how to measure sustainable dairy farming. The approach of Calker (2005) is used to operationalize sustainable dairy farming. This approach is used because it takes all farming activities and related side effects in account. Furthermore, Calker (2005) focuses on the Dutch dairy farming system. This approach focuses on the farm level, because economic, ecological, and social attributes come together at this level (Calker, 2005). According to Calker (2005), sustainability of dairy farming can be divided in four dimensions. Within each dimension attributes were selected that contribute to or are detracted from sustainability. In this research, the attributes function as indicators for the concept ‘sustainable dairy farming’.

Economic sustainability is defined as the ability of the dairy farmer to continue his farming business (economic viability). An indicator for economic sustainability is the profitability of the farm. Other possible indicators like solvability or liquidity are found to be very much interrelated with profitability and therefore left out as indicators. Profitability can be measured by using the net farm income (Calker, 2005). An innovation is perceived to contribute to economic sustainability if it has a positive or neutral effect on the net income of the dairy farmer. If the innovation has a negative effect on the net income of the dairy farmer, the innovation is perceived to be unsustainable.

Internal social sustainability relates to working conditions of the farmer and eventual employees. According to Calker (2005), only working conditions should be used as an indicator, because other possibilities like leisure time can be grouped under this indicator. Calker (2005) suggests using the 'physical load index' (PLI) to measure working conditions. In this study, PLI is too complex to use. Thus, internal sustainability of the innovation is indicated by the perceived effect on the working conditions of the dairy farmer. When the farmer perceives better working conditions due to the innovation, it contributes to internal social sustainability.

External social sustainability relates to the societal impact of agriculture on the well-being of people and animals. For external social sustainability, many indicators can be used, not all of them are independent. ´Cattle grazing´ is sometimes mentioned as an indicator, but it can also be grouped

among animal welfare or landscape quality. Calker (2005) selected the four attributes with the highest relative importance: food safety, animal welfare, animal health, and landscape quality. These indicators will hence be used in this research.

Ecological sustainability is concerned with threats or benefits to flora, fauna, soil, water, and climate. For ecological sustainability the same applies as for external social sustainability, there are many attributes possible. Again, the five with the highest relative score and weight are taken into account. These are eutrophication, groundwater pollution, dehydration of the soil, acidification, and biodiversity. After the first exploratory expert interviews, it became clear that also emission of greenhouse gasses caused by dairy farms is a serious threat to ecological sustainability. Therefore, the emission of greenhouse gasses is added as an indicator for ecological sustainability.

3.2 Problem stream/normative pressure

Normative pressures are conceptualized using insights from SMT, as described in Chapter 2. It can be divided into three dimensions: resource mobilization, framing, and political opportunity structures. These dimensions are already explained in Chapter two, therefore in this section only the relevant indicators will be presented.

Resource mobilization:

According to Edwards & McCartney (2004), five types of resources can be distinguished: material, moral, social-organizational, human, and cultural. These types are used as indicators for resource mobilization. Moral resources include legitimacy, solidarity support, sympathetic support, and celebrity (Edwards & McCartney, 2004). This implies societal organizations that mimic their ideals with norms and values in society have an advantage. Cultural resources are artifacts and cultural products, like specific knowledge, that have become widely known (Edwards & McCartney, 2004). An example can be tacit knowledge on how to enact a protest event, running a meeting, etc. Social-Organizational resources are related to the structure of the societal organization and they are partly intentional and partly appropriable. Three general forms of social organizational resources are infrastructures, social networks and organizations. Infrastructures can be seen as public goods, as they are available for all societal organizations. Access to social networks and other organization is organization dependent and can be controlled (Edwards & McCartney, 2004). Social-organizational resources thus have to do with the access of a societal organization to networks. Human resources include al resources related to the human capital of the societal organization; examples are experience, skills, and expertise. Human resources are situated in individuals rather than organizations structures or culture. Individuals make their labor accessible and usable for specific social movements based on their believes (Edwards & McCartney, 2004). In the category material resources, financial and physical capital are grouped. Examples are monetary resources, property, office space, etc. (Edwards & McCartney, 2004). When a social movement organization has the ability to motivate more from these resources, the chances for success of normative pressure increase.

Framing processes

According to Benford & Snow (2000), collective action frames are used to simplify the world out there in ways that intend to mobilize potential adherents to get bystander support and demobilize antagonists. Another option are sets of beliefs and meanings that inspire and legitimate the activities and campaigns of a social movement organization (Benford & Snow, 2000). The choice for indicators to measure the concept framing processes is based on research of Benford & Snow (2000). They proposed the following factors that increase the credibility of collective frames:

- Their focus, if a collective frame addresses too many issues this impairs its strength.
- Their empirical credibility, if the collective frame is perceived to fit with ongoing events around the issue this makes it more credible.
- Their cultural resonance, good fit with broader repertoires and discourses increases its strength.
- Their emotional-normative appeal, successful playing with emotions, often through images, metaphors, etc. makes a stronger frame.
- The perceived credibility of frame articulators, speakers who are regarded as more credible are generally more persuasive.

The more of these indicators are present in a frame, the stronger the frame. A strong collective frame helps a societal organization to convince others of their ideas. Therefore a strong frame can help to increases normative pressure.

Political opportunity structures

Political opportunity structures are subject to debate and interpretation (Benford & Snow, 2000), making it hard to measure them. Indicators for political opportunity structures are: strength of the state versus civil society, constellation of political parties in power, structure political agenda, and rise of new political parties (Elzen et al.,2011). Per case it must be estimated whether the situation is in favor or against the problem the social movement organization tries to tackle.

3.3 Regulatory/political stream

This concept includes all activities in the regulatory/policy stream (fig. 1) that affect the transition towards sustainable dairy farming. This includes all regulations that can have an effect on the dairy sector, and pressure from governmental and policy institutions. There can be thought of different activities. Examples are new regulations relating to sustainable dairy farming, governmental pressure on the dairy farming sector; (un)favorable subsidies and taxes. These activities are used as indicators.

3.4 Market stream

This concept includes all activities in the market stream (fig. 1) around sustainable dairy farming. Market parties are for example consumers, dairy processing companies, supermarkets, animal feeding producing companies, etc. All these actor can have an effect on sustainable dairy farming. Indicators are for example preference of consumers for sustainable products or retailers who make sustainability a precondition for supplier.

3.5 Technological stream

This concept comprises all technological processes and product innovations that provide solutions for sustainable dairy farming. Furthermore new available knowledge is incorporated in this stream. Indicators can be new products/processes in favor of sustainable dairy farming, for example a new technology which makes it possible to process manure. Or new knowledge what stimulates consumers to change their behavior.

Table 1: operationalization

Concept	Dimension		Indicator		Measurement
Sustainable dairy farming	Economic sustainability		Profitability		Net income farmer (€)
	Ecological sustainability		Eutrophication		Eutrophication potential per ha
			Groundwater pollution		NO3- concentration in groundwater (mg NO3-/l)
			Dehydration of the soil		Water use (m3/ha)
			Acidification		Acidification Potential per ha
			Biodiversity		No. animals/ha
			Greenhouse gas emission		Emission CO2 Emission CH3
	Social sustainability	Internal	Working conditions		Ordinal
		External	Food safety	Chemical	Antibiotics in food Dioxin in food
				Micro-Biological	Salmonella E. coli S. aureus M. paratuberculosis
			Animal welfare		Freedom from discomfort Freedom to express normal behavior Freedom from fear and distress
			Animal health		Freedom from pain, injury and disease Animal Health Index (AHI)
			Landscape quality		Agricultural Nature Norm Analysis (ANNA)
Problem stream/normative pressure	Resource mobilization		Material		Money, physical capital (€), office space.
			Moral		Solidarity, support movement's goals (ordinal)
			Social-organizational		Internal and external networks, contacts,

			credibility
		Human	Members, staff, volunteers (No.)
		Cultural	Prior activists experience, understanding issues
	Framing	Focus	No. issues addressed (less is better)
		Empirical credibility	Ordinal
		Cultural resonance	Ordinal
		Emotional-normative appeal	Ordinal
		Credibility frame articulators	Ordinal
	Political opportunity structure	Strength state vs. civil society	Ordinal
		Constellation political parties in power	Ordinal
		Structure political agenda	Ordinal
		New political parties	Ordinal
Regulatory/political stream		Regulation	Laws concerning sustainable farming issues
		Governmental pressure	Subsidies (advantage) Taxes (disadvantage)
Market stream		Consumer preference	Demand for sustainable dairy products
		Retailer measurements	Measurements in favor of sustainable dairy products.
Technological stream		New products/processes	No. new products/processes

4. Methodology

4.1 Research design

This research is built up of several stages. The first part is descriptive and aims to describe developments in the Dutch dairy farming industry over the last two decades (from 1990 until now). From this description, it becomes clear how the industry develops from industrialized towards sustainable. Also the (innovation) problems dairy farming faced during this transition are discussed. Furthermore, it is described which normative oriented problems could be distinguished in this period, and eventual what innovative solutions did come up for these problems. The aim of this stage is to provide an overview of the ongoing transition of the Dutch dairy sector towards sustainability. Furthermore the first research phase is used to check and complete the operationalization of used concepts. Subsequently, data collected during this stage is used to select relevant cases for the second stage. The second stage of this research is exploratory and more empirical in nature. This stage consists of illustrative case studies. A case study is an appropriate method to investigate complex problems (Baarda et al., 2005), such as the transition of the diary sector. Cases from the dairy industry are studied using the conceptual model (fig. 2). The aim is to explore whether the conceptual model holds for the dairy farming sector and whether the model eventually has to be refined and complemented. Data is collected through a literature study completed with interviews with key stakeholders. This research has a theory building character.

4.2 Data collection

Data for the first, descriptive, stage was collected through literature study. Relevant (academic) literature and reports were used to sketch a historical overview of the Dutch dairy farming system. Relevant literature was searched for on Google scholar and the web of science. Used key words were among others: sustainable dairy farming, dairy farming Netherlands, sustainability Netherlands. References of the found articles is also used to find more relevant literature. Besides articles also relevant reports were searched for at useful institutes and organizations that play a role in the dairy farming industry. Examples are the agri- and horticulture organization (LTO), the Dutch ministry of Agriculture and the Centre for Agriculture and Environment (CLM). Media databases, like LexisNexis, were used to identify which normative oriented problems emerged during this period. When a sufficient overview of the developments in the sector was provided, key actors were approached for an interview. Important with the interviewee selection is that all four streams were represented by the interviewees. Therefore, the following key actors were selected:

- Petra Tielemans, project leader of ‘Duurzame Zuivelketen’ (Sustainable dairy chain). Duurzame Zuivelketen is a cooperation between LTO (agri- and horticulture organization) and NZO (Dutch dairy organization). She represented the farmers and dairy processing industry (market stream)
- Paulien van de Graaff, senior policy adviser of Nevedi (Dutch animal feeding organization). She represented the Dutch animal feeding industry (market stream). Because production of

animal feeding seems to be an important sustainability problem of the dairy farming industry, this is an important actor.

- Ben Hermans, policy employee agriculture and economy of Natuur&Milieu (Nature & Environment). Natuur&Milieu is an important organization that, according to the first literature study, sets many environmental sustainability problems of the dairy sector on the agenda. Hence, this actor represented the problem stream.
- Carel de Vries, project leader of Courage. Courage aims to develop technological sustainable innovations for the dairy sector. This actor represented the technological stream.

Together, these four key actors have sufficient knowledge of the Dutch dairy farming sector and can identify the most important sustainability problems in the sector. The interview data was used to check the literature based overview on consistency. Likewise, two cases were selected based on the information obtained through literature study and these exploratory interviews.

The data for the case studies was collected through studying relevant literature and a second round of semi-structured interviews with important actors for the specific case. These interviewees were also asked whether there are other important actors whom influenced the development of the sustainable innovation. The choice for cases is discussed in the next paragraph. The goal of this second stage was to analyze if and how normative pressure played a role in the development of a certain innovation that provides a solution for a sustainability problem in dairy farming. Similarly, the role of the other streams was analyzed. Semi-structured interviews were used, because interviews generate a large amount of detailed information, whereas written sources may lack the required level of detail. Moreover, by using semi-structured interviews, questions related to the conceptual model could be asked, but at the same time it left room for additional information, underlying motives and explanations from the interviewees.

4.3 Case selection

Two main criteria should be satisfied to estimate whether a case is suitable for this research or not. Firstly, it should discuss a problem in which a normative debate exists; secondly, an innovation must be available that may provide a solution for the problem. As already stated above, cases were selected based on interviews with key actors from the field of dairy farming. This method was used, because these actors are expected to be experts in the field and have better knowledge of what is going on in the industry than literature or common sense can provide. The selected cases were studied using the conceptual model (fig. 2). When the conceptual model was not sufficient, additions or refinements are suggested. The first research phase showed that there are several sustainability problems related to dairy farming, and that most of these problems are surrounded with public concerns. One of these concerns was welfare of dairy cows. Animal welfare of livestock animals has gained more attention over the past years. Therefore, this is an important theme for modern dairy farming. There is a tool on the market which enables measuring and monitoring the welfare of dairy cows. This tool is called the Cow-Compass. Besides measuring and monitoring, Cow-Compass makes

it also possible to improve welfare of dairy cows by advising concrete management actions (more in Chapter 7). Cow-Compass was the first case selected for this research. Another important sustainability problem is the use of raw materials for animal feeding. Soy, one of the main ingredients of animal feeding, is surrounded with public concerns related to its sustainability. Concerns are mainly about environmental impact of soy cultivation. Deforestation of the rain forest is a familiar problem. RTRS (round table responsible soy) is an organization that aims to develop a certification standard for sustainable soy, and implement the use of this certified soy. Because it is one of the main ingredients of animal feeding, this can make a large difference regarding sustainability of the dairy farming sector. Hence, RTRS is selected as the second case for this research.

4.4 Data analysis

For the first part of the research, the obtained literature was analyzed using an analytic induction method. This refers to the systematic examination of similarities between various phenomena in order to develop concepts or ideas. The literature was used to sketch a story about the developments of the Dutch dairy farming industry over the last two decades. When the story was found to be relatively complete and the literature provided no new information, the first round of interviews started. After the analysis of these first interviews, when additional interviews did not provide new information, the story was assumed to be complete. The interviews are used, because the interviewees were expected to have different viewing points, which provided a more complete picture of the ongoing changes in the sector. The results of this first research stage are provided in Chapter 6. The dependent variable in this research is sustainable dairy farming. This variable is firstly used to select the cases, they should contribute to at least one of the dimensions: social, ecological or economic sustainability. To determine if an innovation satisfies this criterion the indicators of the operationalization are used to make interview questions. These questions are asked to all interviewees in order to investigate if the innovation truly contributes to sustainability. The interview data is complemented with literature data about the innovation.

To identify problems surrounded with normative-contestation, data obtained from media databases is analyzed. Firstly, a LexisNexis search was initiated to newspaper articles from Dutch newspapers within the period 1990-2012. As main search term 'melkveehouderij' (dairy farming) is used. The content of these newspaper articles is scanned, and from the articles that had a relation to sustainability a short memo is written. These memos were coded afterwards. Searching for relevant codes, the indicators of sustainable dairy farming (table 1) were used as sensitizing concepts. This means that there is searched for these concepts in the memos, using them as a guideline to approach the data. When all memos were accommodated with a relevant code, these codes were colored and set in line. This provided a nice overview of those topics that were subject to media attention in a specific period of time. To prevent a one-sided view, interviewees are asked what they perceived to be topics subject to societal pressure. These results are also presented in Chapter 6.

Based on the results of the first part of the research, two cases are selected. The literature data of the cases is analyzed using the indicators defined in the operationalization. The result of this step is an overview of the activities per stream for the different cases. This data is complemented with the interview data of the second round of interviews. The interview data was first written down in transcripts. These transcripts were analyzed using a coding approach as described in Bryman (2008). Every fragment of the interview was provided with a matching 'code' that represents the content of that fragment. The indicators from the operationalization are used as sensitizing concepts. An example of this coding is provided in appendix C1. The data was further analyzed using a thematic analysis method (Bryman, 2008). The different codes were grouped around themes. These themes were based on the four streams from the theory; for codes that did not fit in one of these theoretical derived themes, new themes were included. Each theme was divided in several sub themes. The analysis is presented in a matrix, in which the rows represent the different interviewees and the columns the sub themes. This method made it possible to compare the information from different interviewees at the same theme. A selection of the results of this analysis are presented in appendix C2 and C3. The complete analysis is available on request. The data analysis was used to describe and analyze what the roles of different actor groups/streams are in the development of the particular case. The interviewees were also asked to score how large the impact of the different streams is. They could provide the following scores to describe the impact of a stream: 0 = absent or weak, + = moderate, ++ = strong. The different scores are combined into one. In order to combine the different scores, an average of all answers is taken. Absent or weak represents 0 points, moderate 1 point and strong 2 points. The different scores are taken together and divided by the number of interviewees. This leads to an average score. If the answers for a stream are too diffuse, for example when one interviewee states a stream has no impact and another interviewee states it has a strong impact, scores are perceived to be unreliable. These scores can be used as an additional tool to determine whether the different streams align with each other. If the scores show at least three of the streams have a moderate ore strong impact it is assumed the streams align. As stated earlier, when more streams align, there is a larger chance the innovation is successful in penetrating the regime.

4.5 Quality of the research

To investigate the quality of the research, this section focuses on construct validity, internal validity, external validity and reliability.

4.5.1 Internal validity

Internal validity relates to issues of causality (Bryman, 2008). This means that a causal relationship between two variables holds. For example if x causes y, can we be sure x is responsible for variation in y and there is not something else producing an apparent causal relationship. In this study internal validity raises the question if changes in the dependent variable, sustainable dairy farming, are truly caused by the independent variables (streams) and not something else. In this research, the internal validity is increased by investigating the suggested relations in the conceptual model; if it seems

these relations are not correct the model will be adapted. Internal validity is aimed to increase by incorporating all relevant streams in the model.

4.5.2 Construct validity

The construct validity is aimed at the development of a sufficiently operational set of measures for the concepts being studied. To satisfy construct validity, it is important that the measures that are derived from a concept do reflect the concept they are supposed to reflect (Bryman, 2008). A way to increase the construct validity included 'the use of multiple sources of evidence' (Yin, 2009, p. 41). In this research, multiple sources of evidence were used considering (academic) literature, complemented with interview data to verify the literature. This is also called triangulation. A problem can be that interviewees give social desirable answers. This problem is overcome by interviewing more persons per case in order to create a complete and consistent picture.

4.5.3 External validity

The external validity is aimed at the generalization of the findings beyond the specific research context (Bryman, 2008). Because in this research only two cases were studied, it is difficult to generalize the findings to the whole sector. However, the research can serve as a starting point for further research. On the other hand, if the results agree with the research of Elzen et al. (2011), who did a similar study in pig farming, it seems plausible that the findings are generalizable for agro-food sectors including livestock.

4.5.4 Reliability

Reliability is concerned with the question whether the results of the research are repeatable (Bryman, 2008). This means that the same findings should be gathered in a later investigation, while following the same procedures and evaluating the same case studies as the earlier research. In this study, reliability was warranted by making the argumentation and elaboration for the operationalization as solid as possible, and making the interview questions as understandable and unambiguous as possible. Furthermore interview questions are added in the appendix and transcripts of all interviews are available on request. This makes the research transparent.

Because in this research many different organizations and projects are mentioned, Chapter 5 provides an overview of the most important actors of the dairy farming sector.

5. Dairy farming in the Netherlands

Chapter 2 presented the multilevel perspective visualization of the Dutch dairy farming sector (figure 2). From the expert interviews, it became clear that figure 2 is useful to provide a realistic visualization of the Dairy farming sector (Hermans, 2012; Tielemans, 2012). All different actors have their own role, and cooperation between the different actors is very important for innovation. In this Chapter the most important actors/parties/organizations etc. are introduced, to make later Chapters easier to comprehend.

5.1 Dairy farming

One of the most important actors in the dairy farming sector are the Dutch dairy farmers. In this research, the farmers are not approached directly. Instead representing organizations are questioned. They are thought to have a better overview of the complete sector. In The Netherlands, there are several organizations that represent dairy farmers.

LTO (Land- en Tuinbouw organisatie) (Agri- and horticulture organization) is the entrepreneurial and employers organization of the Dutch Agri- and horticulture organization. LTO consists of LTO Noord, ZLTO and LLTB and represents 50.000 agricultural entrepreneurs. 70% of all milk produced in the Netherlands comes from LTO members (LTO Nederland, 2012).

NMV (Nederlandse melkveehouders Vakbond) (Dutch dairy farming Union) is the Union for Dutch dairy farmers. Their main goal is a good family income for dairy farmers. The goal of NMV is an economic, social, and societal sustainable dairy farming sector (NMV, 2012).

NAJK (Nederlands Agrarisch Jongeren Kontakt) (Dutch Agricultural Youth Contact) was established in 1977 by young farmers. This is the interest group for young agricultural people, they have about 8,000 members. The future of young people in the agriculture sector is their central focus point. They generally have a critical voice in the agricultural sector.

5.2 Regulatory/political stream

Ministerie van Economische Zaken, Landbouw en Innovatie

Concerning regulation and legislation the Ministry of EL&I (Economie, Landbouw en Innovatie) (Economy, Agriculture and Innovation) it is the most important governmental institution for dairy farming. The ministry of EL&I is very concerned about making livestock farming more sustainable.

IDH (initiatief duurzame handel) (initiative sustainable trade) is a new form of development assistance. IDH convenes coalitions of front running companies, civil society organizations, and governments to transform markets towards sustainable production and consumption worldwide.

initiatief duurzame handel

5.3 Market stream

The market stream within dairy farming system consists of many different actors. A distinction can be made between suppliers and customers. Some of the most important actors from the market stream, who are also mentioned later in the report, are described here.

Nevedi Nederlandse Vereniging Diervoederindustrie

Nevedi (Nederlandse vereniging diervoeder-industrie) is the interests group for the Dutch animal feeding industry. Nevedi has 110 members, who together produce around 95% of all animal food in the Netherlands. The main goal of Nevedi is to make it possible for their members to optimize company management. Furthermore, they function as an employer organization in CAO negotiations.

Agrifirm is the largest animal feeding producing company in the Netherlands. Sustainability is one of their strategic pillars. They often work together with Nevedi on sustainability issues.

FrieslandCampina is the largest dairy processing company in the Netherlands they have 14.391 member dairy farms. In January 2012, they introduced a sustainability program; the goal of this program is to stimulate their members to become more sustainable. Also, they provide a grazing bonus which is recently raised from 0,05 ct to 0,50 ct per 100 kg milk

CONO is a relatively small cheese producing company. Around 500 dairy farmers deliver their milk to CONO. However, in this report they are of significant importance, because it is one of the most sustainable dairy processing companies. They have their own 'triple B' program (Blije koeien, Blije boeren, Blije aarde) (Happy cows, Happy farmers, Happy Earth). CONO was the first processing company with a grazing bonus of 0,50 ct per 100 kg milk (already in 2002).

Nederlandse Zuivel Organisatie (Dutch Dairy Organization) is the business organization of the dairy sector. Eleven businesses are associated to NZO, together these firms process 98% of all milk produced in the Netherlands. The main goal of NZO is to strengthen the economic and societal position of dairy farming.

5.4 Problem stream/normative pressure

In The Netherlands, there are several societal organizations that are concerned about sustainability problems in the dairy farming sector. In this section, the most important organizations are mentioned.

Natuur&Milieu (Nature and Environment) is a Dutch societal organization that strives for a sustainable and healthy world. Their focus areas are clean energy, smart mobility and health food.

The Dierenbescherming (animalprotection society) is the largest societal organization in the Netherlands that defends the interest of animals. They provide emergency help for animals and control the execution of animal welfare policy.

Wakker dier is a societal organization that strives for good circumstances for animals from the livestock farming sector.

Milieudefensie (Friends of the Earth the Netherlands) is a societal organization that focuses on environmental problems. They have three core themes: Food, mobility and international. Within these themes, they focus on the environmental impact.

Solidaridad is a societal organization that aims to combat poverty with honest and sustainable trade. They work on sustainable production chains from producer to consumer. They established several sustainable brands, for example Max Havelaar and Kuyichi.

5.5 Technological stream

Several universities and knowledge institutions from the Netherlands focus on knowledge development in the agricultural or dairy farming sector. In this section some important institutes are mentioned.

Courage is an initiative from LTO Nederland and NZO. The goal of Courage is to find and promote ground-breaking innovations in dairy farming for the long term. They work together with farmers, scientists, policy makers, businesses, and societal organizations.

Wageningen University (WUR) is in The Netherlands the university that focuses most on the agricultural sector. Healthy food and sustainability in agriculture are important themes.

LEI (Landbouw economisch instituut) (Agriculture economic institute) is a division of WUR what does socio-economic research for the government, companies and other organizations.

5.6 Projects

There are several projects focusing on making dairy farming or the livestock sector more sustainable. Some of the projects are explained here to better understand other parts of the report.

5.6.1 Koeien en Kansen (Cows and Chances)

Societal acceptance of business operations is increasingly important for the future of dairy farming (Ministerie EL&I, 2012). Most farmers do realize this. Not just technology and the economy are important for development; society sets new preconditions (Ministerie EL&I, 2012). The project 'Cows and Chances', which started in 1998, seeks for sustainable and social accepted possibilities for dairy farming. 'Cows and Chances' is a partnership between 16 Dutch dairy farmers, Wageningen University (WUR) and advisory boards. At the request of the ministry of economics, agriculture & innovation (EL&I), the project tests, evaluates and improves the effectiveness of (intended) manure- and environmental policy (Verantwoordeveehouderij.nl, 2011). The goal is to test these policy measures in field conditions, and support the Dutch dairy farming sector with the implementation. The participating firms are spread over the Netherlands and differ in size, intensity, soil, and corporate style (Verantwoordeveehouderij.nl, 2011). The companies are a reflection of the national

dairy farmers. Therefore, almost every Dutch dairy farmer will recognize its own company in one of the participants.

5.6.2 Duurzame Zuivelketen (Sustainable dairy chain)

Sustainable dairy chain is an initiative from NZO and LTO which started in 2008. Dairy processing industry and dairy farmers strive to make the Dutch dairy sector worldwide leader concerning sustainability. They set goals on four themes. *Climate & Energy*: 30% reduction of greenhouse gasses in 2020 compared to 1990, including climate neutral growth; 20% sustainable energy in 2020 and an energy neutral dairy chain; 2% energy efficiency per year (1,5% industry, 0,5% chain) in total 30% energy efficiency from 2005-2020, 2% energy savings per year at farmers. *Animal health & animal welfare*: Reducing antibiotic resistance; In 2013 use of antibiotics reduced to the level of 1999; Increase average lifetime cows, mainly by reducing mastitis and foot problems; In 2015 all new build stables integral sustainable. *Grazing*: Maintain current level of grazing (75%). *Biodiversity & environment*: 100% use of Round Table on Responsible Soy (RTRS) certified sustainable soy and sustainable palm kern expeller in 2015; Take measures that direct and indirect influence the phosphate volume and ammonia emission; Increase biodiversity.

5.6.3 Uitvoeringsagenda duurzame veehouderij (Implementation agenda sustainable livestock farming)

In May 2009, the minister of EL&I and eight chain partners signed the 'Uitvoeringsagenda Duurzame Veehouderij'. These chain partners are: COV (Central organization of meat sector), Dierenbescherming, Interprovinciaal overleg, LTO, Ministry of EL&I, Natuur&Milieu, Nevedi, NZO, Rabobank, Groene Kennis Coöperatie (Green Knowledge Cooperation) (Uitvoeringsagendaduurzameveehouderij.nl, 2012). The cause of this agenda was the 'Toekomstvisie op de Veehouderij' (Vision for the future of livestock farming' from 2008). The goal of this vision was a sustainable livestock farming sector within fifteen years. In the implementation agenda agreements to realize the challenges from the objectives were made (Uitvoeringsagenda Duurzame Veehouderij, 2012). They strive for sustainability improvements on six themes: system innovation; welfare and health; societal fit; energy; environment and climate; market and entrepreneurship; responsible consumerism (Uitvoeringsagenda Duurzame Veehouderij, 2012).

6. Developments concerning sustainability in dairy farming

This Chapter presents the results of the first stage of the research, describing the most important developments concerning sustainability in the Dutch dairy farming sector. Eventually, this will lead to an overview of the most important sustainability problems. Subsequently, the problems that caused the most societal discussion are presented. Later on, answers to the following two sub questions will be provided.

- *How has the Dutch dairy farming regime developed considering sustainability from 1990 until now?*
- *What public concerns regarding sustainability in dairy farming have come up during 1990-now?*

The answers are based on data found through literature research, media databases analysis, and expert interviews. As explained in the methodology four key actors were interviewed in this stage of the research. A complete overview of the interviewees, their background, and interview questions is presented in appendix A.

6.1 The position of dairy farming

According to the expert interviews, dairy farming has a very good starting point considering sustainability compared to other agricultural sectors, like pig and poultry farming (Tielemans, 2012; Vries, de, 2012). The image and societal acceptation of the sector are very good at the moment (Tielemans, 2012; Vries, de, 2012). This image is mainly based on the image of the sector of green meadows with grazing cows. However, several trends such as abolition of the milk quota, up-scaling of companies and increasing milk production per cow, make that the sector has to concern about sustainability (Tielemans, 2012; Vries, de, 2012). Maintaining a good image is very important for the sector, because you cannot work separated from your environment in an urbanized country like The Netherlands. On top of that, dairy farming uses about two third of the available green space in the Netherlands. A continue dialog between farmers and their environment is necessary, and increasingly more farmers are willing to do so (Vries, de, 2012).

According to the expert interviews, the motivation to become more sustainable arises mainly from the market and society. Consumers and citizens ask for sustainable products; consumers via retailers like Unilever and other market parties, citizens via governmental elections (Vries, de, 2012). In the next section, a description of the most important developments concerning sustainability is provided.

6.2 Developments towards sustainable dairy farming

6.2.1 History Dutch dairy farming

After the Second World War, the Dutch rural area changed a lot, up-scaling and mechanization where the main trends. This was caused by the 'hunger winter', what people hoped to never witness again. By 1970, a farmer could milk a fivefold of cows in the same time on his own as in 1950 (Bleunink et al., 2011). In 1962, the 'Gemeenschappelijk Landbouwbeleid' (GLB) (common agricultural policy) was established. The core of this policy existed of guaranteed high prices for grain, dairy and sugar (Bleunink et al., 2011). The goal of this policy was to guarantee enough food for the population. This led to enormous surpluses of agricultural products, which were dumped on the world market for very low prices. In 1970, it was tried to change the GLB to reduce these surpluses, but the agricultural lobby was too strong, so surpluses continued to increase. The Netherlands was the fastest developing country considering agriculture. This was mainly caused by good cooperation between research, information and education (Bleunink et al., 2011).

6.2.2 Sustainability in agro-food

Sustainability gained attention since the 1970's, when economic developments led to increasing environmental concerns. The production of agricultural products was on a desirable level, and attention for the effects on nature and animals increased. At this time, sustainability issues were mainly related to environmental pollution and loss of biodiversity. In the late 60's and early 70's, several societal organizations with specific goals (protection Waddenzee) were established. In 1971, 'Milieudefensie' (Friends of the Earth the Netherlands) was founded and in 1972 'Natuur & Milieu' (nature and environment). These two organizations focus on environmental problems and ecological sustainability. This societal attention for nature, landscape, and environment led to the first steps towards a national (agriculture) environmental policy. Results were, for example, renounce of reclamation of the Waddenzee, and incorporation of nature goals in agricultural policy. Societal organizations like Natuur & Milieu already warned for problems with manure surpluses, but policy makers expected all problems could be solved with technological solutions, like manure processing (Bleunink et al., 2011). However, this technique never became successful. In 1981, CLM (Centrum voor Landbouw en Milieu) (Centre for agriculture and environment) was founded to build a bridge between the agricultural sector and environmental organizations (Bleunink et al., 2011). In 1984, a production control system was implemented in dairy farming, called 'superheffing'. Every farmer was allowed to produce a certain amount of milk, and if they produced more, they had to pay a fine. These rights were tradable (Bleunink et al., 2011). These production control measures had nonetheless nothing to do with environmental concerns, but they were based on economic reasons. There still were very high dairy surpluses and GLB was almost unaffordable. First farmers were against this measure, but it led to stable prices and balance on the European dairy market and therefore, later it could count on much support from the sector (Bleunink et al., 2011).

Another environmental concern in the 80's was the use of pesticides. Among farmers, there was much ignorance towards the environmental impact and health risks of pesticides. Therefore, CLM

plead for the publicity of information about pesticides at the commission for admission of pesticides in 1986 (Bleunink et al., 2011). This information became public in 1988, what made it easier to develop a pesticides policy (Bleunink et al., 2011).

After the appearance of the Brundtland report (Our common future) in 1987 and the 'Rio declaration on environment and development' in 1992, sustainability became an increasingly important topic on international policy agenda's (Gosselink & Smelt, 2008; Unesco, 1992). In 1989, the Dutch government presented a National Environmental plan (Bleunink et al., 2011). This was the first time the Dutch government presented its environmental ambitions in a coherent form. Sustainable development was very important in this policy plan, based on proposals from the Brundtland report (Bleunink et al., 2011). However, although there was a policy plan, in practice there was not always lived up to this plan. This led to high tensions between environmental organizations and farmers.

Concerning the political structure in the Netherlands, much changed after the elections in 1994. The political coalition changed drastically, for the first time in a long period the CDA was not part of the coalition. The first 'purple' (VVD/PvdA/D66) was a fact. This implied the agri- and horticulture sector had no 'natural representive' from CDA as a minister. This had a large influence on the agricultural sector (Bleunink et al., 2011). The new coalition thought the rural area should not be exclusively for farmers and gardeners, but should also offer opportunities for nature, landscape, recreation and living. Moreover, the agricultural sector should be less dependent on governmental support, and be responsible for its own income (Bleunink et al., 2011).

In the 90's, something else changed as well; consumers became more assertive and food quality became more important. The influence of market and consumers became hence increasingly important (Bleunink et al., 2011). Critics of consumers increased after 'criminal' practices of food producers, which caused dioxins in meat and milk. Furthermore, in 1996 a causal relation between ten people who died from Creutzfeld Jacob and eating of meat from cows suffering the mad cow disease was found (Bleunink et al., 2011). According to Gosselink en Smelt (2008), these crises related to animal feeding and animal diseases led to an increasing pressure on the agricultural sector to develop sustainably. For the agro-industrial sector it became increasingly important to provide a valuable contribution to society, besides guaranteeing enough food and making an economic profit (Gosselink & Smelt, 2008).

From 2000 onwards, another structural change took place. Not the government, but large market parties became the driving force behind environmental and welfare requirements. Parties like Unilever, Friesland Foods, Campina and Albert Heijn chose more often for corporate social responsible (CSR) entrepreneurial directions. They often worked together with societal organizations like the world nature fund (WNF) and the Dierenbescherming. Sustainability became a marketing strategy (Bleunink et al., 2011). Additionally, the political field changed again, in which the new coalition strived for more public-private cooperation and decentralization in agriculture. At the same time, agricultural firms continued to grow. On some dairy farms, more than 500 cows were milked (Bleunink et al., 2011).

In 2006, the movie 'An Inconvenient Truth' from Al Gore led to renewed attention for sustainability among consumers. Environmental and consumer organizations held public actions in supermarkets for animal welfare, less use of pesticides, and wanted to increase the supply of biological products (Bleunink et al., 2011). Market parties reacted on these protests by offering more sustainable, high quality products.

In 2001, many cows were preventively killed because of an outbreak of foot and mouth disease. In the following years, other outbreaks of animal diseases such as bird flu and Q-fever followed. Furthermore, the attendance of MRSA (hospital bacteria) was linked to use of antibiotics in farming. This led to societal discussions about intensive farming, and its risks for human health. Besides concerns for human health, attention for animal welfare increased. In 1998, Wakker Dier was founded and in 2002 the Partij voor de Dieren (Party for the Animals) (Bleunink et al., 2011). In 2006, the Partij voor de Dieren (PvdD) got two seats in the second chamber of the Dutch government after the elections, and therefore more influence in National politics. The societal and political attention for animal welfare led to attention for animal welfare within the agricultural sector. However, tangible results seemed difficult to reach. Nowadays, there are regulations related to animal welfare in pig and poultry farming. Examples are the ban on battery cages for chickens, and minimal space availability for pigs. In dairy farming however, there are no regulations (yet).

Several committees discussed the future of livestock farming: commission Wijffels in 2001, societal discussion livestock farming in 2005, and vision for the future of livestock farming in 2008. In May 2009, the minister of EL&I and eight chain partners signed the 'Uitvoeringsagenda Duurzame Veehouderij' (Implementation agenda sustainable livestock farming). The motive of this agenda was the 'Toekomstvisie op de Veehouderij' (Vision for the future of livestock farming from 2008). The objective of these agreements was to create a sustainable livestock farming sector within fifteen years. In the implementation agenda agreements were made to realize the challenges from the vision (Uitvoeringsagenda Duurzame Veehouderij, 2012). Some developments have been withnessed so far, especially concerning animal welfare. Examples are the 'beter leven' (better live) label from the Dierenbescherming and Rondeel eggs (Bleunink et al., 2011). Again, these are both examples from the pig- and poultry farming sector.

At this moment, several trends have an effect on the agricultural sector and dairy farming. First, there is the banking crises that determines the political agenda. Trends like the growing world population, increasing welfare in China, Brazil, and India, food speculation, increasing demand for bio-fuels and climate change will lead to price fluctuations and increasing food prices. Food and food production are increasingly important for political strategies (Bleunink et al., 2011). Expected problems for the future are biohazards, exotic species that disturb the ecosystem; nitrate and phosphate surpluses (due to growth); greenhouse gasses; societal acceptance and new epidemic animal diseases. From the different Livestock farming sectors, dairy farming has the best position concerning sustainability. The sector is more accepted by society than pig and poultry farming (Tielemans, 2012). However, the sector does have to deal with several problems related to

sustainability. In figure 4, the different problems are visualized over time. The selection of these problems is based on information gained from the expert interviews. Also, some 'turning point' events are mentioned at this time scale.

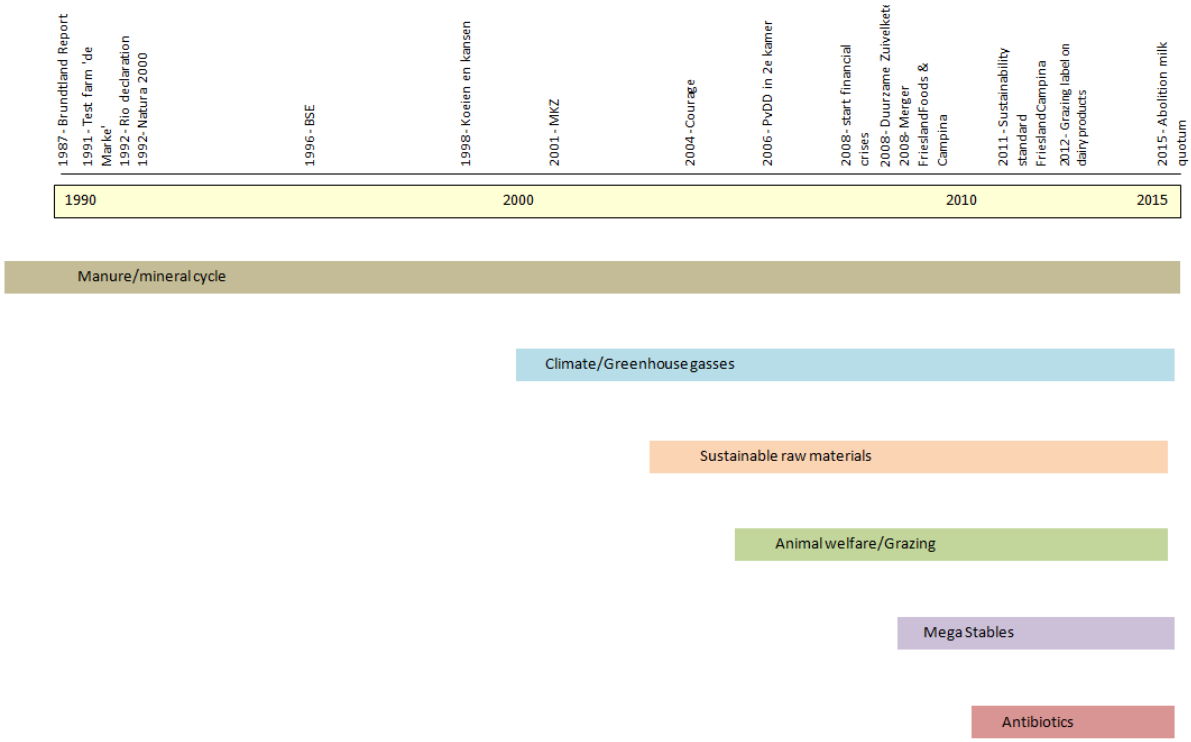

Figure 4: Sustainability problems of dairy farming

6.3 Sustainability problems

In this section, the main problems concerning sustainability in the dairy sector, as shown in figure 4, are explained a bit more thoroughly. In addition, some developments that aim to offer a solution are discussed.

6.3.1 Manure/mineral cycle

Figure 5: Manure/mineral cycle

In the 1990's, most governmental attention was given to manure and mineral policy (Bleunink et al., 2011). The manure problem started in the 80's, back then due to growth of the amount of cows held, manure production reached its peak. Dairy farming is responsible for 35% of the phosphate surplus and 60% of nitrogen losses (Bruchem et al., 1999). High inputs of nutrients through fertilizers, manure, and animal feed, combined with professional farm management led to high productivity levels in Dutch dairy farming (Neeteson, 2000). However, nutrient input exceeded nutrient output by far, which led to high nutrient surpluses. Nutrient surplus is defined as the difference between nutrient input and output from the farm. In 1995, surpluses were, on average, 304 kg nitrogen per hectare and 34 kg phosphate per hectare (Neeteson, 2000). These high surpluses result in large nutrient losses, which have subsequently adverse effects on groundwater, surface water and the atmosphere (Bruchem et al., 1999; Neeteson, 2000).

The Dutch government aims to minimize these negative consequences with policy measures. In 1984, the Dutch government introduced the 'superheffing' (Surcharge on milk produced above a certain limit). This led to a decline of the amount of cows, and therefore the amount of manure. Dutch manure policy is based on the European Nitrate guideline from 1991 (Rijksoverheid, 2012a). To satisfy this guideline no more than 170kg nitrogen per ha. from animal manure can be used. The possibility exists to obtain a derogation (exception) on this guideline. Dairy farmers with at least 70% grassland can use until 250kg nitrogen from animal manure per ha. per year. Dutch farmers use this derogation, and it is extended until 01-01-2014 (Boone & Dolman, 2010). First Dutch policymakers thought the Nitrate guideline could be satisfied by manure processing, but this did not seem successful (Bleunink et al., 2011). In 1994, manure quota were implemented, but this did again not led to the expected decrease of manure production. In 1998, the Dutch government introduced MINAS (minerals accounting system) based on the European Nitrate guideline. This system was based on balance of minerals (Bleunink et al., 2011). MINAS led to a decrease of nitrogen emissions, but used loss standards were to wide according to European standards. Therefore, the European court convicted the Netherlands in 2003. As a consequence MINAS was abolished by the government in 2006 (Hermans, 2012). In January 2006, MINAS was replaced with the 'new manure policy' which is based on supply norms for nitrogen and phosphate instead of loss norms (CBS, 2010). Besides the amount of animal manure farmers can use, the government also set regulations for manure application. Manure can only be spread from February until September (Rijksoverheid, 2012a), because during autumn and winter the risk of nitrate leaching is the largest. Dutch manure policy is evaluated every five years, and its effect is measured every year.

In the 'Uitvoeringsagenda Duurzame Veehouderij', the most important actors in the farming sector are committed to close the feed and manure cycle as much as possible. Recently, a taskforce is initiated to close the mineral cycle (Uitvoeringsagenda Duurzame Veehouderij, 2012). The taskforce exists of Nevedi, Cumela, LTO (agri- and horticulture organization), Stichting Natuur & Milieu (nature and environment foundation), Wageningen University, and EL&I (Uitvoeringsagenda Duurzame Veehouderij, 2012). At the moment, this taskforce is working on an action plan that must be ready by

the summer of 2012. The aim is to minimize phosphate emission via animal feed and to make agreements with LTO over this topic in a covenant. If the amount of useful phosphate in animal feed is lower, this will automatically reduce the emission. This measure already led to much lower surpluses. The project of Nevedi and LTO also yielded a tool for farmers to calculate their own surplus or shortage (Van den Graaff, 2012). Another recent development to decrease manure surpluses is manure refining at company level (Uitvoeringsagenda Duurzame Veehouderij, 2012). This is a form of manure processing to detract nitrogen, phosphate, potassium, and sulfur from manure and make compost or fertilizers from it. NZO and FrieslandCampina started the first pilots and results about the eventual success are expected in 2013 (Zessen, 2012). This is an interesting sustainable innovation, and therefore suitable for the case study. However, because there are no results yet about the success, this innovation will not be used for this case study.

6.3.2 Climate/greenhouse gasses

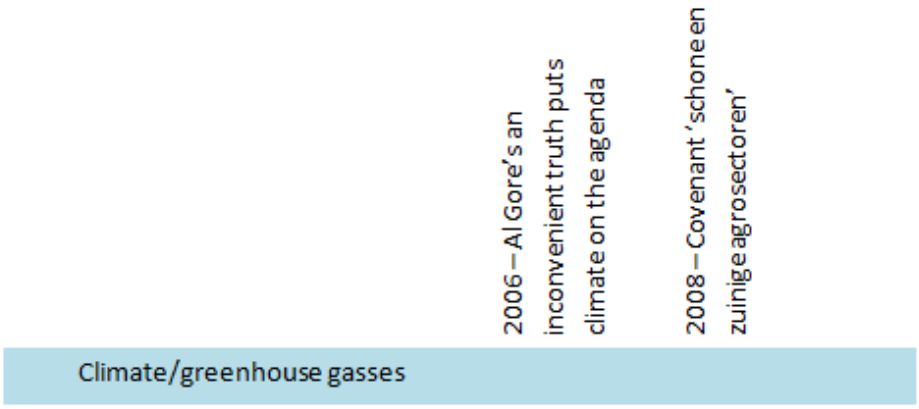

Figure 6: Climate/greenhouse gasses

The Dutch agricultural sector is responsible for about ten percent of all greenhouse gasses emitted in the Netherlands (Agentschapnl, 2011). Dairy farming is responsible for the largest share (Agentschapnl, 2011). Around the year 2000, the concerns about the negative effects of dairy farming on the climate increased, mainly caused by awareness of the high methane emissions. Methane is a greenhouse gas produced by cows during digestion. This problem was put on the political agenda by an international report that pictured cattle farming very unfavorable (Hermans, 2012). The documentary/movie 'An Inconvenient Truth' by Al Gore set climate change even more on the societal agenda. This also increased attention for the causes of climate change, like methane and CO2 emission, among society (Bleunink et al., 2011). According to the report 'Livestock's long Shadow' from 2006, it seemed livestock farming was responsible for a larger share of greenhouse gas emission than people thought (Bleunink et al., 2011).

Solutions in this problem field are mainly based on reduction of energy use, or energy generation at farms. Examples are manure or biomass fermentation to generate energy. In 2006, a trial was started on 'de Marke' (Bleunink et al., 2011) and after 2006, CLM developed a tool 'Klimaatlat' to measure

energy use and greenhouse gas emission of farms. Based on the results of 'Klimaatlat' farmers should be able to take measures to reduce their energy use and greenhouse gas emission (Bleunink et al., 2011). Recently, mainly large market parties like Ahold and Unilver are concerned about climate change. As a result, they set preconditions for their suppliers (Bleunink et al., 2011).

In 2008, the covenant 'Schoon en Zuinig' (Clean and Economical) was signed. This covenant states that the emission of greenhouse gasses should be reduced with 30% by 2020 as compared to 1990. In the covenant 'Schone en Zuinige Agrosectoren' (Clean and saving agricultural sectors), the general policy goals are specified for agricultural sectors (Boone & Dolman, 2010). An example of such a specified goal is the reduction of at least 5% methane emission per milking cow in 2020 compared to 2007. This goals should be reached through diet optimization and usage of special feed additives (Boone & Dolman, 2010). Nevedi, in cooperation with LTO and NZO, supports research to measure methane emission and possibilities to reduce this emission (Graaff, van den, 2012).

6.3.3 Sustainable raw materials

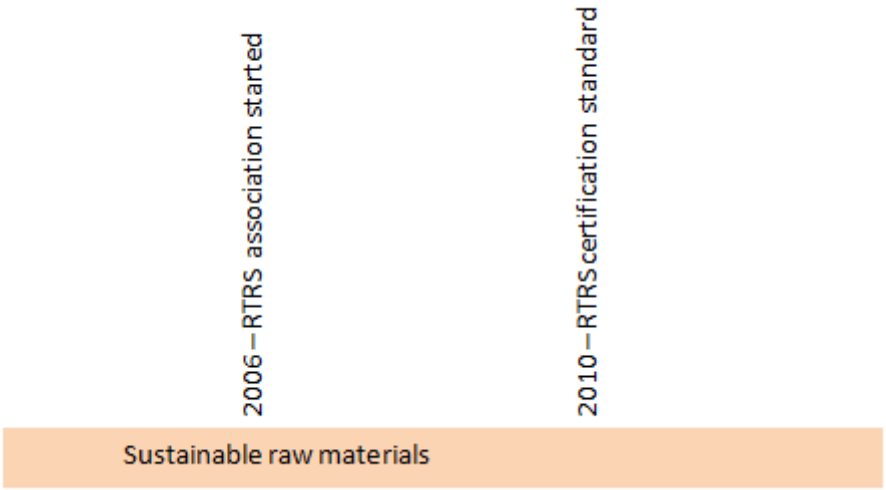

Figure 7: Sustainable raw materials

Animal feeding and sustainable raw materials are closely related to sustainability of dairy farming. In the 'Uitvoeringsagenda Duurzame Veehouderij' it is agreed to close the feed-manure cycle. A large share of raw materials used in animal feeding is imported from countries outside the Netherlands. This leads to several sustainability problems like CO2 emissions through transport; deforestation in South-American countries who produce raw materials for animal feeding; etc. From lifecycle analyses, conducted on several dairy farms, can be concluded that a large share of environmental load comes from the production of animal feed (Boone & Dolman, 2010). About 40% of the environmental load of dairy farming takes place outside the company, mostly through the production of raw materials (Boone & Dolman, 2010). In the 'Uitvoeringsagenda Duurzame Veehouderij', one of the goals is to produce all raw materials for animal food in a sustainable way (Uitvoeringsagenda Duurzame Veehouderij, 2012).

Until now, the most promising developments are around sustainable soy. The ambition is to use 100% sustainable (RTRS certified) soy by 2015 (Uitvoeringsagenda Duurzame Veehouderij, 2012). Round table responsible soy (RTRS) is an international platform in which soy producers, soy traders, the processing industry, banks and societal organizations cooperate to develop and implement sustainability criteria for global soy production. Since October 2010 a standard for sustainable soy was defined, which is the so-called 'round table responsible soy' (RTRS). This standard makes it is possible to certify soy. There are comparable initiatives for other raw materials, for example round table responsible palm oil (RSPO) (Graaff, van den, 2012). The first RTRS certified soy is available on the Dutch market since 2011. RTRS soy is chosen as one of the case studies in this research. It is decided to study RTRS because it is a sustainable innovation and it is already available on the market. RTRS is more elaborately discussed in Chapter 8.

Besides guaranteeing the sustainability of 'regular' raw materials, a search to alternative raw materials for animal feeding is taking place. This because prices of the regular raw materials recently increased due to the growing world population, speculation on the raw materials market, increasing welfare in new economies and the production of bio fuels (Van den Graaff, 2012). Alternatives can be seaweed, insects, or byproducts from the bio fuel industry. Also, animal proteins, byproducts from the meat industry, can be used to replace regular raw materials (Van den Graaff, 2012).

6.3.4 Animal Welfare/Grazing

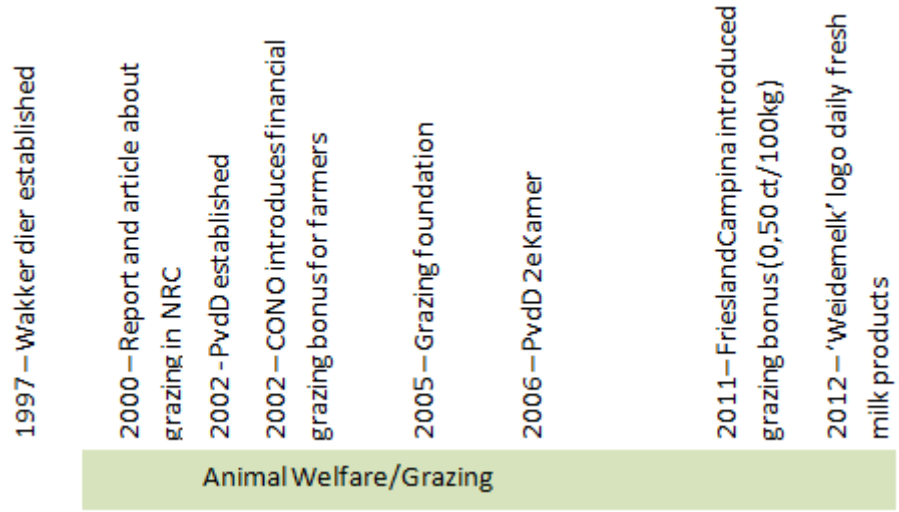

Figure 8: Animal Welfare/Grazing

From around the year 2000, attention to the welfare of livestock animals increased. The foundation and election of the Partij voor de Dieren (PvdD) and the foundation of action groups like Wakker Dier encouraged societal attention. In dairy farming, animal welfare is mainly represented by grazing (Tielemans, 2012). Around 2000, the societal discussion around grazing started with an article in NRC (Bleunink et al., 2011). The large majority of consumers thinks cows should be grazing, and most

dairy farmers agree with this. For most consumers the image of dairy farming and the welfare of cows is directly related to grazing (Tielemans, 2012). However, several trends make that more farmers keep their cows inside year round. Examples of such trends are milking robots, better control of feeding, economic advantages, and up-scaling. In 2011, 26% of all cows were kept inside year round (Keuper et al., 2011). Scientifically, there is no definite answer yet to the question of what is better for cows; grazing or kept inside in a modern stable (De Vries, 2012; De Veer, 2012). The main considered advantages of grazing are animal health and welfare, often heard arguments are: grazing provides better possibilities for natural behavior than most stables; dairy farming is important for the Dutch landscape, grazing cows provide an extra dimension; and grazing makes dairy farming visible, it contributes to a good image of the sector (Stichting Natuur & Milieu, 2005).

In 2002, CONO was the first dairy processing company that provided a financial bonus for farmers who let their cows graze (Tielemans, 2012). In 2005, a conference on grazing took place; the outcome was 'stichting weidegang' (grazing foundation). This foundation first focused on knowledge diffusion. Another development was daily fresh milk with a guaranteed grazing label (Weidemelk) that reached the market. In 2011, FrieslandCampina increased its grazing bonus from 0,05ct to 0,50ct per 100kg milk. Since 2012, the official guaranteed grazing logo (Weidemelk logo) reached the market (Tielemans, 2012). This logo is managed by the grazing foundation (Stichting weidegang). It is expected that the amount of products with such a guaranteed grazing label is going to increase. The market has to pay an additional charge, which is supposed to stimulate grazing. There are no policy regulations concerning grazing. Duurzame Zuivelketen (Sustainable Dairy chain) pleads for a license component in the common agricultural policy (Tielemans, 2012). Tielemans (2012) expects that the grazing logo will have a significant effect. As an example, she calls the star system (Beter leven keurmerk) of the Dierenbescherming. This has a large impact; Unilever has decided only to use meat with a star. Tielemans (2012) expects that through pressure of societal organizations, guaranteed grazing dairy will on the long-run be the only choice offered in supermarkets (Tielemans, 2012).

Besides grazing, also other animal welfare concerns are related to dairy cows. Examples are health concerns (claw and udder infections), problems related to reproduction, veal, worse (winter) stables, and the lifetime of cows (Van den Berg, 2012). There is a tool available, which measures the welfare of dairy cows on many different points. This tool is called Cow-Compass. This innovation is used as one of the case studies in this research. It was decided to focus on a tool that takes all welfare aspects into account and not just grazing, because there is no scientific consensus about the real benefits of the latter.

6.3.5 Mega stables

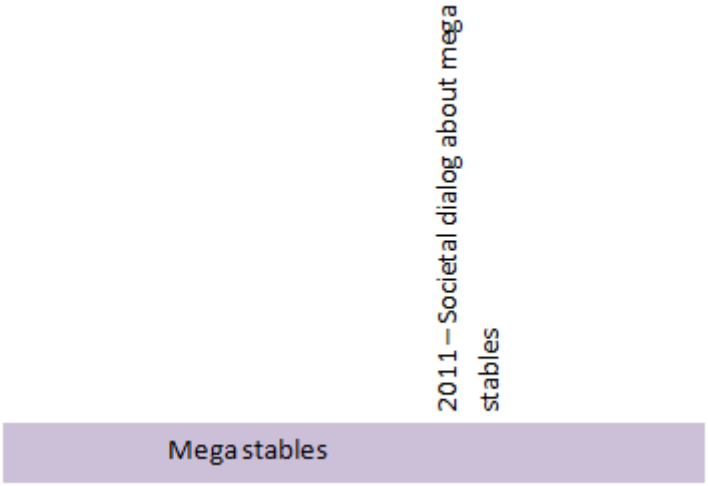

Figure 9: Mega stables

The mega stable discussion started around 2008 with among others an episode of 'Zembla' on mega stables in pig farming, which caused a societal discussion. In February 2011, the majority of the second chamber voted for an immediately stop in building mega stables. This was an initiative of the PvdD (Zembla, 2011). The secretary of EL&I was against an immediately freeze and decided to develop an advice over intensive farming in the Netherlands. From May 2011 until august 2011, a societal dialog over mega stables took place. The secretary of Economics, Agriculture and Innovation (EL&I) stated that livestock farming cannot exist without societal acceptance. Therefore, everyone should join the dialog (Rijksoverheid, 2011). Before the actual dialog started, the opinion of the public on mega stables was investigated. Most people did not choose a definitive position, 42% tends to acceptance, and 49% tends to rejection (Rijksoverheid, 2011). Most people based their arguments on animal welfare and public health concerns (Rijksoverheid, 2011). The discussion on mega stables is organized around five themes: entrepreneurship, animal, human, environment, and landscape (Rijksoverheid, 2011). In November 2011, the secretary of EL&I presented a vision for the future of livestock farming based on the dialog. The secretary noted that a consistent choice for sustainability in agriculture is required to survive economically on the long run. The Dutch government thinks unlimited growth is undesirable. The government is working on legal supplies to set a limit to the size of companies on a specific location. One of the measures they take is the stimulation of gradual development of modern family farms (Rijksoverheid, 2011b).

The discussion around mega stables focuses mainly on intensive farming in the not-soil bound sectors of pig and poultry farming (De Vries, 2012). In dairy farming, this discussion is less important; however, it would not be wise to neglect the discussion. At this moment, dairy farming has the possibility to tackle the discussion before it is being a real issue. For pig and poultry farming it was too late; they already had to deal with a negative image (De Vries, 2012). The discussion around mega stables is very complex; parties who set it on the agenda are for example the PvdD and

Milieudefensie. They focus on animal welfare and animal health. However, in large farms, the animal health and welfare has often been proven to be better than on small farms (De Vries, 2012). Milieudefensie states they have this focus on animal welfare because this is more appealing to consumers (Hooijer, 2012). Nonetheless, their real concerns are related to environmental problems related to mega stables. Examples are particulate matter emission and manure surpluses. Unfortunately, animal welfare triggers citizens more than these environmental concerns (Hooijer, 2012). This makes the discussion very complex.

Solutions in this problem area are, for example, the building of sustainable stables with a high level of animal welfare. Courage tries to change the discussion from quantity to quality. It has to be decided what is acceptable concerning landscape, animal welfare, fit in society, environmental impact, food quality, etc. Courage builds a new type of large stable, the 'Koeientuin' (cow garden) in which the focus is on the welfare of the cow. This implies an extra-large stable, because the cows have many space. The idea of this project is to change imaging around mega stables (De Vries, 2012).

Although there is a lot of societal discussion on mega stables in the Netherlands, not so many dairy farmers are interested to grow to hundreds of cows. De Vries (2012) expects that when the milking quota is abolished in 2015, there will be growth, but mainly small growth. A farmer will grow from 100 to 150 cows for example. A large company with many personnel is financially vulnerable and therefore not an option for many farmers (De Vries, 2012).

6.3.6 Use of antibiotics in livestock farming

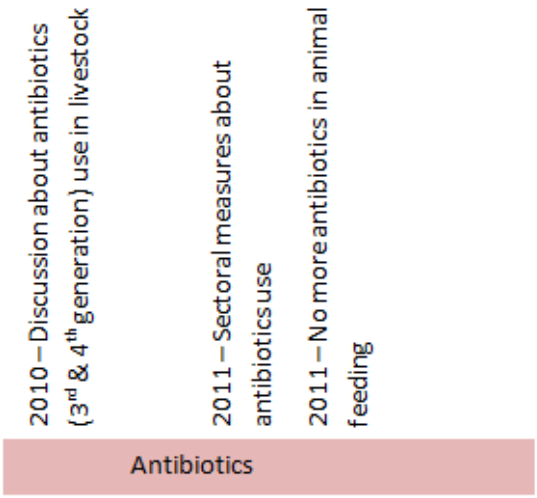

Figure 10: Antibiotics

Around 2010, the discussion around the (over)use of antibiotics in livestock farming came up very intensely. In livestock farming, antibiotics of the third and fourth generation are used on a regular basis. While in human healthcare these antibiotics are only used if no other antibiotic worked. The use in livestock farming caused resistance problems, what is a huge threat for human health

(Tielemans, 2012). Actors that put this topic on the agenda were mainly parties related to human health, like the GGD, societal organizations, and later the representatives of the second chamber.

In dairy farming, there are already solutions for the antibiotics problem. The sector made collective agreements, which are incorporated in delivery conditions. A dairy farmer needs a company health plan (bedrijfsgezondheidsplan BGP); in this plan is included that it is not possible to use antibiotics that are crucial in human health (third and fourth generation). Furthermore, a farmer now works with only one veterinarian to prevent extensive use of antibiotics. Also, antibiotic use is mapped, meaning that if use is above a certain value, the farmer receives a warning. If there is no change, the farmer is forced to change his health plan. If this plan is not approved of, his milk delivery can be refused (Tielemans, 2012). These measures come from the covenant 'antibioticaresistentie dierhouderij' (antibiotics resistance livestock farming). This covenant was signed in 2008 (Rijksoverheid, 2008) and is a cooperation between veterinarians, the government, LTO and NZO. It is expected that the discussion on antibiotics will weaken with these measures (Tielemans, 2012).

In the animal feeding sector, measures were taken as well. Legally, it is allowed to incorporate antibiotics in animal feeding, and especially in the poultry sector this method was used. The animal feeding sector decided they did not want to play a role in the antibiotic resistance problem. Therefore, in 2011 they collectively quit producing animal feeding with antibiotics (Van den Graaff, 2012). All food producing companies had to get an additional GMP (Good manufacturing practice) module, which cost them extra money and work. However, all food producers received the certificate (Van den Graaff, 2012). Some farmers, especially poultry farmers, did not like this decision, because they have to find another way to apply antibiotics. Nevedi thinks the most efficient solution would be to prohibit the use of antibiotics in animal feed by law. However, this is dependent on European law, and will take years. While at the moment, the sector arranged a solution for itself which only took a couple of months (Van den Graaff, 2012).

6.4 Societal discussion

In the previous section, the most important sustainability problems of the dairy sector were discussed. This section aims to discuss which of these problems are surrounded with the most societal discussion. In figure 11 the results and an interpretation of the media database analysis is presented. This overview shows media attention shifts over time. First environmental and manure problems are mentioned a lot, later attention shifted to grazing, animal welfare and greenhouse gasses. Mega stables also get attention, but the focus has been more on pig and poultry farming (not showed in figure 11). The manure/mineral problem does get attention, but this is more from specific societal organizations like Natuur & Milieu (nature and environment) and from specialized research institutes. Sustainable raw materials are an important topic for some societal organizations, but receive less public attention. The same accounts for the climate discussion related to dairy farming, which is apparently not considered an important topic in the Dutch society, but some societal

organizations, like Natuur & Milieu and market organizations like Unilever perceive it as very big. Probably, the link with dairy farming is not clear for most consumers (Hermans, 2012). It is important to note that a distinction has to be made between the societal discussion and the discussion in the market. In the market, the climate/greenhouse gas discussion is much larger than the other discussions (De Vries, 2012). This can be explained by the fact that the other discussions (grazing, antibiotics, mega stables) are mainly Dutch discussions. However, the Dutch dairy farming is mainly export oriented, and therefore its problems should be seen in an international context. A large party such as Unilever has worldwide sustainability standards, which makes the discussion on greenhouse gasses very important (De Vries, 2012). However, the focus in this research is on dairy farming in the Netherlands, and therefore the focus will be Dutch sustainability discussions.

To sum up, the dairy farming sector is subject to several problems related to sustainability. The main problems are related to the manure/mineral cycle, climate/greenhouse gasses, sustainable raw materials, animal welfare/grazing, mega stables, and antibiotics. For some problems, there are already concrete solutions, for others these are in development or there are no potential solutions yet. There are selected two innovative solutions which provide a possible solution for a sustainability problem in dairy farming. The selected cases are Cow-Compass, which aims to improve animal welfare, and RTRS which aims to improve use of sustainable raw materials. These two cases are selected because it are tools which are already on the market, so something can be said about results, and because they aim to solve one of the identified problems. In the next section, an answer to the first two sub questions is provided.

Figure 11: Newspaper analysis

6.5 Answers to sub question 1 and 2

In this paragraph, the aim is to provide an answer on the first two sub questions:

How has the Dutch dairy farming regime developed considering sustainability from 1990 until now?

What public concerns regarding sustainability in dairy farming have come up during 1990-now?

In this Chapter, an overview of the developments concerning sustainability from 1990 until now has been provided. This overview shows normative pressure on the dairy farming regime to change increased after 1990. The focus of societal organizations changed over time. After 2006, large changes in market stream started. Since then, market parties increasingly focused on quality and sustainability as a marketing strategy. Political impact changed a lot after 1994, from stimulating the sector to growing and increasing production, political institutions put responsibility at the side of the farmers. Large technological revolutions took place before 1990. Most recent developments are more managerial types of changes on the side of the farmer. Knowledge development does have an impact on the attention of society for specific sustainability problems. An example is the report: 'Livestock's long Shadow' which increased attention for greenhouse gas emission. Answering sub-question two, public concerns changed over time. In the 1970's and 1980's , societal concerns about sustainability in dairy farming were mainly related to the environment. This was reflected by the establishment of social movements like Natuur & Milieu (nature & environment) (1972) and Milieudefensie (1971) and many more local/specific organizations. Main concerns were manure (over)production and use of pesticides. In the 1990's, consumers became more concerned about food quality and risks for human health. This was mainly caused by the outbreak of several animal diseases with risks for human health and contaminated animal feed. After 2000, the concerns about human health experienced a revival with new outbreaks of animal diseases and antibiotic resistant bacteria, caused by overuse of antibiotics in livestock farming. Another trend after 2000 was the increasing concern about animal welfare in livestock farming. Wakker Dier (1998) and de Partij voor de Dieren (2002) were established. In 2006, after Al Gore's movie, climate problems caused by livestock farming became a new topic of concern. Later, up-scaling, represented by mega stables, became a topic of concern. However, this was mainly at stake in pig and poultry farming.

In the following Chapters, two sustainable innovations in the dairy farming sector are studied. These are Cow- Compass (Chapter 7) and RTRS (Chapter 8).

7. Cow-Compass

This Chapter discusses the Cow-Compass (Koe-Kompas) case study. The Chapter starts with a description of Cow-Compass (Koe-Kompas) and the sustainability problem it helps to solve (7.1). In paragraph 7.2 is explained how Cow-Compass contributes to sustainability of dairy farming. This is based on the definition of sustainability Calker (2005) presented in the operationalization (Chapter 3). In paragraph 7.3 the roles of important actor groups (societal organizations, market parties, political organizations, technological organizations) on the development of Cow-Compass are explained. The most important advantages and disadvantages are also presented. In section 7.4, the found results are analyzed by using the theory described in Chapter 2. This Chapter provides case specific answers to sub questions 3 and 4:

- *How did public concerns influence the development of Cow-Compass in the Dutch dairy farming sector?*
- *What role did actors play from the market, political & regulatory and technological streams in the development of Cow-Compass in the Dutch dairy farming regime?*

The most information used for this Chapter was obtained from expert interviews. To elaborate on this case, interviews with three additional persons were held. The first inverviewee is Joost de Veer, the inventor of Cow-Compass. De Veer invented the tool and thus had a large impact on the development of the tool. The second interviewee was Grietsje Hoekstra of CONO, CONO (dairy processing company) was the first firm that used Cow-Compass. CONO also played a large role in the further development and implementation of Cow-Compass. At last, Bert van den Berg from de Dierenbescherming was questioned. The Dierenbescherming is mentioned by CONO as an involved societal organization. These three key informants were expected to know all relevant information on Cow-Compass. An oversight and more information about these experts is provided in appendix B.

7.1 Cow-Compass

Cow-Compass (Koe-kompas) is a tool to visualize how dairy farmers score on different welfare themes concerning a cow. Cow-compass visualizes the risk profile of a dairy farmer with 30 control points ranging seven categories. These control points score management points that can affect milk quality and mode of production (Duurzame Weidezuivel, 2012). The categories are:

1. Milking – It was checked how the milking room is arranged and what the milking routines of the farmer are. Was there, for example, sufficient cleaning, are there enough preventive measures to prohibit cross-contamination, etc.
2. Food and water – Cows need to have enough drinking water and good quality feeding.
3. Housing – There has to be sufficient space and light and the stables must have soft lying boxes and cow brushes. Also grazing in summer is scored positive (low risk).

4. Animal welfare – The physical shape of the cows is scored. Are they well fed, do the cows move well, are they free from problems with claws or udder.
5. Working routines – There is scored if contamination with disadvantageous germinates is prevented.
6. Animal sickness incidence – It is investigated which diseases occur at the firm, and how they originate. Also antibiotic use is discussed with the farmer. The amount and choice for specific antibiotics is discussed, and there is searched for possibilities to decrease use of antibiotics. The focus is on prevention of animal diseases.
7. Young stock – Housing of young stock is very important for healthy veal. Veal need to have enough good feeding and clean and dry housing (Duurzame Weidezuivel, 2012).

Scores range from 5 (low risk) to 1 (high risk). When the Cow-Compass is completed, the most important risks are visualized. The scores are provided by the farmers' own veterinarian. The farmer can work on these points to improve animal health, welfare, and milk quality. Figure 12 provides a fictional completed Cow-Compass; the larger the colored part, the lower the risks on the firm (Wageningen University, 2010).

CONO cheese makers actively developed and implemented Cow-Compass. Their motivation is that when a farmer knows and controls the possible risks in his company, the chance for deviations is much smaller (Wageningen University, 2010). For farmers cow-compass is a type of company guidance, existing of two company visits a year (Duurzame zuivelketen, 2012). During the first visit, the farmer and his veterinarian draft the cow-compass. Together they formulate goals the farmer can work on the following months. After this first visit, the farmer receives the completed Cow-Compass, a score list, and a short report with advice for improvements (Duurzame zuivelketen, 2012). A half year later, the second, more evaluative, visit takes place. The goals set during the first visit are discussed and again a cow-compass is drafted to visualize improvements.

Cow-Compass is built up of three levels. The seven points from the picture are the so-called Critical Success Factors (CSF). Every CSF is built up of several performance indicators, under each performance indicator several management control points are included (De Veer, 2012). The veterinarian judges if these management control points are met, and based on this judgment a score for the performance indicator is assigned. The average of all performance indicator scores for one CSF lead to the final score for the CSF and the picture. For the farmer the CSF scores and the picture are not very interesting (De Veer, 2012). Farmers find the scores on management control points and the guiding report more useful. They can use these scores to make tangible improvements. Cow-Compass functions as a management instrument for the farmer. Societal organizations and retailers on the other hand are interested in the CSF scores, because this provides them with a quick insight of the situation on the farm. They see Cow-Compass more as a quality control system (De Veer, 2012).

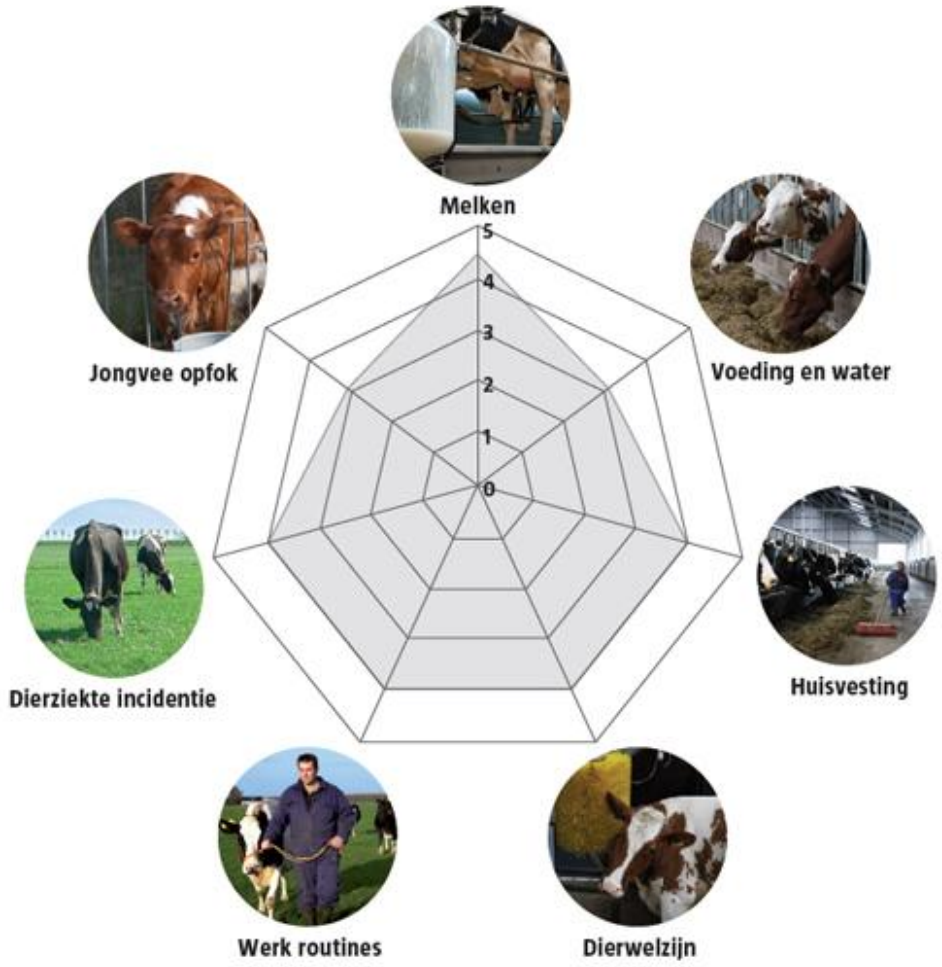

Figure 12: Cow-Compass (Duurzame weidezuivel, 2012)

The Dutch government decided from January 2012 Cow-Compass can replace PBB (Periodiek Bedrijfs Bezoek) (Periodically Company Visit) and BGP (Bedrijfs Gezondheids Plan) (Company Health Plan) (Hoekstra, 2012). PBB are obligatory company visits to warrant veterinarian control and animal welfare. PBB consists of four visits a year. With Cow-Compass this can be reduced to two visits. Since the 1st of January 2012, all dairy farmers are obliged to formulate a company health plan (BGP) together with their veterinarian. Cow-Compass can be used as BGP (Duurzame zuivelketen, 2012). This is an advantage for the dairy farmer because it reduces the amount of veterinarian visits. Furthermore, Cow-Compass provides farmers with more insights in the health and welfare status of their cows than PBB and BGP (Tielemans, 2012). Thereby, Cow-Compass uses a prospective approach, what makes it possible to work preventive instead of curative (Hoekstra, 2012).

Besides CONO, who introduced Cow-Compass, also Bel Leerdammer, DOC Kaas, De Graafstroom, Hochwald Nederland, Rouveen Kaasspecialiteiten en Vreugdenhil Dairy Foods (Nemelco) offer Cow-compass to their members since January 2012 (Duurzame zuivelketen, 2012). It was expected that 10% of member dairy farmers of the mentioned dairy processing firms should join cow-compass, but by the end of January already 25% of dairy farmers joined cow-compass (Duurzame zuivelketen, 2012b). This indicates it is a practical tool, appreciated by farmers.

7.2 Contribution to Sustainability

7.2.1 Economic sustainability

The contribution of Cow-Compass to economic sustainability is hard to tell, there are no research results available yet (Hoekstra, 2012). There can be stated it has an economic disadvantage because veterinarian visits concerning cow-compass will be longer than 'normal' visits and therefore more expensive. But on the longer term there can be economic advantages because of less animal sickness (Hoekstra, 2012). To make a good statement about this, long term research would be required.

7.2.2 Ecological sustainability

At the moment Cow-Compass doesn't contribute to ecological sustainability, and it has no negative effects either. CONO strives to incorporate ecological components in cow-compass in a later stadium (Hoekstra, 2012). Then it can contribute to ecological sustainability.

7.2.3 Social sustainability - internal

The contribution to internal social sustainability is not very clear, a good score on Cow-Compass asks for more time-consuming chores. For example cleaning drinking containers and better taking care of hygiene. On the other hand, most farmers are happier when their livestock is healthy. So, from this point it does contribute to better working conditions. Long term research is necessary to provide a thorough argument answer on this (Veer, de, 2012).

7.2.4 Social sustainability - external

From the different sustainability dimensions Cow-Compass contributes the most to external social sustainability, mainly by increasing animal welfare and animal health. First Cow-Compass can contribute to the prevention of undesirable substances in the milk (like antibiotics, dioxins, bacteria, etc.), however normally there is checked well for this already (Hoekstra, 2012). Furthermore cow-compass contributes to animal welfare in several ways. There is checked for the level of welfare by looking at animal- and surrounding characteristics (Veer, de, 2012). Cow-Compass is based on the natural behavior of the cow, therefore the score is higher if cows can express normal behavior. Cow-Compass also contributes to better animal health. There is preventively checked for circumstances that can cause diseases, in order to prevent for diseases. Cow-Compass doesn't promote less use of antibiotics, but it does stimulate more conscious use (Hoekstra, 2012). Concerning contribution to the landscape it slightly stimulates grazing, which is perceived as to contribute to the landscape. When grazing is applied a higher score is provided (Veer, de, 2012) this might stimulate farmers to let their cows graze.

7.3 The Actors

In this section is described what actors played a role in the development of Cow-Compass. These actors are grouped in: societal organizations, market parties, political and regulatory organizations and knowledge institutions. Because Cow-Compass first is mainly developed by one man there is a separate paragraph about the inventor. Furthermore advantages and disadvantages are discussed.

7.3.1 The Inventor

Joost de Veer is a veterinarian specialized in dairy farming and the inventor of the forerunner of Cow-Compass. During his time as a veterinarian he already valued guiding of farmers. Furthermore he was interested in the possibility to foresee animal health problems in the future based on the current situation (Veer, de, 2012).

Cow-Compass was the result of several developments de Veer noticed. One trend de Veer witnessed was the knowledge gap in dairy farming. The profession of a modern dairy farmer asks for higher educated people, which most dairy farmers are not. Knowledge transfer can bridge this gap. However, if you tell a farmer he needs to change his behavior to optimize his company results, he will ask for proof (Veer, de, 2012). Another trend that started early 2000, is the idea of quality thinking. First this was just about the quality of milk, but later the way of production became more important, how animal friendly milk is produced for example (Veer, de, 2012). According to the Veer (2012) this trend can be explained by the fact dairy farmers have to deal more with influence from their environment. Two generations ago 60% of all Dutch citizens had a farmer in its family at maximal one generation distance. Nowadays this is only 6-7%, this makes the distance between farmer and consumer larger (Veer, de, 2012). This leads to new perceptions of quality. However, farmers and consumers are dependent of each other, therefore most farmers are willing to change. Many firms in the feeding industry use HACCP (Hazard Analysis and Critical Control Points) as a quality control system. This didn't seem useful for the dairy farming industry because most values aren't controllable in dairy farming. However, the principal of a risk analysis is applicable on dairy farming. This is the origin of Cow-Compass, a risk-analysis based on management control points (Veer, de, 2012).

Most systems in dairy farming which aim to improve quality are based on a penalty system. De Veer (2012) is interested if quality improvement could be reached from a management approach. This management approach (forerunner of Cow-Compass) was used in a project called 'MILQ2' (January 2005 – December 2007). The result of this project was that increasing knowledge and improving management, increases quality. MILQ2 was a project of dairy farmers from south east Friesland (de Gagelvenne) and LTO. The farmers liked to work on sustainability of their farm, without losing income. The management tool of de Veer helped them to reach this goal (Veer, de, 2012).

7.3.2 Societal organizations

All interviewees agree there is societal concern related to animal welfare. The presence of several societal organizations and a political party with animal welfare as their focus point endorse this. However, many citizens relate animal welfare in dairy farming directly to grazing (Tielemans, 2012; Veer, de, 2012). In reality there is no scientific research available which supports the idea that grazing contributes to better animal welfare or sustainability (Veer, de, 2012). But because consumers ask

for grazing cows, many dairy processing companies try to meet this demand by stimulating grazing (Hoekstra, 2012; Veer, de, 2012).

Societal organizations in the Netherlands who are concerned about the welfare of livestock animals are for example Wakker Dier and the Dierenbescherming. For this research the Dierenbescherming is questioned. The Dierenbescherming indicates their most important focus areas in dairy farming are all related to animal welfare. They call grazing, several diseases, comfortable stables and veal (young veal soon kept away from mother and worse circumstances during transport and rearing) as the most urgent problems (Berg, van den, 2012). Most of these points are taken into concern within Cow-Compass. Still the Dierenbescherming is very skeptic about Cow-Compass, mainly because they are afraid no action would be undertaken after scores are provided, or because good scores can be reached to easily (Berg, van den, 2012).

In the MILQ2 project seventeen societal organizations were invited to discuss the preconditions for Cow-Compass. The goal of this dialog was to determine the range dairy farmers could move in, while still being accepted by societal organizations (Veer, de, 2012). Organizations that cooperated were among others: Dierenbescherming, Natuur & Milieu, Agrifirm, LTO, FrieslandCampina, Rijkswaterstaat, ANWB, etc. These organizations were asked to think about many different topics (Veer,de, 2012; Berg, van den, 2012). For the Dierenbescherming this wasn't very successful. They preferred to only discuss about their own expertise area (animal welfare) and thought de Veers focus was too broad. For the Dierenbescherming this was a reason to no longer cooperate in the development of the instrument (Berg, van den, 2012). De Veer thinks this has to do with a lack of knowledge at the animal protection society, and pressure from their backing to make grazing a CSF (Veer, de, 2012). Other organizations (like LTO and FrieslandCampina) didn't want to make grazing obliged, and for the Dierenbescherming this wasn't negotiable (Veer, de, 2012).

Another reason for lack of interest at the side of societal organizations is that they focus more on intensive farming than on dairy farming, because they think there are more urgent problems relating to animal welfare (Berg, van den, 2012; Veer, de, 2012). In later stadia of development societal organizations did have some influence. Under pressure of the societal organization 'compassion of world farming' the category veal and young stock is incorporated in Cow-Compass (Hoekstra, 2012). Also farmers who used Cow-Compass during the pilot studies indicated veal and young stock should be incorporated. Supermarkets like to link the name of a societal organization to labels of their products which indicate better animal welfare. They do this to increase trustworthiness of their labels (Berg, van den, 2012).

7.3.3 Market parties

Market parties are the most important group in the development of Cow-Compass. One of the market parties that had a large influence on the development of Cow-Compass is CONO. In 2007 CONO started a cooperation with Ben & Jerry's (brand of Unilever) (Hoekstra, 2012). Ben & Jerry's

has specific terms of delivery related to sustainability for their suppliers. To satisfy these conditions CONO introduced the 'caring dairy' program (Hoekstra, 2012). This is an integral sustainability program which focuses on three areas: happy cows, happy farmers and happy planet (Hoekstra, 2012). Cow-compass is used as a tool in 'happy cows' to monitor the welfare and health of cows of CONO's suppliers. At the same time it functions as a management instrument for the farmers, who can use it to increase animal welfare and health at their company (Hoekstra, 2012). In 2008, 40 dairy farmers cooperated voluntary in a study of veterinary science students; in 2009, 40 farmers voluntary cooperated in a pilot study of CONO. This increased to 140 farmers in 2010, 240 in 2011, and at the moment (2012) 480 of the 500 CONO members use Cow-Compass (Hoekstra, 2012). The results of the pilot studies are used to adapt and improve Cow-Compass. Examples of adaption's are incorporation of 'milking' and 'young stock'. From 2012 Cow-Compass made the tool available for other dairy processing companies (Hoekstra, 2012). By making it available for other firms it provides no competitive advantage for CONO, but should be seen as a precompetitive tool.

It can be stated the motivation for CONO to start using Cow-Compass and focus more on sustainability is related to market demand (Hoekstra, 2012). Companies, in this case Unilever, set preconditions for their suppliers. They do this not just because of moral considerations, but also because consumers ask for more sustainable and high quality products (Hoekstra, 2012). Almost all consumers state they would prefer products from animals with a high(er) level of welfare (Hoekstra, 2012; Berg, van den, 2012). However, when they are in the supermarket they base their decision on price or keep on to old habits (Berg, van den, 2012). Here is a role for supermarkets, who should put focus on high quality products instead of low prices. This way consumers are more stimulated to buy high quality (high animal welfare) products (Berg, van den, 2012). With dairy products it is very difficult for consumers to base their decision on animal welfare, because there is no label available (Hoekstra, 2012). The success of welfare labels like the ‘guaranteed grazing’ label and the ‘better living’ (Beter Leven) label show consumers are interested in animal welfare (Berg, van den, 2012). One problem here is the lack of knowledge among consumer about what is good for a cow, and what is sustainable (Veer, de, 2012). As stated in paragraph 7.3.2 grazing is a mainly consumer driven sustainability topic. There is no scientific consensus if grazing is better for animal welfare or sustainability (Veer, de, 2012).

7.3.4 Policy/regulatory organizations

Dutch policy makers and political parties are diffused about the importance of animal welfare (Berg, van den, 2012). Current Dutch policy is to put the responsibility at market parties, and have only a facilitating and stimulating role (Berg, van den, 2012). However, Hoekstra (2012) and de Veer (2012) expect there will be legal requirements regarding animal welfare in the future. For pig and poultry farming there is already this kind of regulation. Regulations in dairy farming can for example oblige the amount of space per cow in a stable. With Cow-Compass CONO thinks they are prepared for this (Hoekstra, 2012). Often Dutch policymakers 'hide' behind European law. They state the Dutch competitive position would be worsened compared to other European countries when The

Netherlands implement animal welfare requirements (Berg, van den, 2012). According to van den Berg (2012) therefore the best chances for animal welfare are changes in the European agricultural policy that sets requirements for animal welfare.

Although the government had no influence on the development of Cow-Compass, there are some changes in regulations that can be an advantage. Since January 2012 it is obliged to have a BGP, the PBB was already obliged. Since January 2012 Cow-Compass can replace both these regulations. This can be an advantage for dairy farmers, because they have to deal with less regulations.

7.3.5 Knowledge institutions

For the development of Cow-Compass there was no real new knowledge required (Hoekstra, 2012; Veer, de, 2012). The product is based on coupling of existing knowledge from different expertise areas. 95% of Cow-Compass is scientifically substantiated (Veer, de, 2012). Cow-Compass also asks for another way of thinking and a serious training program for veterinarians. Instead of just curing diseased animals, they should look for alarming signals in advance to prevent diseases (Veer, de, 2012). In order to learn this new way of thinking they need to follow a training program of 7 days divided over 7 months.

It is expected in the future new technologies will come up which make it possible to measure animal welfare in other ways. Examples of recent developments are measuring milk and make statements about welfare of the cow who produced the milk (Berg, van den, 2012; Veer, de, 2012). Another example is the use of chips who measure for example heartbeat and body temperature of the cow. This makes it possible for farmers to easily detect attention animals (Berg, van den, 2012). De Veer (2012) hopes to develop Cow-Compass in a way that makes it possible to measure the 'resilience' of a company . This should make it possible to calculate what effect changes (like company growth) have on the health and resistance of the cows (Veer, de, 2012). CONO aims to integrate ‘Happy Cows’ with ‘Happy Earth' (Hoekstra, 2012). This is very difficult because animal welfare and environmental interests conflict in some cases (Hoekstra, 2012; Veer, de, 2012).

7.3.6 Competitive products

There are other tools available that measure welfare of dairy cows. FrieslandCampina uses the constant health- and welfare monitor (Hoekstra, 2012). This is not really comparable to Cow-Compass because this tool uses a retrospective approach (Veer, de, 2012).

Another, international developed, tool is called the 'Welfare Quality System' (WQS). WQS is developed during an European project subsidized by the European Union (Berg, van den, 2012; Veer, de, 2012). With this project there is tried to develop the 'golden standard' for animal welfare (Berg, van den, 2012; Veer, de, 2012). Many research groups from different countries worked together in this project. The system is applied at several animals, including milking cows. This tool tries to look mainly at characteristics of the animal, not the environment (Berg, van den, 2012). This implies that

all animals should be checked securely. The advantage of this is that almost 100% of all possible animal welfare signs are checked for, with Cow-Compass this is about 95% (Veer, de, 2012).

The disadvantage of the welfare quality system is that it is theoretically developed, and not yet practical applicable (Berg, van den, 2012; Veer, de, 2012). To conduct WQS is very time consuming, a trained veterinarian will need about 6 hours to do the WQS check, for Cow-Compass this is about a half an hour (Veer, de, 2012; Hoekstra, 2012). This makes the WQS much more expensive, and therefore less attractive for dairy farmers. To make it possible to compare the different systems, Cow-Compass and the constant health- and welfare monitor will be benchmarked at the welfare quality system (Berg, van den, 2012; Veer, de, 2012).

7.3.7 Advantages and disadvantages of Cow-Compass

Advantages of Cow-Compass are that it is very practical and based on daily practice at dairy farms (Hoekstra, 2012; Veer, de, 2012). For a trained veterinarian a Cow-Compass visit will only take about a half an hour. Furthermore because it focuses on prevention of diseases instead of the normal curative approach, farmers should deal with less sickness among their cows (Hoekstra, 2012; Veer, de, 2012). Most farmers value the worth of healthy cows a lot (Hoekstra, 2012). It also can help to reduce later veterinarian costs (Veer, de, 2012). Another advantage is that Cow-Compass can replace the PBB and BGP what can reduce the amount of different regulations for the farmer (Tielemans, 2012; Hoekstra, 2012).

There are also several disadvantages of cow-compass, which can counteract its success. First there is no standard yet for the interpretation of the BGP, so the veterinarian can use different methods (Hoekstra, 2012). Veterinarians have to make an investment by doing a training which can de-motivate them to offer Cow-Compass to their clients (Veer, de, 2012). For farmers who aren't a CONO member it can be very confusing what is the difference between the BGP and Cow-Compass (Hoekstra, 2012). Cow-Compass is very dependent of trained veterinarians. These veterinarians have to let go their normal way of thinking and adopt a preventive approach. Furthermore the veterinarians have to be convincing enough to have an effect on the farmer (Veer, de, 2012). For consumers Cow-Compass is too complicated to understand at first sight, therefore it cannot easily be used to develop a label comparative to Beter Leven label of the Dierenbescherming (Berg, van den, 2012). Another challenge can be that it is not an international accepted tool, like WQS. This makes it of less value for export (Berg, van den, 2012).

7.4 Analysis

In this section answers to sub question 3 and 4 are provide.

How did public concerns influence the development of Cow-Compass in the Dutch dairy farming sector?

In Chapter 6 it has been stated that animal welfare of livestock animals is a serious public concern in dairy farming. Establishment of societal organizations like the Dierenbescherming and Wakker Dier and political party 'Partij voor de Dieren' (PVDD) are a clear manifestation of this concern. However it seems dairy farming is not the core business of societal organizations. At the moment welfare problems in more intensive sectors, like pig and poultry farming are more urgent. Therefore dairy cows get less public attention. Furthermore welfare of dairy cows is for most citizens represented by grazing. Campaigns of societal organizations often focus on grazing. Cow-Compass focuses on the total concept of animal welfare, but does not receive much attention from societal organizations.

In Chapter two three processes from SMT literature are identified which are useful for social movements to communicate their message (Benford & Snow, 2000; Elzen et al., 2011). These processes are: resource mobilization, framing processes and political opportunity structures. In this section is analyzed how societal organizations used these three processes during the development of cow-compass.

Resource mobilization - In Chapter two is stated that there are five types of resources a societal organization should mobilize. These types are: material, moral, social-organizational, human and cultural resources. The more resources an organization is able to mobilize, the larger the chance the organization can have impact. Societal organizations did not played an active role in the development of Cow-Compass. Therefore it is hard to determine which resources they used. In the early stage of development of Cow-Compass societal organizations are asked to help determine the range dairy farmers could move in (related to welfare). Then the organizations mainly used human resources, because people from the organizations invested time in the discussion with Joost de Veer. To contribute to this discussion the societal organizations should consult their internal and external networks for information. This implicates also socio-organizational resources are mobilized.

Framing processes - Framing processes are not used in the case of Cow-Compass. This is related to the fact Cow-Compass is not a tool used to communicate with consumers. Cow-Compass is used by farmers as a management tool and by processing companies as a monitoring tool. For both user groups it is clear what the instrument does and what the benefits are. Societal organizations who are concerned about animal welfare do often frame welfare of dairy cows as their ability to graze. But there is no scientific consensus about the real benefits for the cow. Consumers however do appreciate it when cows can graze. Another example of framing related to animal welfare is the campaign of Milieudefensie against mega stables. Milieudefensie is against mega stables because they can cause environmental problems (Hooijer, 2012). But in their campaign they focus on cows who are kept inside (thus can't graze) and have low welfare levels, because this strikes the public more than environmental concerns (Hooijer, 2012).

Political opportunity structure - For societal movements with animal welfare as their core business the political opportunity structure is relatively favorable at the moment. In the Dutch politic situation

is attention for animal welfare. A clear manifestation is the Partijd voor de Dieren (PVDD). At this moment there are no laws or regulations regarding to the welfare of dairy cows, but this kind of regulation is expected for the future.

To give an answer to sub question three, there are public concerns related to animal welfare. However, most societal organizations have relatively little attention for dairy cows, and if they focus on dairy cows, it is related to grazing issues. Therefore, the public concerns related to animal welfare had little effect on the development of Cow-Compass.

According to Elzen et al. (2011), normative pressure of societal organizations has a larger effect on transitions when it coincide with other socio-technical developments. To describe these developments four streams are distinguished, based on Kingdon's (1984) multiple stream model. These streams with corresponding actor groups are: Normative pressure stream (societal organizations); Market stream (market parties); Political/regulatory stream (political/regulatory organizations); Technological stream (knowledge institutions). According to Elzen et al. (2011) there is a bigger chance of a successful transition when these streams align with each other. To analyze the impact of these other streams sub question four will be answered:

What role played actors from the market, political & regulatory and technological streams in the development of Cow-Compass in the Dutch dairy farming regime?

Section 7.3 already described the contribution of the different actor groups to the development of Cow-Compass. The interviewees were all asked to score their perceived impact of the four different actor streams on the development of Cow-Compass. These answers are presented in table 2.

Table 2: Scores Cow-Compass

Name	Problem stream	Market stream	Political stream	Technological stream
Grietsje Hoekstra	+	++	+	++
Bert vd Berg	+	++	+	++
Joost de Veer	0/+	+	0	++
Average	+	++	+	++

From table 2 it can be noticed that the market stream and the technological stream had the most impact on the development of Cow-Compass. This corresponds with information from paragraph 7.3. As stated in 7.3 Cow-Compass is invented and developed by one inventor (Joost de Veer) and in later stages CONO developed the tool further (market stream). Also scientific knowledge was of significant importance to develop the tool (technological stream). De Veer (2012) based Cow-Compass for 95% on scientific research. Knowledge development on the side of veterinarians is also very important. Without well trained veterinarians, Cow-Compass cannot become a success, because the whole idea is based on a new way of thinking for veterinarians. The government didn't play a role in the

development, but does provide advantages by making it possible to replace PBB and BGP. As described societal organizations had a little impact on the development of Cow-Compass. But their goal, better welfare for animals, corresponds with the goal of Cow-Compass: increasing welfare of dairy cows. Therefore, it can be stated that all different actor groups align. They all strive for the same goal, increasing animal welfare. And if they do not actively work on this, they at least do not hinder it. According to the theory (Elzen et al., 2011) this increases potential success of an innovation.

To provide an answer on sub question four actors from the market stream played a very active role in the development of Cow-Compass. Actors from the political and regulatory stream did not played a role in development, but they provided an advantage by letting Cow-Compass replace two regulations. Therefore their role is indirectly facilitating and supportive. Knowledge institutions provided the knowledge Cow-Compass is based upon. The normative pressure stream put the problem (animal welfare) Cow-Compass aims to solve on the agenda, but did not played an active role in the development.

8. Sustainable Soy

This Chapter discusses the second case, sustainable soy. The Chapter starts with a description of the Round Table on Responsible Soy (RTRS) and the sustainability problem it aims to solve (8.1). Paragraph 8.2 explains the position of RTRS in the Netherlands, and the coalitions and groups playing an important role. Then the contribution of RTRS to sustainability is explained in 8.3, which is based on the definition of sustainability by Calker (2005) presented in the operationalization (Chapter 3). In paragraph 8.4 the roles of important actor groups (societal organizations, market parties, political organizations, technological organizations) in the development of RTRS are explained. Also the most important advantages of and critiques on RTRS are presented. In section 8.5 the found results are analyzed using the theory described in Chapter 2. This information provide case specific answers to sub questions 3 and 4:

- *How did public concerns influence the development of RTRS in the Dutch dairy farming sector?*
- *What role played actors from the market, political & regulatory and technological streams in the development of RTRS in the Dutch dairy farming regime?*

Most information used for this Chapter is obtained from five expert interviews. The experts represents the different actors who are involved in the development of RTRS. From the market parties Cornel Boere from Agrifirm (animal feeding producing company); Marc Jansen from CBL (branch organization of supermarkets) and Hugo Byrnes from Ahold (largest supermarket in the Netherlands) are questioned. From the societal organizations Hugo Hooijer from Milieudefensie and Gert van der Bijl of Solidaridad are questioned. Solidaridad is one of the Dutch organizations (WNF is the other) who participate in the development of from the start. They are involved because they are a very active member in RTRS from the start on. Milieudefensie is involved because they are one of the largest and most familiar societal organization who is against RTRS. With these five interviewees all important actors who are involved in the development of RTRS are included. Also Milieudefensie represents the societal organizations who do not support RTRS. This helps to describe the activities in the normative pressure stream. An oversight and more information about these experts is provided in appendix B.

8.1 RTRS

In section 6.3.3 is explained raw materials play a large role in the sustainability of dairy farming. About 40% of the environmental load of dairy farming takes place outside the company, mainly through the production of raw materials (Boone & Dolman, 2010). Soy is the main ingredient of dairy cow feeding. The past ten years the production of soy beans in South-America increased due to an increasing worldwide demand for soy used for human and animal feeding (RTRS, 2011). This leads to environmental and social problems. Problems are for example decreasing biodiversity (caused by deforestation), problems for the local communities and problems with pesticides, erosion etc. Almost

85% of European Union (EU) soy is imported from South-American countries (RTRS, 2011). The round table on responsible soy (RTRS) is a multi-stakeholder initiative which aims to facilitate a global dialogue on soy production that is: economically viable, socially equitable and environmentally sound. RTRS is an international platform in which soy producers, soy traders, the processing industry, banks and societal organizations cooperate to develop and implement sustainability criteria for global soy production. The RTRS standard is made up of 5 principals and 27 criteria, in total the standard exists of 98 indicators that have to be satisfied (RTRS, 2011). As well conventional as organic or genetically modified soy can be certified. The principals and criteria comply with the following disciplines: legal compliance and good business practices; responsible labor conditions; responsible community relations; environmental responsibility and good agricultural practices. Currently RTRS has over 150 members worldwide (RTRS, 2011). This are producers, industry parties, societal organizations and observers (RTRS, 2011). A complete list of all members can be derived from the RTRS website.

The development of RTRS started in May 2004 with the beginning of the responsible soy forum in London. With the vision: "That soy help to meet social needs, environmental and economic consequences of the present generation without compromising the resources and the welfare of future generations and allowing the construction of a better world through consensus and joint action." (RTRS, 2011). The RTRS foundation is established in November 2006 in Switzerland. In 2009 the 'Principles and Criteria - field test version' was approved and in June 2010 version 1.0 of the RTRS standard for production was ready. In June 2011 the first South American producers were certified and later in 2011 the first RTRS soy was sold (RTRS, 2011).

8.2 RTRS in the Netherlands

In the Netherlands there are different institutes that aim for sustainable soy. They differ in their opinion about RTRS. To make the Dutch situation better understandable, the different initiatives are explained briefly.

8.2.1 Dutch Soy Coalition

The Dutch Soy Coalition (DSC) is a cooperation between eight Dutch societal organizations: Both Ends, ICCO, IUCN National Committee of the Netherlands, Kerkinactie, Milieudefensie (Friends of the Earth Netherlands), Solidaridad, Oxfam Novib, Stichting Natuur & Milieu and WNF (WWF-Netherlands). The DSC urges all actors in the soy value chain – from producers to consumers - to take concrete measures to reduce the social and environmental impacts caused by soy production. Not only should actors aim for a more responsible soy production; the consumption of soy should also be reduced (Dutch Soy Coalition, 2012; Bijl, van der, 2012; Hooijer, 2012). The members of the DSC agreed there must be made changes in the following three areas:

Responsible soy - Reducing impacts of soy production, or improvements in the system. Here DSC aims to reduce the impacts or improve aspects of the current soy production. Some members see RTRS as a good solution other members think the RTRS standard doesn't go far enough (Dutch Soy Coalition, 2012; Bijl, van der, 2012).

Replacement - DSC works towards replacing soy in feed by other protein-rich ingredients. Examples of activities include research and pilots on alternative feed crops that can be produced in Europe (Dutch Soy Coalition, 2012; Bijl, van der, 2012).
Reduction - DSC aims to reduce meat and dairy consumption. Since soy is mainly used in animal feed, reducing meat and dairy consumption can contribute to lowering the impacts of (the expansion of) soy production (Dutch Soy Coalition, 2012; Bijl, van der, 2012).

The different members of DSC agree about the above mentioned areas, however they do not agree about the realization and solutions for these problems. WNF, Solidaridad and Natuur & Milieu for example are active members of RTRS, and think this is a good interpretation of responsible soy (Bijl, van der, 2012). Milieudefensie on the other hand thinks soy shouldn't be imported at all, they state all protein rich crops Europe needs should be produced in Europe (Hooijer, 2012). Milieudefensie also thinks there exists better sustainable soy standards, like ProTerra, which does not allow GM soy to be certified (Hooijer, 2012). In the section about the problems stream this discussion will be explained more thoroughly.

8.2.2 Taskforce Sustainable Soy

The taskforce sustainable soy (TSS) is a platform established in 2006 of nineteen Dutch companies in the soy chain who want to make a contribution to use of sustainable soy. These members come from the sectors: oil and fats, processing, animal feeding, meat and dairy. The members of the TSS support RTRS (Task Force Duurzame Soja, 2012). This support exist of several initiatives: stimulating membership of RTRS; informing interested parties; active member of working groups; financer of RTRS; regular discussions with Dutch societal organizations and the government (Task Force Duurzame Soja, 2012).

8.2.3 The Sustainable Trade Initiative

The sustainable trade initiative (Initiatief Duurzame Handel, IDH) is a form of development aid. Instead of providing money right away the Dutch Ministry for Development Cooperation founded IDH. The goal of this initiative is to get sustainable produced products to the Netherlands. Products are among others: cacao, cotton, wood, coffee, tea, spices and soy. IDH helps farmers from developing countries to produce in a more sustainable way, and supports the transition towards sustainable products in the Netherlands (IDH, 2012). In the case of soy, IDH supports RTRS.

Dutch businesses in the soy value chain (TSS) have begun the transition towards responsibly produced soy. The overall objective is to achieve 100% use of responsible (RTRS certified) soy for the production of meat, dairy, eggs, and other foods in the Netherlands by 2015. Over the next years, the participating companies aim to purchase increasingly large volumes of responsibly produced soy: 500,000 tons in 2012; 1,000,000 tons in 2013; and 1,500,000 tons in 2014. The total investment required to achieve this transition is estimated at approximately € 7 million. Half of this amount will be financed by trade and industry, with the other half funded by IDH (IDH, 2012).

8.3 Contribution to sustainability

The most sustainability contributions caused by RTRS are in the South-American countries were the soy is cultivated (Boere, 2012). However, because the Netherlands imports much soy, sustainable production in South-America has an effect on the ecological footprint of the Netherlands. Most progress is achieved because RTRS obliges farmers to comply with the law (Bijl, van der, 2012). In Brazil for example an area of 30 meters near surface water can't be cultivated. Most farmers do not comply with this, but if they want to be RTRS certified they have to. In this section the contribution of RTRS to sustainability is described regarding the definition of Calker (2005).

8.3.1 Economic sustainability

According to a recent analyses of KPMG, RTRS soy has economic advantages for the farmer (KPMG, 2012). To produce according to the guidelines of RTRS farmers have to make an initial investment, but they can earn this back in 3-4 years. The investment mainly exist of training to improve soy cultivation, reforestation of existing grounds and setting up a good documentation system about the use of pesticides and (artificial) manure. The largest financial advantage comes from the bonus they earn on every ton soy beans they produced according to the RTRS standards. Furthermore the volume of soy produced on the same area can increase with better production methods. Another advantage is that farmers can get financing for more favorable conditions (KPMG, 2012). There can be concluded that RTRS contributes to economic sustainability of soy producers (Bijl, van der, 2012). The effect on the economic sustainability of Dutch dairy farmers is uncertain. If the higher price for sustainable soy is recharged by animal feeding producers in the price of animal feeding, this has a negative effect on the net income of dairy farmers. And Dutch dairy farmers already have very small margins, due to high costs mainly caused by purchase of animal feeding (Boere, 2012). Therefore it is important the sustainable soy is affordable (Boere, 2012). Another option would be that the use of sustainable produced animal feeding is rewarded with a higher price for the farmers milk (Bijl, van der, 2012). Because RTRS is not on the market for a long time or in high quantities it is not sure what effect it has on the economic sustainability of Dutch dairy farmers.

8.3.2 Ecological sustainability

RTRS contributes to ecological sustainability in several ways. It contributes to a decrease of phosphate and nitrogen because it obliges farmers to do integrated nutrient management (Bijl, van der, 2012). The contribution to a decrease of nitrate concentration is hard to say, because soy is a nitrogen binder, so artificial manure isn't much used in soy cultivation. The same counts for methane emission. It does however contribute to increasing biodiversity, because deforestation is counteracted. For the same reason it can contribute to less CO2 emission, because the forest takes up CO2 (Bijl, van der, 2012). For Dutch dairy farmers RTRS contributes indirectly to ecological sustainability. As stated earlier about 40% of environmental load of Dutch dairy farms stems from animal feeding production (Boone & Dolman, 2010). Use of RTRS certified soy in animal feeding can decrease this number.

8.3.3 Social Sustainability - Internal

RTRS contributes a lot to internal social sustainability. According to Calker (2005) internal social sustainability is indicated by working conditions of the farmer. Working conditions for the soy farmers who produce according to the RTRS standard are increased (Bijl, van der , 2012) An example is the obligation to wear protective clothes when the farmer uses pesticides(RTRS, 2012). For Dutch dairy farmers use of RTRS certified soy in their animal feeding will have no effect on their working conditions.

8.3.4 Social Sustainability - External

RTRS has no advantages for animal welfare or health, except due to increasing biodiversity. It does contribute to a better landscape by slowing down deforestation (Bijl, van der, 2012). For the welfare of Dutch dairy cows or landscape in the Netherlands use of sustainable soy makes no difference.

8.4 The actors

RTRS is a project with member from all over the world, however in this research the focus is on the development of RTRS in the Netherlands. With actors therefore are meant Dutch actors that had an impact on the development and implementation of RTRS.

8.4.1 Societal organizations

Societal organizations play a significant role in the development of RTRS. First of all, societal organizations put the sustainability and social problems related to soy on the agenda (Hooijer, 2012). Furthermore they play an important role in the development of RTRS. In this case there can be distinguished two types of societal organizations: action groups versus consideration groups (Jansen, 2012; Bijl, van der, 2012; Byrnes, 2012). The differences between these groups are explained in the next paragraphs.

In the case of responsible soy, action groups are: Milieudefensie, Greenpeace and some smaller organizations (Bijl, van der, 2012; Byrnes, 2012). Greenpeace focuses on deforestation of the Amazon (deforestation of other areas is not mentioned) and on genetic modification (GM) free production of soy. This focus on the Amazon is chosen because many citizens are concerned about deforestation of the Amazon, while other areas are unremarkable (Bijl, vander, 2012; Jansen, 2012) In reality however, the Amazon isn't the area that suffers a lot from deforestation. Other areas suffer more from deforestation (Bijl, van der, 2012; Boere, 2012). Milieudefensie strives for decreasing the consumption of meat and replacing soy with proteins produced in Europe (Hooijer, 2012). One characteristic of action groups is they are good in public campaigns (Bijl, van der ,2012). An example of this is the campaign of Milieudefensie in 2007 'Stop fout vlees' (stop wrong meat). This campaign related meat to deforestation in the Amazon and focused on the supermarket Albert Heijn (Hooijer, 2012). This campaign focused on deforestation of the Amazon with pictures of sad monkeys, because this strikes consumers more than well founded analyses (Hooijer, 2012). Later this year Milieudefensie will launch a new campaign to introduce the idea of soy replacement among citizens (Hooijer, 2012). In this case Milieudefensie and other societal organizations frame the problem of

sustainable soy as deforestation of the Amazon while the real problem is much more complex (Bijl, van der, 2012; Boere, 2012; Jansen, 2012). In their campaigns societal organizations focus mainly on firms, for example supermarkets. They focus on firms because this has a larger effect on the public than a campaign addressed to 'farmer Joe' (Hooijer, 2012). Furthermore supermarkets and other firms are more vulnerable to image damage, and therefore inclined to act. Supermarkets also are perceived powerful to adjust change (Bijl, van der, 2012). Firms do consider societal organizations to be important, because they represent the opinion of consumers and firms do not want to be blamed for not acting (Jansen, 2012; Byrnes, 2012; Boere, 2012). In short action groups are societal organizations who are good in public campaigns. With these campaigns they play along with emotions of consumers to motivate them to support their goals.

Consideration groups in the case of responsible soy are WNF, Solidaridad and Natuur & Milieu (Bijl, van der, 2012). These organizations are all members of RTRS, Solidaridad and WNF from the start. This way they influenced the principals and criteria RTRS certified soy has to comply. Most firms are willing to discuss with societal organizations as long as they do not have unrealistic demands (Byrnes, 2012; Jansen, 2012; Boere, 2012). Unrealistic demands are for example fast decrease of meat consumption, while the worldwide trend is a growing demand for meat (Jansen, 2012). Another unrealistic demand of some societal organizations is immediate replacement of soy with proteins produced in Europe. At this moment it is not possible to produce the same amount of proteins in Europe, thereby this will cause even more sustainability problems (Bijl, van der, 2012). This has several reasons, first of all in Europe production of carbohydrates is always stimulated with subsidies (Jansen, 2012). This made it attractive for farmers to produce carbohydrate rich crops. Due to years of experience European farmers are very efficient in producing carbohydrate rich crops. Because production of protein rich crops wasn't stimulated, this is not developed in Europe. Therefore at the moment there are no crops available with whom the same amount of proteins per ha. can be reached (Bijl, van der, 2012). Therefore production of protein rich crops in Europe will need much more land, energy (due to less favorable climate and lower output per ha.), (artificial) manure and pesticides and therefore it isn't a sustainable solution (Bijl, van der, 2012). Another problem with replacement is the postponed production of carbohydrate rich crops (Boere, 2012). When Europe produces protein rich crops, carbohydrate rich crops must me imported from somewhere else (Boere, 2012). Under pressure of societal organizations research in the field of protein production in Europe increased, so it might be a more realistic option in the future.

In short, societal organizations played an important role in the development of RTRS. First they put the problem of sustainable soy on the agenda, which stimulated market parties to undertake action. Furthermore they had an active role in the development of the RTRS standard.

8.4.2 The market

Consumers are slightly aware of problems related to sustainable raw materials (Hooijer, 2012). A group of these aware consumers is prepared to pay more for products from sustainable raw materials (Hooijer, 2012; Byrnes, 2012). An example of this is the popularity of some sustainable labels like 'Puur & Eerlijk' (from Albert Heijn) and MSC (for sustainable fish) (Byrnes, 2012). But in the case of sustainable soy this is more complicated. A specific group of consumers is aware of the sustainability problems around soy, but most of them do not link soy to meat or dairy products (Byrnes, 2012; Bijl, van der, 2012; Boere, 2012). Soy is a hidden raw material in meat and dairy products, cows eat animal feeding from sustainable soy and they produce milk. For producers of dairy products it is hard to communicate their efforts in relation to sustainable soy to consumers (Boere, 2012; Bijl, van der, 2012). Producers are afraid consumers think their milk contains soy or is soymilk. This has also an effect on investments in sustainable soy. FrieslandCampina and CONO are two of the dairy processing firms who invest a lot in sustainable soy. But they invest even more in stimulating grazing, while this has much less sustainability advantages. The advantage of grazing however is that consumers appreciate it and are willing to pay more for milk from grazing cows (Bijl, van der, 2012). With sustainable soy it is very hard to ask a high price, because consumers do not see the linkage between soy and dairy. Furthermore many consumers assume the products they buy are already responsible. They assume retailers take their responsibilities and deliver a sustainable product (Jansen, 2012; Bijl, van der, 2012; Byrnes,2012).

Retailers do take measures to stimulate sustainable raw materials. Especially producers of 'brand' products consider sustainability important (Byrnes, 2012). This first because their brand would suffer a lot from image damage, second because they see sustainability as a part of their identity (Bijl, van der , 2012). But dairy and meat products are often 'home-brand' products of supermarkets. One of the largest supermarkets in the Netherlands, Albert Heijn, has made a commitment to make its products more sustainable. They are going to check for every product if there are things that can better and more sustainable. Important is that this isn't at the expenses of quality or price (Byrnes, 2012). Soy is one of their six critical commodities (coffee, tea, cacao, see-food, palm oil and soy). These products get extra attention. For soy this implies Albert Heijn uses from 2015 only RTRS certified or equivalent soy (Byrnes, 2012). The motivation of Albert Heijn is that to have a right to exist in the future sustainable production is a necessity. Also to have enough products available in the future (Byrnes, 2012). CBL (Centraal Bureau Levensmiddelen) is the branch organization for supermarkets. Because they have to represent all their members they sometimes try to retain obligations relating to sustainability, for example taking up sustainability criteria in their terms of delivery (Bijl, van der, 2012). But now also the CBL agrees to use only RTRS certified soy in 2015 (Jansen, 2012). Supermarkets play a large role in this, because they can take it up in their terms of delivery. This forces other firms to use RTRS certified soy because otherwise they can't sell their products to the supermarkets (Jansen, 2012; Bijl, van der, 2012). Albert Heijn and CBL have also played a role in the development of RTRS. Ahold (mother firm of Albert Heijn) has been an active member of RTRS from the beginning, they participated in the working group that set the principals

and criteria (Byrnes, 2012). RTRS is chosen because Ahold expects this is the only certification that will lead to mainstream sustainable soy (Byrnes, 2012). CBL is also a member of RTRS and the TSS, their role is mainly supportive (Jansen, 2012). CBL strives to build in precompetitive sustainability criteria for all supermarkets (Jansen, 2012).

Another important market actor in this case are the animal feeding producing companies. Agrifirm, one of the largest animal feeding producing company in the Netherlands, has sustainability as a strategic pillar (Boere, 2012). This is manifested in sustainability measures within the organization, like reducing energy use and training their employees. But also sustainable production is an important aspect (Boere, 2012). For an animal feeding producer sustainability of raw materials plays an important role (Boere, 2012). Agrifirm decided to focus on sustainability because the growing world population makes it difficult to produce enough food in the future. Therefore they want to use raw materials more efficient. Soy is very important because most animal feeding recipes contain a large share of soy. To guarantee enough available soy in the future a sustainable production standard is required (Boere, 2012). Agrifirm is an active member of RTRS and participates in several working groups (Boere, 2012). Furthermore they try to profile the industry and convince other organizations of the importance of sustainable soy. In this they often participate with Nevedi (branch organization of animal feeding producers) to increase their strength (Boere, 2012; Graaf, van de, 2012). The animal feed producing sector decided to support RTRS because this organization represents all chain actors. Another important characteristic is that RTRS is technique neutral, both GM and non-GM soy are allowed. Furthermore it was one of the first initiatives what provided RTRS with an advantage (Boere, 2012).

Very important in the case of sustainable soy is that it is affordable for Dutch (dairy) farmers. Margins on dairy products are very small, and animal feeding is a substantial part of the farmers costs (Boere, 2012; Bijl, van der, 2012). Dairy farmers often do not have the choice between feeding from sustainable or unsustainable soy (Bijl, van der, 2012). They also have no preference for sustainable feeding, good technical results and an affordable price are most important. The responsibility in this case is at the side of the feeding producing company, they have to deliver a responsible product for an affordable price (Bijl, van der, 2012).

8.4.3 Political and regulatory organizations

Sustainable raw materials is a topic that receives attention from different political parties. There have been several proposals related to sustainable raw materials (Hooijer, 2012). And there has been a debate about sustainable soy in 2009 (Bijl, van der, 2012). The Dutch government states they support RTRS, but they have not played an active role in the development of the standard (Boere, 2012; Bijl, van der, 2012). The ministry of EL&I provided financial support for RTRS, arranged meetings for the interested parties and helps with relevant knowledge (Jansen, 2012; Bijl, van der, 2012; Boere, 2012). As described in paragraph 8.2.3 the Dutch government also stimulates RTRS via the sustainable trade initiative (IDH).

All interviewees agree that it is not likely there will be legal obligations related to RTRS or sustainable soy (Boere, 2012; Bijl, van der, 2012; Byrnes, 2012). If the government sets restrictions for imported soy, internationally this will be seen as trade distorting (Byrnes, 2012; Bijl, van der, 2012). From the WTO (World Trade Organization) products that have no physical deviations or negative health effects can only be restricted in exceptional cases, sustainability is no such case (Bijl, van der, 2012). Because it is hard to use political measures to oblige sustainable raw materials, the government supports the industry to take their own responsibility (Byrnes, 2012; Jansen, 2012).

In section 8.4.1 about societal organizations was stated that some societal organizations wish to replace imported soy with protein rich crops produced in the Netherlands or Europe. In 2014 the European agricultural policy will be replaced. In 2013 there will be decided about the content of this new policy (Hooijer, 2012). Environmental organizations plea for more stimulation of protein rich crops. If they get what they want, this may have an effect on RTRS or sustainable soy.

8.4.4 Knowledge institutions

RTRS is developed by soy producers, the soy industry and societal organizations. Knowledge institutions have been involved during the realization of the principals and criteria of RTRS (Byrnes, 2012; Boere, 2012). These include experts from environmental organizations and agronomists (specialists in agriculture) (Byrnes, 2012). Other research related to RTRS is for example research about European alternatives. Also in the South-American production countries is conducted research to make production more sustainable. WUR (Wageningen University) compared the advantages and disadvantages of GM and non-GM soy (Bijl, van der, 2012). According to Byrnes (2012) at this moment it is important to take care of a successful implementation. If RTRS is the standard soy for animal feeding in Europe the current principals and criteria of RTRS should be investigated for improvements.

8.4.5 Advantages of RTRS

The interviewees called as the main advantage of RTRS that it is a widely supported initiative that represents all segments of society. All actors from the soy-chain and all organizations who focus on soy are incorporated (Jansen, 2012; Boere, 2012; Bijl, van der, 2012; Byrnes, 2012). RTRS is mainstream applicable and the only certified soy that is available on a large scale for a reasonable price (Bijl, van der, 2012; Byrnes, 2012). Furthermore it is technique neutral, what allows GM-soy to be also certified. If GM-soy would be excluded, about 80% of all soy produced wouldn't qualify the certification criteria (Bijl, van der, 2012). RTRS also is very transparent, they publicate which soy areas are certified. Other soy certification standards, like ProTerra, do not make this information publicly available (Bijl, van der, 2012). For societal organizations and firms an advantage of RTRS is also they can influence the standard themselves (Bijl, van der, 2012). Another advantage for RTRS is that it was one of the first sustainable certified soy initiatives. When a product is first on the market this provides it with an advantage. Companies that use RTRS wouldn't switch to another type of sustainable soy if there are no large differences (Boere, 2012).

8.4.6 Critiques on RTRS

There are several parties who have critique on RTRS, this section presents the most heard critiques. Some of the soy producing farmers in South-American countries think RTRS has too many rules and is to complex (Boere, 2012). Several societal organizations, like Greenpeace and Aseed, do not agree with RTRS because it allows GM-soy (Byrnes, 2012; Bijl, 2012; Jansen, 2012). Another critique of societal organizations, like Milieudefensie, is that RTRS doesn't go far enough to increase sustainability, the rules should be stricter (Hooijer, 2012; Boere, 2012). Milieudefensie thinks RTRS can only be a temporal solution, for the long term they strive for replacement with European proteins and decrease of meat and dairy consumption (Hooijer, 2012).

8.5 Analysis Sustainable Soy

In this section the results of the case study about RTRS are analyzed based on the theoretical framework. First a case specific answer to sub question three is formulated.

How did the derived public concerns influence the development of RTRS in the Dutch dairy farming sector?

Public concerns in this research are represented by concerns expressed by societal organizations in the form of normative pressure. In Chapter 2 three processes from SMT literature are identified which are useful for social movements to communicate their message (Benford & Snow, 2000; Elzen et al., 2011). These processes are: resource mobilization, framing processes and political opportunity structures. This section analyses how societal organizations used these three processes in order to stimulate sustainable soy. It focuses on the two organizations that are interviewed for this research: Milieudefensie and Solidaridad. These organizations are chosen because they have the most clear opinion about RTRS. Solidaridad is one of the organizations which was involved from the start, and a convincing supporter of RTRS. Milieudefensie is one of the most familiar Dutch organizations that publicly does not support RTRS. Therefore these organizations are used to provide examples in this section.

Resource mobilization - In Chapter 2 is stated there can be distinguished five types of resources a societal organization should mobilize in order to increase its influence. These types are: material, moral, social-organizational, human and cultural resources. As described in paragraph 8.4.1 there are several societal organizations involved in the development of RTRS, and even more organizations are concerned about sustainable soy. Most of these organizations are large well-known organizations in the Netherlands. For example: Milieufdefensie, Solidaridad, WNF (WWF). Therefore the ability to mobilize material and human resources is not a problem. These organizations can count on a large backing for volunteers and human capital. They also have the availability of financial sources, like funding of supporters and governmental support. Milieudefensie received a subsidy from the government for their new soy campaign (Hooijer, 2012). Besides governmental subsidies societal organizations generate financial resources by fundraising (Bijl, van der, 2012). The questioned

organizations, Milieudefensie and Solidaridad, have large groups of followers and no problems with mobilizing enough financial or human capital. Both organizations also have good internal and external networks to obtain knowledge (Hooijer, 2012; Bijl, van der, 2012). Employees of the organizations are for example environmentalists or development economists. Therefore the organizations have the relevant knowledge in house to understand the problems related to sustainable soy. Furthermore they have external networks to obtain knowledge. An example of an external network in the Netherlands is the Soy Coalition, where information is shared with other societal organizations. Furthermore both Solidaridad and Milieudefensie have a large international network they can use for information. This availability of networks implies both organizations have good socio-organizational resources. Solidardidad is founded in 1969 and Milieudefensie in 1971. In the long period they exist Milieudefensie has a long tradition of environmental campaigns. Also in the field of soy they have had several campaigns. Solidaridad has a tradition of connecting western companies with sustainable production initiatives in third world countries. This long history led to significant experience in their own expertise area, what implies both organizations have tacit knowledge. Therefore also the cultural resources of both organizations are present. Moral resources is harder to determine, because these resources mainly come from outside the organization. Because both Solidaridad and Milieudefensie are large organizations with a large group of supporters, there can be stated that moral resources are good. They both can count on support of a significant group of people. It seems Solidaridad, or the pro-RTRS organizations, have better moral resources, because the government is pro-RTRS this increases legitimacy.

Framing processes - According to Benford & Snow (2000) the following criteria can increase the strength of a collective action frame: their focus (less issues is better); their empirical credibility (perceived fit with ongoing events); their cultural resonance (good fit with broader repertoires and discourse); their emotional-normative appeal (playing with emotions, through images, metaphors, etc.); perceived credibility of frame articulators (credible speakers are more persuasive). Both Solidaridad and Milieudefensie are large societal organizations which focus on several topics. But both organizations have a very clear core business. For Milieudefensie this is a sustainable, clean world with respect for the carrying capacity of the earth and the entire world population benefitting from it. This implies they signal environmental problems, and try to put possible solutions on the agenda and mobilize large groups of citizens to show support and put pressure. The core business of Solidaridad is to fight poverty with sustainable trade. They work on sustainable production chains from producer to consumer, to get a fair price for farmers in developing countries and provide them with access to the world market. So although both organizations focus on several topics, their core business is relatively specific. The empirical credibility of Solidaridad is high, their goal of sustainable trade fits perfect with other events. For example with the goals of the sustainable trade initiative, who also want to use sustainable trade for development aid. The same counts for the cultural resonance of Solidaridad's ideas. Most market parties and consumers agree with the need for sustainable raw materials. For Milieudefensie the empirical credibility and cultural resonance is less obvious, mainly because Milieudefensie pleas for decreasing meat and dairy consumption and

replacement with European alternatives. At this moment most Dutch citizens are not willing to decrease their meat and dairy consumption. Therefore firms are not willing to change their supply, because they base their supply on what consumers want. As described earlier also replacement of soy with European crops isn't an option for the short term. Therefore most parties do not agree with the ideas of Milieudefensie. Concerning emotional-normative appeal Milieudefensie is really good. In the case of sustainable soy they frame a very complex problem (unsustainable soy) as deforestation of de Amazon which destroyed the habitat of monkeys and native americans. This enhances the appeal of the wider public. Although they know the real problems isn't this simple, they use this frame because it reaches and mobilizes a large public. Solidaridad is less good in playing along with emotions of citizens. They publish brochures with analyses that sketch the problem, but most citizens are not reached with this. Although most firms see Solidaridad as a credible actor to go into discussion. Due to their populist approach Milieudefensie is by some firms seen as less credible. There can be distinguished many differences between the organizations. From the interviews can be stated that there are indications that this is not a coincidence. Firms as well as societal organizations endorse there are different kinds of societal organizations with different roles. Milieudefensie (and other action groups) play with the emotions of citizens in order to set a problem on the agenda and generate support among the public. They have sometimes unrealistic demands in order to strive for their ideals. Most times these organizations are aware their demands are unrealistic to be satisfied in the short term. But they want to motivate firms and other organizations to strive for the best solution and not be satisfied with what is reached now. This is also the reason they do not support RTRS, they think it can only be a short term solution. Solidaridad (and other consideration groups) do not focus on the emotions of citizens. They conduct well founded analyses and go into dialog with companies and the government. By firms this type of organization is seen as a good and trustworthy conversation partner. Probably both types of societal organization are required to conduct change.

Political opportunity structure - For societal movements who strive for more use of sustainable soy the political opportunity structure is relatively favorable at the moment. There are for example two parties who have the environment as their core point. These are GroenLinks (GL) and the Partij voor de Dieren (PvdD). Also other parties presented motions related to (certification of) sustainable raw materials. This implies politic institutions are aware of the problems related to soy, and looking for a solution.

To answer sub question three for the development of RTRS the theme 'sustainable raw materials' is a serious public concern where several societal organizations are involved in. These organizations are large and credible and have the ability to mobilize resources. Two types of organizations can be distinguished: a action/protest type versus a consideration type. Both are necessary to mobilize the general public and convince companies to act. The main role in the development of RTRS was to motivate market parties to take measures in favor of sustainable soy. The societal organizations stimulated the public concerns about soy by having public campaigns focused on the emotions of the

public. This created public concern together with pressure from societal organizations forced market parties to act. The result is that many market parties committed themselves to RTRS.

According to Elzen et al. (2011) normative pressure of societal organizations has a larger effect on transitions when it coincide with other socio-technical developments. To describe these developments four streams are distinguished, based on Kingdon's (1984) multiple stream model. These streams with corresponding actor groups are: Normative pressure stream (societal organizations); Market stream (market parties); Political/regulatory stream (political/regulatory organizations); Technological stream (knowledge institutions). According to Elzen et al. (2011) there is a larger chance of a successful transition when these streams align with each other. To analyze the impact of these other streams sub question four will be answered:

What role played actors from the market, political & regulatory and technological streams in the development of RTRS in the Dutch dairy farming regime?

Section 8.4 already described what the different actor groups contributed to the development of RTRS. The interviewees were all asked to score the importance of the four different actor streams on the development of RTRS. These answers are presented in table 3.

Table 3: Scores RTRS

Name	Problem stream	Market stream	Political stream	Technological stream
Marc Jansen	++	++	+	?
Hugo Hooijer	+	++	0/+	?
Cornel Boere	++	++	0/+	0/+
Gert van der Bijl	++	++	0/+	0/+
Hugo Byrnes	++	++	0/+	+
Average	++	++	0/+	0/+

All interviewees perceive a large impact of societal organizations and market parties. This is not surprising because RTRS is an initiative from market parties together with societal organizations. The political and technological stream do not had a large impact on the development of RTRS according to the interviewees. The absence of knowledge institutions can be explained by the fact that RTRS is not a knowledge intensive or technical innovation. However, knowledge institutions were consulted for the creation of the principals and criteria of RTRS. Therefore they did contributed to the development of RTRS. Also the interviewees agree about the absence of political and regulatory institutions in the development of RTRS. However, they all state that the government provides financial support via the sustainable trade initiative. And the government helps with relevant knowledge and discussion opportunities. So it is right the government did not played an active role in the development or implementation of RTRS, but they are very supportive.

To answer sub question four for the development of RTRS, actors from the market stream played, together with societal organizations, a very large role. These actor groups together developed the RTRS standard and made concrete appointments about the implementation of RTRS. Actors from the political stream had a supportive role in providing financial support and advice. Actors from the technological stream helped to develop principals and criteria RTRS has to satisfy. All in all it can be concluded that the four different streams do align, what increases the chances for success. In the case of RTRS it seems this alignment assumption is right, because until now it is the most promising certification for sustainable soy. In contrast to other certifications, for example ProTerra, RTRS is applicable on a large scale and is expected to lead to mainstream soy. Probably the cooperation between market parties and societal organizations which together represented all actors in the soy production chain are the reason for this success. This cooperation guaranteed a broad support for the initiative. And because all different interests are represented the final product is a compromise which is practically applicable.

In the next Chapter a comparison between the Cow-Compass and the RTRS case is provided. In this Chapter also a first answer to the main research question based on the case studies is formulated.

9. Comparison Sustainable Soy and Cow-Compass cases

This chapter compares the findings of the two cases, Cow-Compass and Round Table Responsible Soy (RTRS), with regard to the impact of the four different streams on their development. Later on answers to the research questions will be formulated. At first sight the cases are very different from each other. Both cases aim to tackle another sustainability problem in the dairy farming sector. But they also have similarities. Both projects started around 2005 and both are available in the Netherlands by now. Cow-Compass can be used by all dairy processing companies since January 2012 and the first RTRS certified soy is on the Dutch market since 2011.

9.1 Theoretical model

Chapter two presents the theoretic model this research is based upon (figure 3). According to this model four different streams, represented by corresponding actor groups, have an effect on sustainable dairy farming. The streams can also interact with each other. According to Elzen et al. (2011) an innovation will be more successful if more streams undertake activities in favor of the innovation. Normative pressure increases if societal organizations mobilize resources, frame the problem and if the political opportunity structure is in favor of their ideals.

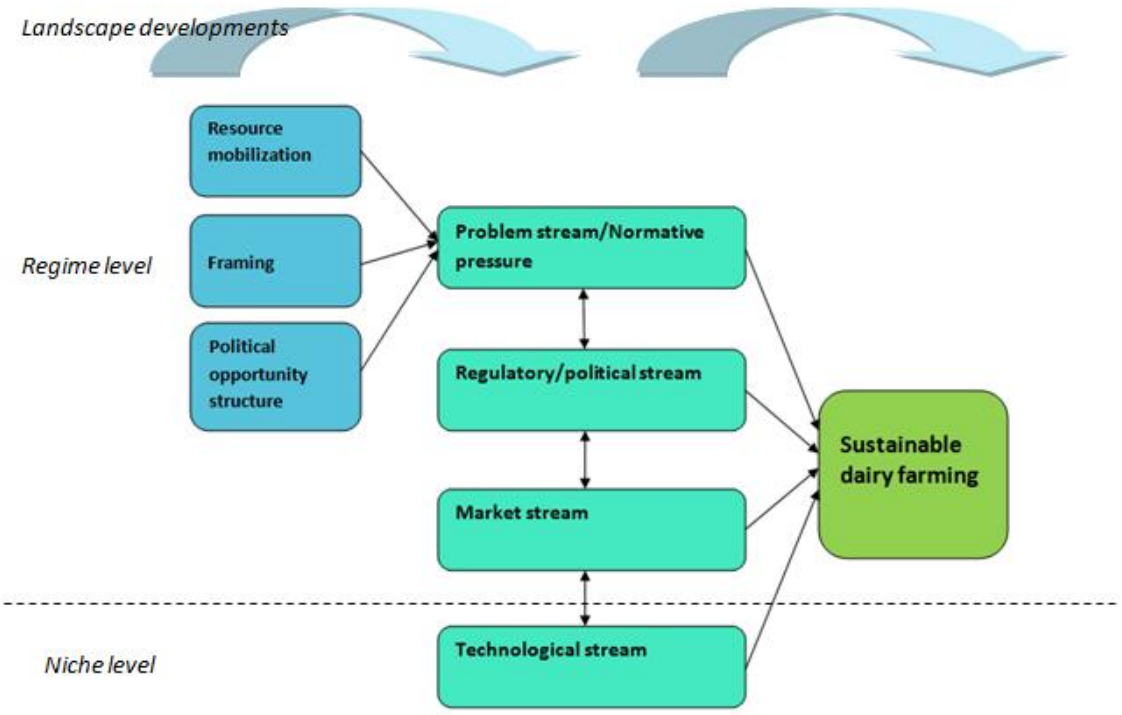

Figure 3: Conceptual model

9.2 Comparison cases

9.2.1 Problem stream/normative pressure

According to literature study and expert interviews animal welfare of dairy cows and unsustainable raw materials are both problems surrounded with public concerns. Both topics are put on the agenda by societal organizations such as Wakker dier, Dierenbescherming (regarding animal welfare) and Solidaridad, Milieudefensie, Natuur & Milieu (regarding raw materials). Concerns about animal welfare came up after outbreaks of several animal diseases around 2000, such as the mad cow disease and foot and mouth disease. Attention for raw materials increased after it became clear around 2003 that almost 40% of environmental impact from the dairy sector is caused by the production of raw materials for animal feeding. In the case of animal welfare the focus of societal organizations is mainly on intensive farming, because societal organizations find animal welfare problems in intensive farming more urgent. Dairy farming is not an intensive farming sector.

Societal organizations, like Solidaridad and WNF, had a very large influence on the development of RTRS. On the development of Cow-Compass societal organizations, like Compassion For World Farming, only had a marginal impact. In the case of RTRS societal organizations had an active role in gaining attention for the problems related to unsustainable soy and developing RTRS as a (partial) solution. This active role required mobilization of resources (people, money, material, etc) at the side of societal organizations. Because most organizations who committed themselves to RTRS are relatively large organizations (WNF, Solidaridad) this is not a problem. These organizations have sufficient human and material resources, furthermore they have a good internal and external network and therefore also social-organizational resources are present. The organizations furthermore have a long history of campaigns and therefore also cultural resources are present. In the case of Cow-Compass societal organizations had mainly a passive role, when the inventor of Cow-Compass (Joost de Veer) consulted them in the development phase. This consultation asked for the mobilization of human resources in order to participate in the discussion, but other application of resources was not required. In a later development phase at CONO (dairy processing company) Compassion for World Farming had an impact by incorporating veal and livestock in Cow-Compass.

In the RTRS case societal organizations framed the problems around soy mainly as deforestation of the Amazon. This strikes consumers and increased the public awareness and concerns about sustainable soy. In reality the sustainability problems of soy are very complex, but societal organizations present it like dying out of monkeys and other species due to deforestation of the Amazon (Figure 13). For most consumers the link between soy and meat or dairy consumption is unclear. Most consumers of meat and dairy products state they are concerned about sustainable soy, but they do not translate this in behavior when they buy dairy or meat products.

Welfare of dairy cows is often framed by societal organizations as the cow's ability to graze, and many consumers link animal welfare directly to grazing. Some consumers also base their purchase

decisions on grazing abilities of the cow (grazing label). Cow-compass thinks a cows welfare doesn't depend on grazing alone. Therefore they see grazing only as a part of the cows housing and don't focus on grazing specifically. This implies the grazing frame does not have much effect on Cow-Compass.

Figure 13: Framing of unsustainable soy

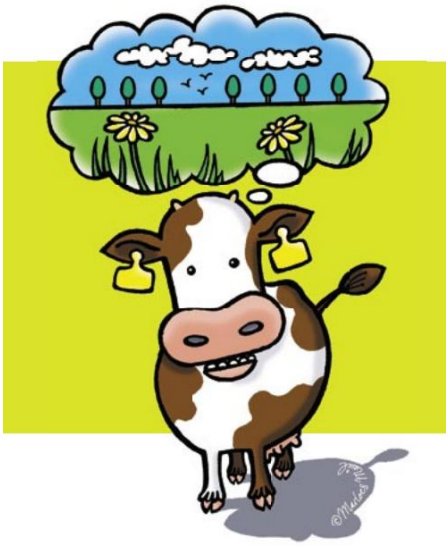

Figure 14: Framing of welfare of dairy cows

The political opportunity structure is relatively the same for both cases. Both animal welfare and unsustainable raw materials have the attention of political parties like the Partij voor de Dieren and Groenlinks. But there are no laws or other regulations related to these problems. In both cases this has to do with the fear to worsen the international position of the Netherlands and European law. In table 4 is summarized how societal organizations used resource mobilization, framing and political opportunity structures to increase their influence.

Table 4: Normative pressure stream

	Cow-Compass	RTRS
Resource mobilization	Human resources	Human resources Material resources Socio-organizational resources Cultural resources
Framing processes	Frame dairy cow welfare as grazing	Frame unsustainable soy as deforestation of the Amazon and killed monkeys.
Political opportunity structure	Attention, but no laws/regulation.	Attention, but no laws/regulation.

9.2.2 Regulatory/political stream

In both cases actors from the regulatory/political stream had no direct impact on the development of the innovation. In both cases political or regulatory institutions were not involved during the

development process. However, they had an indirect influence. In the case of RTRS they offered financial support via the Sustainable Trade Initiative (IDH). The IDH also supported RTRS with relevant knowledge about the soy producing countries. In the case of Cow-Compass regulatory institutions indirectly stimulated farmers to use Cow-Compass, because they enabled farmers to replace PBB (periodic company visit) and BGP (company health plan) with Cow-Compass. In both cases there are no regulations or laws directly related to the innovation. In the case of RTRS there are no regulations that harm unsustainable soy because this can internationally be seen as trade distorting (by WTO), which can cause export problems. In the case of Cow-Compass Dutch policy makers are afraid that the competitive position of the Netherlands will be hindered if animal welfare regulations are implemented. So in both cases international related considerations cause the absence of regulations and laws. For both cases changes in the European agricultural policy can have an effect on the success of the innovation. For Cow-Compass this can be an obligation to offer certain welfare standards for dairy cows. Cow-Compass can in that case function as a control instrument for welfare standards. Changes that can have an effect on RTRS are for example stimulation of protein rich crops in Europe, which can decrease the need for sustainable soy. Summarizing, the regulatory/political stream impact is comparable for both cases, and is mainly passively facilitating and stimulating the development of Cow-Compass and RTRS.

9.2.3 Market stream

Both cases have in common that the underlying problems are subject to public concerns (paragraph 9.2.1). However, the solutions Cow-Compass and RTRS offer to these public concerns are difficult to communicate to consumers. Sustainable soy is a hidden raw material in dairy products. Consumers do not relate soy to dairy products, which makes it hard for market parties to sell a dairy product based on sustainable soy instead of normal soy. Cow-Compass is too difficult to explain to consumers, because it incorporates many welfare criteria, while consumers are only concerned about grazing. Another similarity in both cases is that market parties played a very important role in the development. In the case of Cow-Compass this was mainly one party, CONO (dairy processing company). CONO involved the most important users of the product, dairy farmers, in the development. This led to a very practically applicable tool. RTRS is developed by many market parties from different branches, such as soy producers, soy traders, soy processers, supermarkets, societal organizations, etc. These are the parties that have to buy the RTRS certified soy. Their involvement in the development generated a broad acceptance of the product and makes implementation easier. So it seems that involvement of market parties and users leads to broad acceptance and stimulates implementation.

9.2.4 Technological stream

For both innovations development of new scientific knowledge was not required. This can be explained by the fact that both innovations are not technically driven. Cow-Compass is a management instrument built upon existing knowledge. In the development the inventor, Joost de Veer, played an important role. During the development of Cow-Compass he used his own back ground knowledge (experienced veterinarian) combined with relevant scientific knowledge to

develop the tool. RTRS is an institutional innovation, not a concrete product. During the development knowledge institutions are consulted about preconditions for sustainable soy and sustainable production methods to develop a standard. But in both cases knowledge institutions did not play a active role in the development.

9.3 Concluding

In this paragraph a first answer to the main question derived from the case comparison is formulated. A more complete answer will be provided in chapter 10, the conclusion. The main question of this research is:

How does normative pressure influence the transition towards sustainability of the Dutch dairy farming regime from 1990 until now?

According to the theory normative pressure is very important in order to stimulate sustainable innovations. Sustainable innovations often do not offer clear benefits for the market parties. The advantages the sustainable innovation offers are a public good. Chapter six describes how societal attention for sustainability problems in dairy farming increased over the past twenty years. Attention for animal welfare increased since 2000 but mainly focused on intensive farming. Attention for problems related to raw materials came up around 2003. Striking in both cases is that market parties had a large role in the development of the innovation. However, both animal welfare and unsustainable raw materials are set on the agenda by societal organization before the innovations were developed. It seems market parties in the dairy farming industry take their own responsibility in order to be prepared for allegations of societal organizations. Regulatory and political institutions stimulate this own responsibility by playing a facilitating and stimulating role. Returning to the theoretical model, societal organizations sometimes directly influence sustainable dairy farming via normative pressure. But more often they influence market parties (market stream), which in turn influence sustainable dairy farming. Sometimes societal organizations also try to have an impact via the political/regulatory stream, but in these cases international policy hinder concrete measures as the Netherlands have to commit to EU regulation. So it can be stated that normative pressure influences the transition towards sustainability of the Dutch dairy farming regime mainly by putting sustainability problems on the agenda among market parties and consumers.

10. Conclusion

In this chapter, answers to the sub questions and the main questions are formulated. Furthermore, implications of the research are discussed.

10.1 Answering Research Questions

First the research questions are answered. The main research question of this study is:

How does normative pressure influence the transition towards sustainability of the Dutch dairy farming regime from 1990 until now?

In order to answer this question, four sub questions are formulated. These are:

- *How has the Dutch dairy farming regime developed considering sustainability from 1990 until now?*
- *What public concerns regarding sustainability in dairy farming have come up from 1990 until now?*
- *How did public concerns influence the development of sustainable innovations in the Dutch dairy farming sector via normative pressure?*
- *What role played actors from the market, political & regulatory and technological streams in the development of sustainable innovations in the Dutch dairy farming regime?*

In this study insights from the multi level perspective are used to describe the transition of the Dutch dairy farming regime. The regime level in this study is represented by three streams. A normative pressure or problem stream, which represents societal pressure; a political/regulatory stream, which represents political and regulatory influences; and a market stream, which represents all market related impacts. The niche level is represented by a technological stream which includes among others new knowledge and technological developments. In the case studies these streams are represented by their corresponding actor groups. Also external events and landscape developments which influenced the Dutch dairy farming regime are taken into account. The focus is on the influence of normative or societal pressure, because it is assumed this is very important in sustainable transitions. To study this societal pressure, social movement theory has been incorporated. In this section first the sub questions are answered. Then an answer to the main research question is formulated. The first sub question aims to give a description of the most important developments in the Dutch dairy farming regime concerning sustainability over the past decades.

Sub question 1: *How has the Dutch dairy farming regime developed considering sustainability from 1990 until now?*

After the Second World War the Dutch agricultural sector was heavily supported by the Dutch national government to guarantee enough food for the population. This support led to fast growth

and development of the Dutch agricultural sector. The first attention for sustainability came up in the 1970's when a desirable production level of agricultural products was reached, and people started thinking about the effects agriculture had on nature and animals. Issues of concern were the decreasing biodiversity and environmental pollution. By then, also the first societal organizations that focused on environmental problems were established. These were for example Milieudefensie and Natuur & Milieu. These societal organizations already warned for problems related to manure surpluses. However, most people, including policy makers, thought these problems could be solved in time with technological solutions. In 1984, the 'superheffing' was implemented. This limitation measure was implemented due to economic reasons, but caused as a side effect decreasing manure production because farmers held fewer cows. In addition, the environmental effects of pesticides use were a concern in the 1980's. After the appearance of the Brundtland Report in 1987 and the Rio Declaration in 1992, global attention for sustainability increased. The Brundtland Report led to the first Dutch governmental plan based on environmental ambitions: the National Environmental Plan. However, in practice there were no actual changes visible. For Dutch farmers, much changed after national elections in 1994; the agricultural sector lost its privileged position and policy makers decided that the rural area should offer opportunities for nature, landscape, recreation and living. On top of that, the sector was found to be more responsible for self-sustenance. Another development that took place in the mid 1990's was the increasing importance of food quality. Consumers became more assertive and problems related to food safety increased the awareness of food quality. After 2000, yet another development took place. Sustainability became a marketing strategy and large market parties, like Unilever and Ahold, became the driving force behind environmental and welfare requirements. The movie 'An inconvenient truth' in 2006 led to renewed attention for sustainability among consumers. This societal attention led to increasing supply of more sustainable high quality products. Outbreaks of several animal diseases in a short period of time led to societal discussion on the risks of intensive farming for human health. Additionally, societal attention for animal welfare increased due to these diseases. In the pig and poultry farming sectors regulations relating to animal welfare were already implemented. For dairy farming there are no welfare requirements yet. At this moment, the most important sustainability problems in the dairy farming sector are: manure surpluses and closing the mineral cycle; climate problems, mainly the emission of greenhouse gasses; sustainable raw materials; animal welfare, often manifested as grazing; mega stables; and the use of antibiotics.

The second sub question aims to identify which public concerns came up during the period 1990-now. These public concerns are used to identify on which topics societal or normative pressure focused on over the past twenty years.

Sub question 2: *What public concerns regarding sustainability in dairy farming have come up from 1990-now?*

The first public concerns from the 1970's and 1980's focused on environmental consequences of dairy farming and also manure surpluses were a topic of concern. Due to outbreaks of several animal diseases around 2000, societal concerns related to food safety increased. Animal welfare became an important topic of concern. At this moment, grazing and antibiotics usage are surrounded with many societal concerns.

A general pattern can be distinguished. Developments in the technological stream, or the niche level, trigger societal organizations. The technological stream is represented by knowledge institutions. Availability of new knowledge, for example the publication of a report about greenhouse gas emission of dairy farming, increases public concerns about that topic. Also external events can increase public concerns. External events can among others be movies (inconvenient truth) or outbreaks of animal diseases. These public concerns trigger societal and consumer organizations to undertake action. Organizations put in turn pressure on market parties and policy makers to take measures. Before 2000, political and regulatory institutions were responsible for these measures, but after 2000, market parties became the drivers of sustainability preconditions.

Based on the observations after the first research phase, two cases of sustainable innovations were selected. The first case is Cow-Compass, a tool which aims to monitor and improve welfare of dairy cows. The second case is RTRS (Round Table Responsible Soy), which aims to contribute to the use of sustainable raw materials; soy in this case. The third and fourth sub question are answered on the basis of these two case studies.

Sub question 3: *How did public concerns influence the development of sustainable innovations in the Dutch dairy farming sector?*

Both welfare of dairy cows and (un)sustainable raw materials are topics of public concern in the Netherlands. However, in the case of animal welfare, attention of societal organizations is mainly focused on intensive farming, because these societal organizations think that in intensive farming more urgent animal welfare problems are at stake. Furthermore, societal organizations frame animal welfare in dairy farming mainly as grazing. This led to more investments of dairy processing firms in stimulating grazing than in other welfare aspects. Because Cow-Compass focuses on all welfare aspects of the dairy cow, the grazing discussion has not much effect on the development of Cow-Compass. Therefore, it can be stated that public concerns had little effect on the development of Cow-Compass.

In the case of RTRS, societal organizations did pay significant attention to the problems around unsustainable soy. Two types of societal organizations are distinguished: action groups versus consideration groups. Both are necessary to mobilize the general public and convince companies to act. Action groups stimulated the public concerns about soy by having public campaigns in which unsustainable soy was framed as deforestation of the Amazon. These campaigns focused on the

emotions of the public. Consideration groups had discussions with market parties about their responsibility in the case of unsustainable soy. The created public concern together with pressure from societal organizations forced market parties to act. The result was that many market parties committed themselves to RTRS. To accomplish this change, societal organizations had to mobilize several resources. Due to size and experience of the involved societal organizations this was not a problem. Furthermore, societal organizations played an active role in the development of the RTRS standard. Hence, public concerns had significant influence on the development of RTRS, both by creating awareness and actively developing sustainable solutions.

As stated earlier, in the dairy farming regime also a market stream and a political/regulatory stream are distinguished. Furthermore, developments at the niche level (technological stream) can have an impact on sustainable innovations. For both cases it was studied what the role of these different streams was in the development of the innovation.

Sub question 4: *What role played actors from the market, political & regulatory and technological streams in the development of sustainable innovations in the Dutch dairy farming regime?*

During the development of Cow-Compass, mainly the actors from the market stream and the inventor played an important role in the development. Measures from the political/regulatory stream might indirectly stimulate the implementation of Cow-Compass by enabling it to replace two existing regulations (PBB and BGP). Knowledge institutions (technological stream) provided the knowledge the inventor used to develop the tool. In the development of RTRS, actors from the market stream, together with societal organizations, were the most important actors. These actor groups together developed the RTRS standard and made concrete appointments about the implementation of RTRS. Actors from the political stream played a supportive role in providing financial support and advice. Knowledge institutions were involved in developing principals and criteria RTRS had to satisfy.

The relatively passive role of the political/regulatory stream in the development of the two studied cases corresponds with the answer to the first sub question. These findings state that after 1994, the government adopted a more supporting and facilitating role, and they made the sector responsible for itself. Furthermore, according to the results of the first phase of the study, after 2000, market parties became the driving force behind sustainability developments. This also corresponds with the findings of the two case studies.

The main goal of this research was to study how pressure from society, or normative pressure, influences the transition towards sustainability of the Dutch dairy farming sector. The answered sub questions help to formulate an answer to the following main research question:

How does normative pressure influence the transition towards sustainability of the Dutch dairy farming regime from 1990 until now?

Due to the fact that sustainable innovations very often do not offer clear benefits for the firm who uses the innovation, theory assumes normative pressure plays an important role in developing sustainable innovations. This research shows normative pressure on dairy farming to produce more sustainable increased over the past decades. The topic of concern, however, changed over time. From the literature study, it seemed new available knowledge, for example knowledge about the effects of pesticides, a report about the emission of greenhouse gasses, or an analysis of the contribution of raw materials to the ecological footprint can trigger societal organizations. In other cases, an external event, like the outbreak of animal diseases, has been the trigger. After this initial trigger, societal organizations can react in two ways depending on the nature of the organization. The first type holds campaigns to mobilize a larger public. These campaigns often focus on the emotions of citizens to convince them about their goals. Besides, these organizations point to specific firms as the perpetrators, again, because this is more appealing for the larger public. The second type of societal organization acts less obvious, by which they take part in discussions with firms and policy makers to convince them to take measures. All in all, the goal of societal organizations is to motivate policy makers or firms to undertake action in order to solve the noticed problem. It seems that before 1994, policy makers were the change agents, and from then on this responsibility shifted to market parties. From 2000, market parties play an active role in solving sustainability problems, and use it as a marketing strategy. It seems that market parties in the dairy farming industry take their own responsibility in order to be prepared for allegations of societal organizations. Regulatory and political institutions stimulate this own responsibility by playing a facilitating and stimulating role.

Returning to the theoretical model, societal organizations sometimes directly influence sustainable dairy farming via normative pressure. However, more often they influence market parties (market stream), which in turn influence sustainable dairy farming. Market parties develop sustainable innovations for their own reasons, for example to guarantee enough raw materials in the future;
under pressure of societal organizations; or to avoid the attention of societal organizations in advance. Sometimes, societal organizations also try to have an impact via the political/regulatory stream. Nonetheless, in the dairy farming sector, international policy makes it very hard for Dutch policy makers to take actual measures, as the Netherlands have to commit to EU regulation. Therefore, Dutch policy makers have only an impact by stimulating market parties. This support consists of monetary resources and advice. The influence of these flows are incorporated in the conceptual model as red arrows. New knowledge or external events trigger societal organizations, which increases normative pressure. These societal organizations do use the three processes: resource mobilization, framing, and political opportunity structures to increase their influence. In both studied cases, involved societal organizations were relatively large and familiar organizations. This implies mobilizations of resources is relatively easy. The organizations have access to sufficient human and material resources. Furthermore due to past experience cultural resources are present.

And access to wide networks provides socio-organizational resources. As stated before mainly action groups use framing. They frame the problem in such a way the larger public is appealed. The political opportunity structure was the same in both cases. There was attention, but no concrete measures.

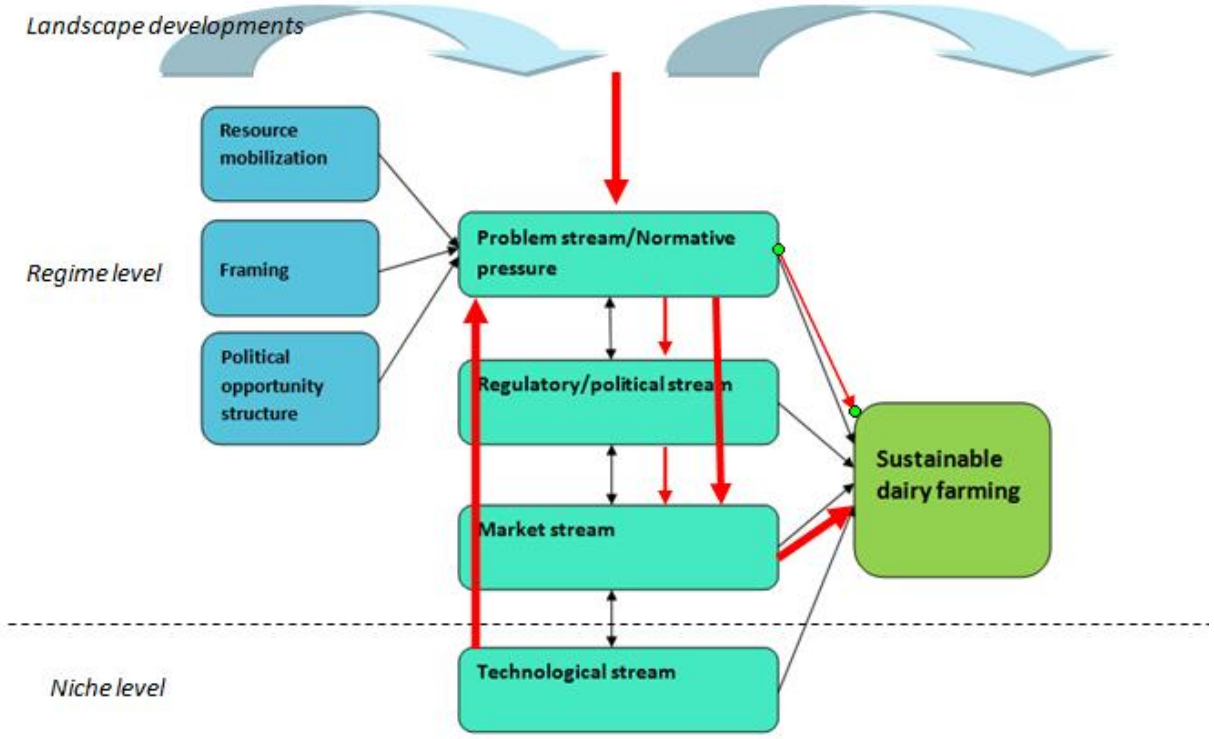

Figure 15: Refined conceptual model

10.2 Implications

This study shows that pressure from society can play an important role in the development of sustainable innovations. Until now, most research in the field of innovation studies focused at factors that influenced innovativeness based on economic issues of competitiveness and profitability criteria. Earlier research paid less attention to questions surrounding societal pressure. Sustainable innovations often do not offer clear economic benefits to the firm which uses the innovation. Therefore societal pressure is an important factor in the development of sustainable innovations. Because sustainable development is becoming increasingly important in almost all sectors, it is advised to take societal pressure into account when studying sustainable innovations.

If we go back to the refined conceptual model, some interesting policy recommendations can be derived. If the policy goal is to improve sustainable innovation policy makers have several options. First policy makers could try to have a direct impact on sustainable innovation, for example by designing regulations. However, this research shows international consideration can make it hard for

policy makers to implement such regulations. Therefore other routes can be more interesting for policy makers. First the technological stream can be stimulated to do research on sustainability problems or sustainable solutions. This study showed developments in the technological stream can trigger societal organizations to act. Another option for policy makers is to go on with stimulating market parties. This fits with the intention to stimulate the dairy farming sector to be more self sustaining, and it seems to work.

11. Discussion

This chapter discusses some limitations of the study, regarding used theories and methodology. Furthermore, some interesting remarks and thoughts about the research are presented. And lastly, suggestions for further research are presented.

First, some remarks on the used method are mentioned. This study is built on qualitative research methods. According to Bryman (2008) qualitative research is in general often perceived to be too subjective, meaning that qualitative findings rely too much on the researchers views' on what is significant and important. In this research, multiple sources are used (literature, media databases and expert interviews) to avoid a one sided view. The use of multiple sources contributes to source triangulation. Internal validity is warranted by refining the conceptual model. The estimated relations between concepts are investigated, and if necessary adapted. To increase construct validity results based on literature are confirmed with interviews. Furthermore the operationalization of theoretical concepts is adjusted after the first interviews. An example is the adding of greenhouse gasses in environmental sustainability. The former definition of sustainable dairy farming stems from 2005, and attention for greenhouse gasses came up after 2005. Therefore it probably did not play an important role when Calker (2005) developed his definition. The small number of cases in this research makes it hard to generalize findings to other settings. However, as will be discussed later on, there are some similarities to the research of Elzen et al (2011) in pig farming, which makes it more plausible the findings are generalizable to other agricultural sectors. Furthermore the research can function as a starting point for further research on the impact of societal pressure on the development of sustainable innovations. A common critique on qualitative research refers to the difficulty of replication (Bryman, 2008). In this study all research and analysis steps are written down as clear as possible. However, another researcher probably will not arrive to exactly the same conclusions. The investigator is the main instrument, so findings are very much a product of predilections of the researcher. Also, response of interviewees depends on characteristics of the researcher. However, literal replication is not what is strived for in this study. A final, general critique is the lack of transparency (Bryman, 2008). It is hard to establish from qualitative research what the researcher actually did and how he or she arrived at the study's conclusions. The process of coding has also some limitations, which again has to do with replication. Probably, another researcher would have labeled specific fragments with other codes, this would affect the results.

For this research a combination of multi-level perspective theory with social movement theory is used. The combination of these theories led to interesting insights, like the impact of landscape developments on societal pressure. However, it might be that this combination of theories neglected some aspects of what makes an innovation successful. One is the existence of competing products. In the case of Cow-Compass it becomes clear there are more tools available who aim to monitor and manage welfare of dairy cows. Insights from, for example, the five forces model of Porter (1979)

could help to explain why one tool becomes successful and other not. This might help developers of sustainable innovations to develop a successful product. This can be interesting for further research.

During the first phase of the research, one step was a media analysis. One point of discussion is that more articles are available from recent dates. This led to a skewed distribution, from older years less articles are found and analyzed than from more recent years. Another observation which might have had an effect on the results is the fact that several interviewees perceived the impact of the stream or actor group they belonged to, to be relatively high. While other actors from that stream did not think this stream had that much impact. It is tried to correct these subjective views by incorporating interviewees from all streams, and if possible check finding with literature.
There are two main criteria used to select the cases: firstly, it should discuss a problem in which a normative debate exists; secondly an innovation must be available that may provide a solution for the particular problem. The first research phase showed there are several sustainability problems related to dairy farming, and that most of these problems are surrounded with public concerns. Therefore, to satisfy the first criteria for case selection is not hard. More difficult is to find an innovative solution for the sustainability problems (the second criteria). For most sustainability problems there are no concrete solutions yet. Or solutions are not presented in one tool or product, for example energy use and emission reducing measures. Other solutions, like manure refining, are only in the test phase and there are no results available whether it works. This lack of sustainable innovations in the dairy farming sector suggests that there are opportunities for entrepreneurs to focus upon. However, this lack of sustainable innovations led to a case selection which was not fully based on a strict case study design, but also on the availability of suitable cases.

Another point of discussion is the amount of interviews the cases are built upon. Especially in the case of Cow-Compass this is not a very large amount, which might provide a subjective view. However with the interviews performed all important actor groups who had an impact on the development of the product were represented. The interviewees were asked to mention other important actors, but they only mentioned each other. Furthermore their answers did not contradict each other, and the feeling of saturation was reached after the third interview. Therefore it is assumed three interviews were enough in this case. For RTRS the same story holds, five interviews had been held, which together represent all important actor groups. Also in this case saturation is reached, and interviewees answers did not contradict each other. However, there is one stream that's been missing in the interviews. This is the political/regulatory stream. It has been tried to involve this stream, but no respondents were found that were willing to cooperate. However, the persons interviewed were also able to give insight in the influence of this stream.

During the case studies some remarkable differences between the cases have been noticed. It seems that Cow-Compass has developed in a 'classic' manner. One inventor devised the fore runner of Cow-Compass. This inventor consulted other actors, like societal organizations, but developed the tool himself. When he thought the product was good enough the inventor approached a firm (CONO) to

put it on the market. Together with CONO and farmers (members of CONO) Cow-Compass was further developed and made available for other potential users (farmers). This approach looks like a 'classic' innovation process as described in innovation literature. RTRS is developed in another manner, different societal organizations and firms, which together represented all actors in the soy chain, discussed how the product should look like. When a compromise was found between all parties, the RTRS standard, was developed. Due to this approach when RTRS came on the market there was already a wide acceptance of and knowledge about the product.

In the Cow-Compass case it seems there is no dominant design available yet. Different dairy processing firms use different tools to monitor welfare. FrieslandCampina uses the constant welfare monitor, CONO and other small dairy processing firms use Cow-Compass, and the Welfare Quality System (WQS) is European developed and it seems the government is interested in this last tool. If the expectation of the interviewees come true, and in the future dairy farmers have to satisfy certain welfare standards, this might have an effect on the different tools. One option is the government obliges one of the tools. If this is not Cow-Compass this is probably the end for the tool. Another option is that the government obliges to use a form of monitoring which has to satisfy specific criteria. In that case Cow-Compass has a good chance, because it agrees with many criteria of the WQS system, which is seen as the golden standard, but more practical.

One of the conclusions of the RTRS case is that societal organizations can be divided in two types. Because societal organizations had less impact on the development of Cow-Compass it is hard to make a statement about the existence of different types in this case. However there are indications this indeed is the case. An example is Wakker Dier versus the Dierenbescherming. Wakker Dier is familiar for its notable campaigns, some recent examples are de Plofkip (against intensive breeding of chickens) and the Kiloknaller (against cheap meat in supermarkets). These campaigns often try to trigger consumers by playing with their emotions. Wakker Dier also points in its campaigns directly to supermarkets. In radio commercials for example they reprimand Albert Heijn/Plus/Coop/Jumbo for selling cheap chicken. The Dierenbescherming on the other hand does not have this type of campaigns. They are more like a consideration group. They are involved in discussions with market parties in order to reach their goals. Furthermore they guide research processes intended to increase animal welfare. This indicates that also around animal welfare there are different types of societal organizations. And probably also in other cases this distinction between societal organizations can be made. To confirm this observation further research is required.

This research builds on a study of Elzen et al. (2011) about normative contestation in pig farming. Similar to Elzen's approach also in this research two cases have been studied. A similarity is the notion of the establishment of the Partij voor de Dieren (PvdD), which pushed animal welfare concerns high on the political agenda. Another similarity is the outbreak of animal diseases and food scandals as an external shocks which triggered societal organizations. These external events increased the empirical credibility and cultural resonance of societal organizations (Elzen et al, 2011).

And therefore increased societal pressure. An interesting difference with Elzens study is that in his cases normative pressure led to political measures. Elzen et al (2011) state that societal organizations mobilized the public opinion and put pressure on political institutions. In this study societal organizations focused mainly on the public opinion and market parties. A possible explanation can be that the development of the innovative solutions in the cases of Elzen et al (2011) started before 2000, and in this research the development of the innovative solutions started after 2000. From 2000 market parties became the drivers behind sustainability, because they saw it as a marketing strategy. Therefore it might be more useful for societal organizations to focus on market parties instead of political institutes.

Elzen et al (2011) assume a variety on the problem side (several problems related to one case) and a variety of solutions weaken the possibility of alignment and therefore the success of an innovation. Therefore they expect that the creation of a successful package (all different streams align) has more chances if there already is a dominant design. In the case of Cow-Compass it seems this is at stake; there are different problems related to animal welfare. Furthermore there are different solutions that aim to solve the animal welfare problem of dairy cows. There are for example several welfare tools (Cow-Compass, WQS), and there is the guaranteed grazing label. Because consumers link grazing to welfare this guaranteed grazing label is more successful. If normative pressure focuses more on the total welfare of dairy cows, a tool like Cow-Compass could become more successful. However first there must establish a dominant design of a welfare tool.

There are also external trends at stake, which can influence sustainable innovations. Very recently (12 September 2012) the Netherlands had governmental elections. This might have an effect on the political opportunity structure for sustainable innovations. In these elections the focus was mainly at providing solutions for the economic crisis the Netherlands suffers from. Sustainability concerns are less prominent at the agenda. This could also be witnessed in the results of the elections, the political party what is known for its sustainable focus (GroenLinks) lost six seats (from ten to four). This might indicate the focus of the Dutch society and policy makers is not on sustainable innovation. This might have an hindering effect on the transition towards sustainable dairy farming. On the other hand, this study showed market parties are at the moment the drivers for change, more or less stimulated by societal organizations. And these market parties regard sustainability as a tool to distinguish themselves from other firms. It seems international consideration hold back policy makers from implementing regulations in dairy farming. Because the Netherlands is an export oriented problems, this can be at stake in other sectors too. Further research would be required to investigate this.

This research addressed the impact of normative pressure on transitions which are not yet completed. The study is based on earlier research of Elzen et al (2011) and some similarities are found. This indicates the results of Elzen et al (2011) from pig farming, also hold for other agricultural sectors, like dairy farming. Further research is required to confirm this observation. Furthermore it is plausible the normative pressure theory also holds in other sectors which develop in a sustainable

way. To generalize findings and elaborate the perspective further research should investigate the impact of normative pressure in other sectors. The study of Elzen (2011) provided valuable insights this study used as a starting point. This study showed the idea of societal pressure is also applicable in other domains. Furthermore this study showed that conclusions are time dependent. Changes in the regime, for example a change in the political situation or another perception of consumers of the sector, influences how normative pressure influences a transition. Probably the refinement of the conceptual model as presented in the conclusion is also time dependent. Further research could focus on studying whether this refinement holds in other situations and times. Another suggestion for further research is to further operationalize the other streams, because the cooperation between the different streams seems to be very important. Therefore the other streams should be operationalized further. All in all societal pressure seems a promising field for further innovation research on sustainability issues.

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Appendix A: Interview 1

Interview Candidates

Table A1: Candidates Interview 1			
Name	**Interview date**	**Organization**	**Function description**
Ben Hermans	01-05-2012	Natuur & Milieu	Policy employee from the team agriculture and economy at Natuur & Milieu. Enhancing sustainability of agriculture/feeding is a very imporant topic in the new strategy of Natuur & Milieu.
Petra Tielemans	02-05-2012	NZO/Duurzame Zuivelketen	Project leader of Duurzame Zuivelketen, Duurzame Zuivelketen started in 2008. In this function Tielemans guides LTO and NZO to work together on the road to sustainability. Before this, Petra Tielemans worked 4,5 years as lobbyist for LTO.
Paulien van de Graaff	04-05-2012	Nevedi	Paulien van de Graaff works at Nevedi for one year, she works on increasing the sustainability of the entire animal feeding chain. Before she worked at the 'productschappen akkerbouw'.
Carel de Vries	14-05-2012	Courage	Carel de Vries works for 30 years in different areas related to dairy farming. He worked among others as agricultural journalist and was project leader of the 'Marke'. At the moment he leads Courage, this is an innovation foundation of LTO Nederland, NZO and the ministry of EL&I.

Interview questions

Introductie:

Hallo, welkom en bedankt dat u mee wilt werken aan dit interview. Ik zal beginnen met een korte introductie van mezelf en het onderzoek. Ik ben student van de Universiteit Utrecht, van de master Science & Innovationmanagement. Ik ben nu bezig met mijn master scriptie. Hiervoor doe ik onderzoek naar de invloed van druk vanuit de maatschappij op de overgang naar duurzame melkveehouderij. Het doel van dit interview is om een overzicht te krijgen van de belangrijkste ontwikkelingen in de melkveehouderij aangaande duurzaamheid van 1990 tot nu. En welke problemen/belemmeringen/uitdagingen de sector tegen is gekomen in zijn transitie naar duurzaamheid. Verder wil ik achterhalen wat volgens u de grootse maatschappelijke problemen zijn die de sector treffen en welke oplossingen hier voor gevonden zijn.

Praktisch:

Is het goed als ik dit gesprek opneem?
Mag ik uw naam en de naam van uw organisatie in het verslag opnemen?
Na uitwerking zal ik het interview opsturen ter correctie.

Interview:

Geinterviewde:

Kunt u kort uw functie en relatie tot de Nederlandse melkveehouderij beschrijven?
Hoe lang bent u al werkzaam in deze functie?

Wat is uw visie vanuit deze functie op het begrip 'duurzame melkveehouderij'?

Structuur innovatie systeem:

Wat zijn de belangrijkste actoren/instituten in de melkveehouderij sector?
Hoe staan deze actoren met elkaar in verband?
Wat zijn de belangrijkste wetten, normen en waarden waar de melkveehouderij aan moet voldoen?
Hoe komen innovaties/vernieuwingen in de melkveehouderij over het al.gemeen tot stand?
Door wie worden deze geïnitieerd?

Transitie:
Wie zijn, volgens u, de belangrijkste actoren (wie spelen de grootste rol) in de transitie naar duurzame veehouderij?
(bijv. Politiek/overheid, markt (toeleveranciers/supermarkten), maatschappij (maatschappelijke organisaties), universiteiten/onderzoeksinstellingen, boeren, intermediaire groeperingen).
(na eerste interviews evt. actorschets, wat mist geïnterviewde)

Wat zijn volgens u de belangrijkste ontwikkelingen (in relatie tot duurzaamheid) in de melkveehouderij van 1990 tot nu?

Wat zijn de grootste problemen/belemmeringen die de melkveehouderij in de transitie naar duurzaamheid is tegengekomen? In welke periode(s) speelden deze specifiek?

Over welke problemen was de grootse maatschappelijke twist? Waaruit bestond deze twist?
Welke actoren speelden een rol hierbij? (Tussen wie was onenigheid + standpunten)

Welke oplossing is hier (eventueel) voor gevonden?

Wie speelde(n) een rol bij het vinden van deze oplossing? Welke rol speelden zij specifiek? (wat waren uw verrichtingen, doelen, verantwoordelijkheden hierin)

Op welk moment speelden deze actoren een rol?
Welke verbanden bestaan er tussen deze partijen?

Welke (nieuwe) technologieën zijn ingezet om de melkveehouderij duurzamer te maken?
Welke partij(en) speelde(n) een rol bij het introduceren van deze technologieën?

Welke gebeurtenissen hebben volgens u het meest bijgedragen aan de overgang naar duurzame melkveehouderij? Waarom juist deze gebeurtenissen?

Afsluitende vragen:
Heeft u nog vragen of opmerkingen over transities naar duurzame melkveehouderij die nog niet besproken zijn?

Heeft nu nog vragen of opmerkingen over mijn onderzoek?

Weet u nog andere partijen/personen die u mij aanraad om te interviewen?

Appendix B - Interview 2

Interview candidates

Table B1: Candidates interview 2			
Koe-Kompas			
Name	**Interview date**	**Organization**	**Function**
Grietsje Hoekstra	25-06-2012	CONO	Grietsje Hoekstra is the project manager of the 'Caring Dairy' program of CONO cheese makers. This is an integral sustainability program.
Bert vd Berg	04-07-2012	Dierenbescherming	Bert van den Berg is a senior policy employer at the Animal protection society. He focuses on ruminants, pigs, animal transportation, intoxication and killing. His work entails many consultations, lobbying towards businesses and the government and accompanying academic research.
Joost de Veer	08-08-2012	Founder	Joost de Veer worked as a veterinarian from 1975 to 1992. From then he worked for the veterinarian society and developed dairy farming ratios. Furthermore he worked for NEDAP (Nederlandse apparaten techniek) and since 2000 he works for himself, still in relation to dairy farming.
RTRS			
Name	**Interview date**	**Organization**	**Function**
Marc Jansen	27-07-2012	CBL	Marc Jansen is director consumer affairs and quality at CBL. CBL is the covering organization which looks after the interests of supermarkets.
Hugo Hooijer	09-08-2012	Milieudefensie	Hugo Hooijer works at Milieudefensie for two years. He works as employer at the theme: sustainable food.
Cornel Boere	10-08-2012	Agrifirm	Cornel Boere works at Agrifirm for five years. He is responsible for the purchase of raw materials. For Agrifirm he is active in RTRS.
Gert van der Bijl	14-08-2012	Solidaridad	At Solidaridad Gert van der Bijl is responsible for sustainable soy and livestock programme of Solidaridad, with main focus on development of sustainable supply chains for animal products in the Netherlands and Europe.
Hugo Byrnes	21-08-2012	Ahold	Hugo Byrnes is vice president product integrity at Ahold.

Interview Questions

The interview questions are adjusted to the specific interviewee, based on his background and actor group. With interviewees from societal organizations the focus is on the questions in the 'problem stream' section. While probably interviewees from other actor groups don't have detailed knowledge about internal processes of a societal organization. Also if during the interview additional information comes up, there is asked through on this information.

Interview 2 – RTRS:		
Nr.	**Vraag**	**Antwoord**
Sustainability of the innovation		
Economic sustainability		
1	Heeft RTRS financiële voor- of nadelen voor de boer? Wat zijn deze voor/nadelen?	Voordelen: Nadelen:

2	Wat is het effect van RTRS op het netto inkomen van de boer? Waardor wordt dit effect veroorzaakt? Hoe groot is dit effect?	Negatief – Neutraal – Positief …….. %
Ecological sustainability		
3	Draagt RTRS bij aan vermindering van de hoeveelheid fosfaat en stikstof per ha land? Als ja, hoeveel ongeveer?	Ja - Nee …..
4	Draagt RTRS bij aan vermindering van de NO3 (nitraat) concentratie in het grondwater? Als ja, hoeveel ongeveer?	Ja - Nee …..
5	Draagt RTRS bij aan een vermindering van de hoeveelheid water die gebruikt wordt? Als ja, hoeveel ongeveer?	Ja - Nee …..
6	Draagt RTRS bij aan een vermindering van de verzuring van de grond? Als ja, hoeveel ongeveer?	Ja - Nee …..
7	Draagt RTRS bij aan het vergroten van de biodiversiteit? Als ja, hoeveel ongeveer?	Ja - Nee …..
Social sustainability – Internal		
8	Draagt RTRS bij aan betere werkomstandigheden voor de boer?	Ja – Nee
9	Op welke manier(en)?	…..
Social sustainability – External		
10	Draagt RTRS bij aan het voorkomen van antibiotica in voedsel?	Ja – Nee
11	Draagt RTRS bij aan het voorkomen van dioxines in voedsel?	Ja – Nee
12	Draagt RTRS bij aan het voorkomen van micro biologische entiteiten in voedsel? (Salmonella, E. coli, S. aureus, M. paratuberculosis)	Ja - Nee
13	Draagt RTRS bij aan dierenwelzijn?	Ja - Nee
14	Op welke manier(en)?	Freedom from discomfort, Freedom to express normal behavior, Freedom from fear and distress, anders namelijk:…
15	Draagt RTRS bij aan diergezondheid?	Ja - Nee
16	Op welke manier(en)?	Freedom from pain, injury and disease, ander namelijk:…
17	Draagt RTRS bij aan het verbeteren van het landschap?	Ja - Nee
18	Op welke manier(en)?	
Problem stream/Normative pressure		
19	Zijn er maatschappelijke organisaties die zich inzetten voor duurzame grondstoffen in de melkveehouderij? Welke?	….. ….. …..
20	Op welke manier(en) hebben zij zich ingezet?	…..
21	Zijn deze organisaties ook betrokken geweest bij de ontwikkeling van RTRS? Als ja: Op welke manier, wat was hun rol? In welk stadium van de ontwikkeling? Was deze betrokkenheid vooral actief of passief? Als nee: Waarom niet?	Ja - Nee …. ….. Actief - passief, want….. ……..
Resource mobilization		
22	Beschikt de organisatie over voldoende financiële middelen?	niet – matig – gemiddeld – voldoende - veel
23	Beschikt de organisatie over voldoende ander fysiek kapitaal? (kantoorruimte etc)	niet – matig – gemiddeld – voldoende - veel

24	Heeft de organisatie financieel kapitaal ingezet ten behoeve van duurzame grondstoffen? Als ja, kunt u een voorbeeld geven?	Ja – Nee, € ….
25	Wat is het hoofddoel van de organisatie? Heeft dit doel legitimiteit (rechtmatigheid)? Waarom wel/niet?	….. niet – matig – gemiddeld – voldoende - veel ……
26	Kan het doel van de organisatie rekenen op sympathie vanuit de maatschappij? Waarom wel/niet?	niet – matig – gemiddeld – voldoende - veel …..
27	Heeft de organisatie ervaring met het houden van (protest) acties? Kunt u een voorbeeld geven?	niet – matig – gemiddeld – voldoende - veel …..
28	Heeft de organisatie specifieke kennis van duurzame grondstoffen? Waar bestaat volgens u deze kennis uit,?	niet – matig – gemiddeld – voldoende – veel …..
29	Heeft de organisatie mensen ingezet ten behoeve van het gebruik van duurzame grondstoffen? Hoeveel? Welke acties hebben deze mensen ondernomen?	No. Leden, no. vrijwilligers …..
31	Hoe zou u het leiderschap van uw organisatie inschalen? (alleen bij onbekendere organisatie) Hoe is de organisatie gestructureerd?	niet – matig – gemiddeld – voldoende - veel …..
32	Kan de organisatie gebruik maken van externe contacten? Beschikt de organisatie over een grote achterban? Hoe groot?	niet – matig – gemiddeld – voldoende - veel …..
33	Hoe zou u de geloofwaardigheid van uw organisatie inschalen? Waaruit blijkt dit?	heel klein –klein – gemiddeld –groot-heel groot …..
Framing		
34	Op hoeveel verschillende kwesties focust de organisatie zich? Welke kwesties zijn dit? Wat zijn de 3 belangrijkste? Waarom op deze? Waarom zoveel/weinig?	No. ….. ….. ….. …..
35	Hoe sluiten de acties/activiteiten van deze organisatie aan bij andere activiteiten die spelen rond duurzame grondtoffen? Waarom vindt u dat?	niet – matig – gemiddeld – voldoende - goed …..
36	Wat is het standpunt van de organisatie betreffende duurzaamheid in de melkveehouderij? Wat is het standpunt betreffende RTRS in relatie tot duurzame grondtoffen??	….. …..
37	Hoe sluit het standpunt van de organisatie aan bij de realiteit? Wat verstaat u onder deze realiteit?	niet – matig – gemiddeld – voldoende - goed …..
38	Doet de organisatie met RTRS een beroep op de emotie van mensen? (met afbeeldingen oid)	niet – matig – gemiddeld – voldoende - veel
39	Op welke manier(en)?	…..
40	Worden de vertegenwoordigers van de organisatie als geloofwaardig beschouwd? Waar blijkt dit uit?	niet – matig – gemiddeld – voldoende - goed …..
Political opportunity structure		
41	Heeft de maatschappij veel in te brengen in beleid betreffende duurzame grondstoffen? Waar blijkt dat uit?	niet – matig – gemiddeld – voldoende - veel …..
42	Welke politieke partijen hebben op dit moment de ‘macht’?	
43	Welke invloed heeft de huidige politieke situatie op het	niet – matig – gemiddeld – voldoende –

	duurzame grondstoffen vraagstuk? Waarom wel/niet? Is dit gunstig voor RTRS? Waarom wel/niet?	goed ....
44	Zijn er nieuwe/andere politieke partijen die invloed hebben op de aandacht voor duurzame grondstoffen? Welke? Waarom?	Ja – Nee,……. .....
45	Hoe staat duurzame grondstoffen op de politieke agenda? Waarom wel/niet? Lijkt het erop dat dit binnenkort gaat veranderen? Waar blijkt dat uit?	niet – matig – gemiddeld – voldoende - hoog ....
Regulatory/political stream		
46	Zijn er wetten/maatregelen die betrekking hebben op RTRS? Op welk niveau zijn deze maatregelen? (nationaal/provinciaal/gemeente) Om welke wetten/maatregelen gaat het? Welke gevolgen hebben deze voor RTRS?	Ja – Nee,… ....
47	Is er sprake van druk vanuit de overheid om een bepaalde richting op te gaan in duurzame grondstoffen? Welke? Waarom deze richting?	Ja - Nee,.... ....
48	Is er sprake van druk vanuit de overheid om een bepaalde richting op te gaan in duurzame grondstoffen gebruik in de veehouderij? Welke? Waarom deze richting?	Ja – Nee, … ....
49	Zijn er maatregelen die dit laten zien? (subsidies/belastingen) Welke?	Ja – Nee,…
Market stream		
50	Is er onder consumenten een voorkeur voor producten afkomstig van duurzame grondstoffen? Is er onder consumenten een voorkeur voor producten van bedrijven die duurzame grondstoffen gebruiken? Waarom? Waar blijkt dit uit?	niet – matig – gemiddeld – voldoende - veel ....
51	Nemen retailers maatregelen ten gunste van producten van duurzame grondstoffen? Nemen retailers maatregelen ten gunsten van producenten die duurzame grondstoffen gebruiken? Welke maatregelen? Waarom?	niet – matig – gemiddeld – voldoende - veel ....
52	Nemen toeleveranciers maatregelen ten gunste van duurzame grondstoffen? Welke maatregelen? Waarom?	niet – matig – gemiddeld – voldoende - veel ....
Technological stream		
53	Is er nieuwe kennis beschikbaar wat een effect zal hebben op RTRS?	Ja - Nee
54	Wat voor kennis? door wie is dit ontwikkeld?	....
55	Wat is het verwachte effect?	.....
	Lopen er onderzoeken/projecten die een effect zullen hebben op RTRS?	Ja - Nee
57	Welke onderzoeken/projecten? door wie worden deze uitgevoerd?	....

58	Wat is het verwachte effect?	.....
59	Zijn er nieuwe producten/processen die invloed hebben op RTRS?	Ja - Nee
60	Welke?	.....
61	Wat is het verwachte effect?	.....
Samenvattend		
62	Wat is de impact van de 'Problem stream/normative pressure'?	Geen/zeer weinig (0) – Gemiddeld (+) – Veel (++)
63	Wat is de impact van de 'Regulatory/political stream'?	Geen/zeer weinig (0) – Gemiddeld (+) – Veel (++)
64	Wat is de impact van de 'Market stream'?	Geen/zeer weinig (0) – Gemiddeld (+) – Veel (++)
65	Wat is de impact van de 'Technological stream'?	Geen/zeer weinig (0) – Gemiddeld (+) – Veel (++)

Appendix C - Analyse

C1 - Example coding

In this appendix a short example of coding is provided. For this study coding is done by hand, therefore no digital version is available.

Solidaridad is één van de oprichters die RTRS in 2006 oprichtten **[Rol – oprichter]**. RTRS is een samenwerkingsverband van soja producenten, handelaren en maatschappelijke organisaties **[Samenwerking]**. Nu heeft RTRS zo'n 180 leden. Vanaf het begin heeft Solidaridad zich ervoor in gezet dat ook kleinschalige producenten een belangrijke rol spelen in RTRS **[Belangen kleinschalige producenten]**. RTRS is begonnen met het in kaart brengen van de belangrijkste duurzaamheids problemen die aangepakt moesten worden. De volgende stap was een standaard (lijst met criteria) te formuleren om aan de belangrijkste duurzaamheids problemen het hoofd te bieden. Solidaridad heeft hier een actieve en belangrijke rol in gespeeld, en heeft ook een aantal jaar de voorzitter geleverd **[Rol – actief/criteria formuleren/voorzitter]**. Wat Solidaridad betreft is RTRS een belangrijk platform om samen te komen met producenten, de industrie en MOs om samen aan verduurzaming van de keten te werken **[Samenwerking]**. Dat wil niet zeggen dat RTRS alle problemen oplost, maar het is wel een belangrijke stap **[RTRS – goede stap]** .

Als je kijkt naar de afgelopen 10-15 jaar is er wel aandacht geweest voor problemen in de sojateelt, met name voor ontbossing. **[Maatschappelijke aandacht – ontbossing]** De meeste mensen zullen ontbossing van de Amazone noemen als het gaat over de negatieve gevolgen van sojateelt**.[ontbossing Amazone]** Terwijl in werkelijkheid de meeste ontbossing niet in de Amazone plaatsvindt, maar in andere gebieden in Zuid-Amerika. Dus hier zijn mensen wel bezorgd over. Weinig mensen verbinden dit met de productie van vlees of zuivel **[consumenten - geen link zuivel]**. Mensen die in de winkel een pak melk kopen realiseren zich niet dat dat iets met soja te maken heeft. Dat is ook het lastige van soja, er zitten zoveel stappen tussen de sojateelt en het product in de winkel. Dat maakt het ook lastig om dingen te communiceren naar consumenten **[consumenten – communicatie lastig]** . FrieslandCampina doet bijvoorbeeld veel voor duurzame soja, maar vind het lastig hier iets over naar hun consumenten te communiceren. Ze zeggen de meeste mensen die hun product kopen hebben niet het idee dat melk iets met soja te maken heeft. Soja is dus een verborgen grondstof **[soja verborgen grondstof]**, het zit niet in het product.

C2- Thematic analyse Cow-Compass

Thema: Maatschappelijke organisaties

	Antibiotica	Invloed	Focus
Grietsje Hoekstra (CONO)	Milieu en volksgezondheid organisaties vinden minder antibioticagebruik belangrijk. Dierenbescherming vind goede behandeling en niet lijden van dier belangrijk.	MO's vinden jongvee en opfok (bijv. transport kalveren) belangrijk. (daarom opgenomen in KK). Dierenbescherming vanaf begin uitgenodigd mee te denken, niet veel gedaan.	
Bert vd Berg (Dierenbescherming)	Antibiotica zou niet standaard gebruikt moeten worden (zoals in kalverhouderij).	In 2002 contact met de Veer voor project: 'Milq2'. Discussie met de Veer	Focuspunten Dierenbescherming. - Weidegang - Klauwontstekingen - Uierontstekingen

		over waar het niveau zou moeten liggen en hoe de weging tot stand komt. De Veer dacht erg breed in eerste stadium. Vroeg veel verschillende actoren mee te praten over natuur, milieu, dierenwelzijn, economie, etc. Dierenbescherming wil alleen over eigen expertise gebied meedenken (Dierenwelzijn). Focus meer op intensieve veehouderij,	-Problemen rond de voortplanting - Kalveren - direct na de geboorte bij de moeder weggehaald (dierenbescherming pleit ervoor om kalveren minstens 3 maanden bij de koe te laten). -Levensduur van de koe - Slechte (winter)stalling (te krap/te hard) (koeien zijn groter geworden, ligboxenstal is verouderd) - Kalverhouderij
Joost de Veer (inventor)		Milq2 17 MO's betrokken om bandbreedte te bepalen. Niet mee willen denken van dierenbescherming wijst op kennis tekort. MO's richten zich vooral op de intensieve veehouderij.	Veel MO's vinden weidegang belangrijk (breekpunt) terwijl dit geen bewezen positief effect op duurzaamheid heeft. Kennisgebrek MO's leid tot onpraktische eisen.

Thema: Markt

	Consument	Retail	Veehouder
Grietsje Hoekstra (CONO)	Dierenwelzijn belangrijk voor consumenten. Nog geen goed systeem (als beter leven) beschikbaar voor zuivel. KK te ingewikkeld voor consument.	Ben & Jerry's eist duurzame producten van leveranciers. Duurzaamheid steeds interessanter om te vermarkten.	Verwarrend verschil BGP & Koe-Kompas. Cono probeert Koe-Kompas via de markt te stimuleren (Veehouder vraagt veearts).
Bert vd Berg (Dierenbescherming)	Stimulans voor prod. van dieren met hogere mate van welzijn zou uit de markt moeten komen. KK te ingewikkeld voor consumenten, daarom geen communicatie (label) functie. Consumenten zeggen een voorkeur voor producten met hoge	Retail zou producten op kwaliteit ipv prijs moeten vermarkten (Vb. weidegang). Dierenbescherming spreekt supermarkten hier op aan. Supermarkten hebben een rol consumenten te overtuigen om bewuste keuzes te maken.	

	mate dierenwelzijn te hebben, maar handelen hier niet naar.	Supermarkten bieden steeds meer producten met hogere mate duurzaamheid aan. Combineren dit vaak met een label van een MO. Motief voor bedrijven: 1.: er is markt voor, 2.: als we nu niets doen zijn er over aantal jaar geen grondstoffen meer.	
Joost de Veer (inventor)	Consumenten linken dierenwelzijn vaak 1 op 1 aan weidegang.	Retailers kijken waar vraag naar is. Op dit moment: producten met een goed verhaal.	

Thema: Politiek

	Invloed	Wetten/maatregelen	
Grietsje Hoekstra (CONO)	Minimale invloed. Voor toekomst meer regelgeving aangaande dierenwelzijn verwacht. KK is daar op voorbereid.	Vervangt PBB en BGP.	EL&I geïnteresseerd in WQS.
Bert vd Berg (Dierenbescherming)	Is discussie over dierenwelzijn maar de meningen zijn erg verdeeld. Overheid volgt een beleid van terugtrekken en meer stimuleren en faciliteren.	Alleen Europese wetgeving op het gebied van welzijn kan invloed hebben.	Nederlandse politiek verschuilt zich achter Europa.
Joost de Veer (inventor)	Geen invloed gehad op ontwikkeling KK.	Niet, wel verwacht in de toekomst.	
Petra Tielemans (Duurzame zuivelketen)		Vervangt PBB en BGP.	

C3 - Thematic analyse RTRS

Thema: Maatschappelijke organisaties

	Druk op wie	Emotie	Typen	Overleg	Actiegroep
Marc Jansen (CBL)	MO's richten zich vaak op supermarkten omdat dat meer aanspreekt (bij het grote publiek), en supermarkten meer kans op imagoschade hebben.	Soja wordt direct gelinkt aan kap van de Amazone terwijl het een veel complexer probleem is.	Er zijn twee soorten MO's. Instanties als WNF, Natuur en Milieu, de dierenbescherming. Valt goed mee te overleggen. Wakker dier, Greenpeace, Milieudefensie. Proberen met hun campagnes op de emoties van	MO's zijn belangrijk omdat ze de mening van de consument vertegenwoordigen. CBL probeert door overleg tot een oplossing te komen.	Overdrijven Spelen in op emoties. Hebben onrealistische wensen. Bijvoorbeeld dat de consument stopt met

			consumenten in te spelen en zo veranderingen tot stand te brengen.	Grote rol in ontwikkeling RTRS deze zien verduurzaming als een proces.	vlees eten.
Hugo Hooijer (Milieudefensie)	MD (milieudefensie) start jaar een publiekscampagne om het idee van soja vervanging te pluggen. Doel is consumenten mobiliseren om druk op bedrijven te zetten. Ook politiek resultaat is het doel. Bedrijven, omdat die een duidelijk profiel hebben. Spreekt het publiek meer aan.	Doet heel erg een beroep op emoties. Vormen complexe soja probleem om tot kap amazone en zielige aapjes en indianen. Megastallen: focus op dierenwelzijn omdat dat de consument aanspreekt. Terwijl het MD om het milieu. gaat			Campagnes. Lobbyen bij de politiek. Draagvlak onder boeren creëren.
Cornel Boere (Agrifirm)	Agrifirm ondervind geen druk van MO's. Dat komt omdat ze duurzaamheid als strategische peiler hebben.	Consumenten liëren soja aan de kap van de Amazone.		Agrifirm heeft goede contacten met MO's en probeert altijd met een open vizier in gesprek te gaan en tot een oplossing te komen.	Agrifirm zit niet te wachten op actievoerders die silo's beklimmen. Als er zoiets staat te gebeuren zullen ze altijd proberen in gesprek te treden.
Gert van der Bijl (Solidaridad)	Groot publiek (via media, boekjes, brochures ed) om druk van breder publiek te genereren. Bedrijven, vaak supermarkten.	Partijen als milieudefensie richten zich op emoties. Met zielige aapjes ed. Dit heeft meer impact dan een goed onderbouwde analyse.	Taakverdeling tussen MO's waarneembaar, Greenpeace/Milieudefensie: publiekscampagnes tegen bedrijven. WNF/Solidaridad: samenwerking met bedrijven.	Solidaridad en WNF meest actief	Greenpeace media gericht. Daarom focus op Amazone (scoort goed).

Hugo Byrnes (Ahold)	Aandacht van MO's belangrijke reden om wat aan duurzaamheid te doen.		Actiegroepen vs. groepen waar goed mee te overleggen valt.	Ahold staat open voor overleg. Moet wel met realistische doelen komen. Soja vervanging is bijv. niet mogelijk op korte termijn.	Campagnes van actiegroepen moet je ondergaan.

Thema: Markt

	Consument	Supermarkten	Veevoerbedrijf	Veehouders
Marc Jansen (CBL)	De consument moet niet belast worden met regeltjes betreffende duurzaamheid. Ze kunnen het zelf opzoeken als ze willen. Consumenten vertrouwen erop dat bedrijven hun verantwoordelijkheid nemen of dat de overheid maatregelen neemt.	Supermarkten nemen duurzaamheids criteria op in hun leveringsvoorwaarden.		
Hugo Hooijer (Milieudefensie)	Het probleem is enigszins bekend, mogelijke oplossingen niet. Als consumenten bekend zijn met problematiek is een groot deel bereid meer te betalen.			
Cornel Boere (Agrifirm)	Consumenten linken onduurzame soja vooral aan kap van de Amazone. Het is belangrijk te luisteren naar de consument. Maar nog belangrijker dat iets toepasbaar en betaalbaar is.	Voor retailers is het moeilijk iets met branding te doen in het geval van soja. Dit omdat het een verborgen grondstof is. Het zit niet al.s ingrediënt in zuivel, maar speelt wel een grote rol. Voor retailers is dit moeilijk te vertalen naar de consument.	Belangrijk is zorgen dat het veevoer betaalbaar blijft voor de veehouder.	Onder veehouders is geen voorkeur voor duurzaam veevoer. Het gaat om technisch goed resultaat voor een betaalbare prijs. Dat ligt vooral aan kleine marges op zuivel.
Gert van der Bijl (Solidaridad)	Vooral kap Amazone bekend. Weinig mensen verbinden soja met zuivel of vlees.	Lastig om duurzame soja te communiceren naar consumenten. Verborgen grondstof. FrieslandCampina doet veel aan duurzame soja		Vaak niet mogelijk om te kiezen voor duurzamere variant veevoer. Aandeel voer in

	Lastig dat veel grondstoffen niet zichtbaar zijn. 10-20% betaald meer voor duurzaam prod. Duurzaamheid is niet het doorslaggevende aankoop argument (kwaliteit of prijs). Consumenten verwachten dat de leverancier zorgt voor een deugend (duurzaam) product.	maar communiceert weinig. Moeten hun leveranciers verplichten duurzame producten te leveren. Lettenvaak erg op de kleintjes. 'Geen gezeur' van MO's is voor supermarkten een belangrijke prikkel. Nemen steeds meer uit zichzelf duurzame maatregelen.		kosten erg hoog. Verantwoordelijkheid ligt bij voer producent. Die moet duurzaam product leveren voor een betaalbare prijs.
Hugo Byrnes (Ahold)	Er is bezorgdheid onder kleine groep consumenten. Veel consumenten gaan ervan uit dat de supermarkt alles regelt. Voorkeur merkbaar aan populariteit bepaalde keurmerken (Puur en Eerlijk, MSC). Groot verschil tussen producten. Soja speelt minder, verborgen grondstof wat ergens in de keten gebruikt wordt.	Per product kijken wat beter kan. Vooral bij eigen merk producten. Verduurzaming mag niet ten koste gaan van kwaliteit. Mag alleen duurder zijn als consument bereid is te betalen. Puur en Eerlijk is simpele manier om te communiceren met consument.		

Appendix D – Media analyse

A small selection of the memo's of newspaper articles with corresponding codes is presented in this appendix.

Economic, sustainability
LEI: DALENDE MELKPRIJS SCHAADT DUURZAAM IMAGO
2005 - According to research of the agriculture economic institute worse economic circumstances can have a negative effect on the sustainable image of the sector.

Grazing
MANIFEST KOE ZOEKT WEI VOOR BEWEIDING
2005 - The animal projection society (Dierenbescherming) in cooperation with other environmental organizations presents a manifest to gain attention for grazing of dairy cows. They are afraid dairy farming is going to be 'bio-industrial'. They state that keeping inside year round of cows is worse for animal welfare and health of cows. They presented this manifest to the government, supermarkets, retailers and dairy farmers.

Sustainable Energy
'MELKVEEHOUDER PRIMA ENERGIELEVERANCIER'
2006 - Courage expects that the dairy farming sector can become a large scale supplier of sustainable energy. This can be an opportunity for the sector to become multi-supplier of primary life necessities.

Up-scaling
Melkveehouder melkt straks 1000 koeien
2006 - It is expected that due to trends like liberalization dairy farmers have to get a sideline (camping, care) or grow. In a project of Courage (cowmunity) there is done a pilot study with such large farms. Animal welfare and transparency are very important in this project. A so called 'comfort-class' stable will be developed to guarantee this.

Diseases
FRIESLAND FOODS VERWACHT DYNAMISCHE DISCUSSIE OVER DIERZIEKTEAANPAK
2006 - Friesland foods, a dairy processing company, puts animal health high on its agenda. According to Friesland foods there is no commitment for a national program to fight animal diseases. Therefore the company thinks of a bonus on the milk price for farmers that are free from para-TBC or salmonella.

Quality products, Grazing
'ANONIMITEIT DOORBREKEN'
2006 - Dairy companies try to find out if consumers are willing to pay extra for dairy products with added value. This can be products with health claims, like omega-3 milk, or milk from Dutch grazing cows. From this research it becomes clear that Dutch consumers do not have much knowledge about their dairy products. Two third doesn't know were their milk comes from. However, 70% of Dutch consumers state that they are willing to pay extra for milk from grazing cows. This implies that the dairy sector should differentiate the milk stream. People are willing to pay more if it is clear for what.

Grazing
TELOORGANG WEIDEGANG
2006 – According to research of CLM by 2016 57-61% of dairy cows is kept inside year round. De party for animals (partij voor de dieren) and awake animal (wakker dier) see this as a reason to sound the alarm bells for the dairy sector. Animal welfare is considered increasingly important by society.