

AGRICULTURE IN THE NETHERLANDS, KNOWING THE RULES, RULING THE KNOWLEDGE

IN THREE REGIMES: AGRICULTURAL SCIENCE, FARMING AND VOCATIONAL EDUCATION

Report: Msc Thesis

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Date: August 22nd, 2018

ABSTRACT

This study provides an overview of the rules (in the broad sense of the word) which are present in three regimes related to agriculture in The Netherlands: the vocational education regime, the production regime and the agricultural science regime. Assessing rules in each regime according to the three types: normative rules, regulative rules and socio-cognitive rules, uncovered some stabilizing mechanisms. In this study a strong emphasis is on the role and different types of knowledge and knowledge creation, diffusion and use. The findings show that different epistemic cultures and perceptions of what is legitimate knowledge and how to create knowledge should not be underestimated as an influence and challenge in change processes in agriculture.

Summary

In the Netherlands we encountered an increase in water pollution and loss of biodiversity. The Broad Wealth Monitor of the Central Statistics Office (CBS, 2018) shows 'natural capital' went down drastically in The Netherlands, especially the indicators 'water-quality' and 'biodiversity' decreased in 2017 (CBS, 2018). Since agriculture is an important *source* of water pollution and loss of biodiversity in The Netherlands Van Dijk et al. (2018) state that a transition is needed to reach harmony again with nature, the environment and the landscape. Moreover, they indicate transformation-failure caused by the absence of appropriate and effective regulations in agriculture in the Netherlands. While they mostly talk about *regulative rules*, the study at hand investigated three types of change obstructing rules: *Regulative*, *socio-cognitive* and *normative rules*. Participatory research, semi-structured interviews with stakeholders from the different regimes and desk-research was carried out to answer the main research question:

How do stabilizing rules in the vocational education, agricultural production and science regimes obstruct change toward more Nature Inclusive Agriculture in The Netherlands and how do they relate to epistemic cultures?

A two-layered analytical framework was used to analyze the data, consisting of two main concepts: The three types of rules of Scott (and their stabilizing effects on regimes) and the epistemic cultures. As shown in the figure below, the relations between the three types of rules will be analyzed.

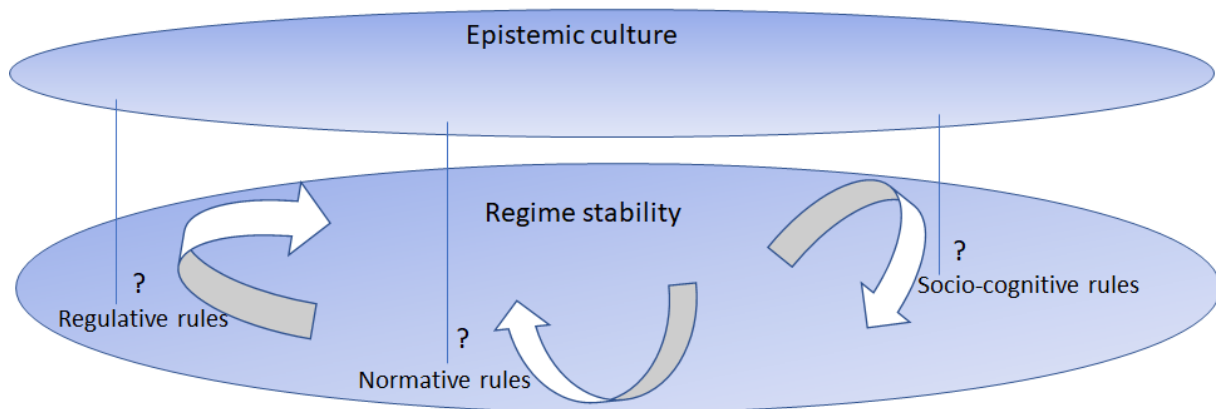


Figure 1 Analytical framework to study regime stability

This study provides an overview of the rules (in the broad sense of the word) which are present in three regimes related to agriculture in The Netherlands: the vocational education regime, the production regime and the agricultural science regime. Assessing rules in each regime according to the three types: normative rules, regulative rules and socio-cognitive rules, uncovered some stabilizing mechanisms. In this study a strong emphasis is on the role and different types of knowledge and knowledge creation, diffusion and use. These can

be studied as elements of distinct *epistemic cultures*. The concept *epistemic culture* is used to analyze the data and trace potential relations between these cultures and stabilizing regime rules. The findings of the study at hand show the importance of recognizing distinct epistemic cultures and their stabilizing effects on interlinked regimes in the agricultural system in the Netherlands, i.e.: perceptions of which knowledge is legitimate, which knowledge is relevant and how to create and validate knowledge.

ACKNOWLEDGEMENTS

In the first place I would like to thank my supervisor, Barbara van Mierlo, for her guidance and optimism. This support meant a lot for me. I am grateful for the way she helped me to structure the thoughts (in my chaotic mind) and the positive way she phrased comments. Without her this process and the end product would not have been the same. I want to thank the interviewees who were willing to share their insights, experience and ideas with me. The conversations with them were the part of the research I enjoyed most. Another very interesting part of this research was the time I spend with farmers, doing participatory research. I am grateful to the Foundation for Natural Livestock Farming, for welcoming me in their group of farmers and veterinarians in the course of the past two years during various meetings, a conference and a trip to India. Especially being surrounded by farmers, gave me insights which were crucial for my understanding of their life worlds. My special thanks go to the head of the Foundation Livestock Farming, Katrien van't Hooft. Talking with her was always a great pleasure and motivation, thanks to her warm character, critical view and unstoppable ambition to improve livestock farming in a natural way.

I am grateful to my wonderful, caring friends and housemates who supported me by being present in my live and giving me a feeling of belonging after days of getting lost in the process of this thesis. Thank you for all the delicious dinners, I will make up for that, when this is finished. Marjolein, thank you for your solidarity, spending your day with me pretending you were working as well. My family, I want to thank for their patience, understanding and tolerance, even when I was tensed because of the thesis, your love empowers me. Last but not least, my gratitude goes to Jacob for proofreading my concept thesis, in times when this still appeared to be a crossword puzzle, with your help I found back some logics and managed to structure it into what it now is. You made me enjoy working on my thesis again and gave me back my confidence.

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ABBREVIATIONS

AOC =	Agrarisch Opleidingscentrum (EN: Centre for Agricultural Education)
CBS =	Centraal Bureau voor de Statistiek (EN: Central Statistics Office)
GKC =	Groene Kennis Cooperatie (EN: Green Knowledge Cooperation)
IPES-Food =	International Panel of Experts on Sustainable Food Systems
MT =	Management Team
NIA =	Nature Inclusive Agriculture
NLF =	Foundation for Natural Livestock Farming
TDU =	Institute for Trans-Disciplinary Health Sciences and Technology
UU =	Utrecht University
WUR =	Wageningen University & Research

1. INTRODUCTION

1.1 PROBLEM STATEMENT AND RESEARCH OBJECTIVE

In the Netherlands we encountered an increase in water pollution and loss of biodiversity. The Broad Wealth Monitor of the Central Statistics Office (CBS, 2018) shows 'natural capital' went down drastically in The Netherlands as compared to other EU countries (appendix II). Especially the 'natural capital' indicators 'water-quality' and 'biodiversity' decreased in 2017 (CBS, 2018). An illustrative and serious result is the decline in pollinators: *"pollinator declines can result in loss of pollination services which have important negative ecological and economic impacts that could significantly affect the maintenance of wild plant diversity, wider ecosystem stability, crop production, food security and human welfare"* Potts et al. (2010, pp.345). Agriculture is mentioned as a field affected by the negative results, but above all is an important *source* of water pollution and loss of biodiversity in The Netherlands (Rijksoverheid, 2016). Accordingly, Van Dijk et al. (2018) state that agriculture has reached its limits in the Netherlands and a transition is needed to reach harmony again with nature, the environment and the landscape. Moreover, they indicate transformation-failure (Weber en Rohrer, 2012) is caused by the absence of appropriate and effective regulations in agriculture in the Netherlands.

Van Dijk et al. (2018) suggest it is clear by now *why* a transition to nature inclusive agriculture is needed, yet attention is required for *how* to achieve this. They suggest that transition failure results from regulative rules in the agricultural production regime are not enabling transition. While the study at hand will also investigate the stabilization related to two other types of rule: the socio-cognitive and normative rules (next to the regulative rules). The use of the concepts rules and regimes were in this study was inspired by Kemp, Schot & Hoogma (1998), who use the concept of 'rules' to explain the pre-structured context in which actors tend to look for certain ways of problem-solving rather than others and 'rules' as the governing elements which determine 'the privileged way forward' developments in a regime.

The three types of rules will be studied in three regimes: the agricultural production, vocational education and science regime. Besides the stabilizing effect of the above mentioned rules on the regimes, this study will analyse the stabilizing effect of epistemic cultures in and among the regimes.

These epistemic cultures concern the role of and approach to knowledge and knowledge creation. A transition in the agricultural system requires different types of knowledge and knowledge creation and diffusion, including farmers' knowledge (IPES, 2016; De Nooy-van Tol, 2013; Wiskerke & Van der Ploeg, 2004). Leeuwis (2000) also indicated the importance of developing knowledge of a different nature than the knowledge required for conventional agricultural practices. Moreover, Wiskerke & Van der Ploeg (2004, pp.78-79) highlight the importance of contextualised farmer's knowledge in sustainable innovations in agriculture. They explain that societal pressure to reorient agriculture to more sustainable production, since the 1970's led to the enlarged interest in farmers' knowledge. This had multiple reasons, such as: *"the discovery that such knowledge is indispensable in view of the need to re-balance growth factors, increased recognition of the*

significance of diversity in agriculture, and changed perceptions about the nature of innovations and innovation processes.” (Wiskerke & van der Ploeg, 2004, p.94). Moreover, they mention the knowledge of farmers as an important source for understanding the possibilities of ecosystem management and transformation (idem, p.95). So, for a transition to come about, farmers’ knowledge (with its features distinct from scientific knowledge) can play an important role.

In this study, the concept ‘regime’ will be used to study ‘knowledge’, an approach inspired by Hobart’s (1993). He explained that a regime prescribes a specific distribution of knowledge and ignorance, which indicates the ‘privileged way forward’ (Hobart, 1993). The study at hand assumes that regime actors’ anticipation of the ‘privileged way forward’ can have a stabilizing effect and thereby may obstruct changes required for ‘different ways forward’. Moreover, the study at hand suggests that the organisation of knowledge and knowledge creation, the distinct epistemic cultures of the regimes, could be bottleneck for transitions. In line with various scholars (e.g. Lieshout et. al. 2013, Wiskerke 2003, Erjavec & Erjavec 2009, Hobart, 1993) this study aims to analyse the predominance of developments serving the dominant perception of the ‘privileged way forward’ in the agricultural system. The domination of intensive agriculture embeds and legitimizes itself through a powerful dominant discourse amplified in research, policy-making and practices (Lieshout et al., 2013). According to Lieshout, Dewulf, Aarts and Termeer (2013), governmental policy makers in the Netherlands have continuously been framing issues in the way that ‘scale increase’ would be the solution for the Dutch agricultural sector, i.e. the ‘privileged way forward’. Nowadays the minister gives recognition to the need to make changes in the agricultural system, by measures under the term ‘Nature Inclusive Agriculture’ (explained in more detail in Appendix II). The main question in the study at hand therefore refers back to this term and the study will investigate how changes toward more Nature Inclusive Agriculture are obstructed.

1.2 RESEARCH QUESTIONS

The situation described above, caused me to pose the following research questions:

How do stabilizing rules in the vocational education, agricultural production and science regimes obstruct change toward more Nature Inclusive Agriculture in The Netherlands and how do they relate to epistemic cultures?

- Which change obstructing rules (cognitive, normative and regulative) are at play in the three regimes which are part of the agricultural system in the Netherlands?
- How do these rules relate to regime stability in the agricultural system?
- What is the role of knowledge and different epistemic cultures in the developments in the Dutch agricultural sector and how does it affect regime stability?

1.3 SCIENTIFIC RELEVANCE

As described above this work tests the approach suggested by Geels (2004) which aims to uncover stabilization in regimes by studying regime rules. So assuming this works, this will give insights in the actors' practices and their argumentation for doing what they do in terms of three types of rules, normative, socio-cognitive and regulative. Besides the sociological concept of 'rules', this study will explore the role of another concept originating from philosophy instead, 'epistemic cultures' (Knorr-Cetina, 1999). Both concepts will be tested as analytical tools in exploring the stability of regimes. Moreover, the study at hand aims to assess whether and how distinct epistemic cultures relate to the distinct types of rules of Scott (2008). Hereby exploring mutual reinforcement of change obstructing rules and epistemic culture's stabilizing effect on regimes.

1.4 SOCIETAL RELEVANCE

Research journalists Bouma & Marijnissen (2018) reported that farmers would like to change and become more sustainable, if only there would be clarity in the agricultural policies. In line with this, the International Panel of Experts on Sustainable Food Systems report (IPES-Food, 2016) underlines, complexity and interlinkages at the farm level are often not recognized in research, since researchers are trained in their own specific discipline. The authors of the IPES-Food report fear that this will keep reinforcing the same agricultural system by scientific publication supporting policies which build on the assumptions of the specific disciplinary knowledge in isolation: *"The compartmentalization in research, policy and farm industry structures is mutually reinforcing. The agricultural policies made in isolation depend on the knowledge emanating from the corresponding agricultural silo of the research world. Agricultural sector bodies are organized to convey this knowledge to farmers, who in turn rely on agricultural subsidies and other political support measures geared towards raising crop productivity and net production."* (IPES-Food, 2016). This study will be relevant, assuming that farmers would like to change, the rules and distinct epistemic cultures which obstruct these changes (directly or via policies) need to be uncovered.

1.4 STRUCTURE OF THIS THESIS

This thesis consists of five chapters. Chapter 1 introduces the research, first by presenting the problem statement and the research objective and then the research questions. This Chapter also sketches the scientific and societal relevance and the structure of this thesis. Chapter 2 gives an overview and explanation of the theoretical concepts that guide the study. Chapter 3 describes the research approach and the methods used for data collection and analysis. The result chapter, Chapter 4, consists of a separate section for each of the three regimes, 4.1 The production regime, 4.2 The Science regime and 4.3 The Vocational education regime. This Chapter aims to identify what is causing stability in the distinct regimes. The three sections in Chapter 4 each contain five subsections, first three on the distinct types of rules in the regime (1. Normative, 2. Regulative and 3. Socio-cognitive) followed by a summarizing section of these three rules and their interactions and finally a subsection in each regime-section addresses the distinct epistemic cultures of the regimes. The last chapter,

Chapter 5. consists of a conclusion in which the research questions are answered, a discussion of the research and its implications and reflections on the research with the help of existing literature. The last chapter closes with recommendations, based on both the societal and the scientific relevance of this research.

2. THEORETICAL FRAMEWORK

In this chapter, first the types of rules of Scott are described (2.1), then in section 2.2 the stabilizing effects these rules can have will be explained. Section 2.3 underlines the importance and significance of knowledge and epistemic cultures. This chapter concludes with an analytical framework

2.1 THE THREE TYPES OF RULES OF SCOTT SUPPORTING REGIMES

The concept rules will be core in determining regimes in the study at hand. To be more precise: The different kinds of rules distinguished by Scott (2008) into the three types of rules: regulative, normative and cognitive rules. According to Scott these three types of rules can be used to explain individual and collective behaviour in institutions and organisations, each rule type with their own basis for compliance. These compliance mechanisms per rule type, as well as the distinct logics and basis of legitimacy for each of the three kinds of rules are presented in table 1.

	Regulative	Normative	Cognitive
Examples	Formal rules, laws, sanctions, incentive structures, reward and cost structures, governance systems, power systems, protocols, standards, procedures	Values, norms, role expectations, authority systems, duty, codes of conduct	Priorities, problem agendas, beliefs, bodies of knowledge (paradigms), models of reality, categories, classifications, jargon/language, search heuristics
Basis of compliance	Expedience	Social obligation	Taken for granted
Mechanisms	Coercive (force, punishments)	Normative pressure (social sanctions such as 'shaming')	Mimetic, learning, imitation
Logic	Instrumentality (creating stability, 'rules of the game')	Appropriateness, becoming part of the group ('how we do things')	Orthodoxy (shared ideas, concepts)
Basis of legitimacy	Legally sanctioned	Morally governed	Culturally supported, conceptually correct

Table 1. The three types of rules and distinct emphasis (source: Scott, 1995 in Geels, 2004)

The *regulative, normative, and socio-cognitive rules* bring about processes which exhibit meaning-making and stabilizing properties in institutions (p.57 Scott 2008). The rules relate to arguments for (individual or collective) compliance with rules and prescriptions, possibly bringing about change obstructing effects. Scott (2008) suggests these arguments can be: *"because they are rewarded for doing so, because they believe that they are morally obligated to do so, or because they are following their conception of what reasonable others would do in the situation."* The arguments for compliance mentioned in his example, each relate to a particular rule type:

Argument for compliance	Related rule type
being rewarded for doing so	Regulative
believe to be morally obligated to do so	Normative
conception of what reasonable others would do	Socio-cognitive

Table 2. examples of arguments for compliance and related rule type according to Scott (2008)

Regulative: Regulative aspects of institutions are recognized and underscored by all scholars and in the discipline of economics for regulative aspects are considered to be most determining for institutions. Regulative aspects can have various shapes and means of compliance, they can be coercive and restricting, but can also be enabling, and positive incentives (Scott, 2008). The regulative rules include incentive structure, regulations and governance systems.

Socio-cognitive: This rule type stresses the importance of a common framework of meanings which develops as a socially mediated construction. Features that feed this co-creation of common understanding are for example shared attitudes and common values (e.g., Hofstede 1984) as well as shared problem definition and belief systems, routines and things which are taken for granted. Compliance occurs for the comfort of belonging and doing what one is supposed to do, what others perceive to be the right thing, correct and sound. Not complying with socio-cognitive rules might bring the risk of losing connectedness, feeling less competent or disoriented. (Scott, 2008).

Normative: A stable social order, according to scholars from the normative perspective, is based on shared norms and values. Normative systems are based on a logic of “appropriateness” and determine responsibilities, rights, duties and roles. *Roles* in this sense is to be understood as: *conceptions of appropriate goals and activities for particular individuals or specified social positions* (Scott, 2008 p.64). Normative systems have a stabilising effect and can restrict the social behaviour of people, but can be empowering as well. Scholars in sociology argue that socialisation processes serve the internalisation of these rules into the values, norms, rights, responsibilities and expectations of people (Geels, 2004, p.904). The three types of rules are not only linked within regimes, but also between regimes (Geels, 2004).

In the study at hand the concept of ‘rules’ is used since these rules of Scott (1995) enable a clear distinction, and thereby a thorough analysis, of what causes stabilization in the regimes by distinguishing rules types.

2.2 STABILIZATION IN THE REGIMES

As explained in the introduction stabilization can result from change obstructing rules. This section will explain that particular rules can have a strong stabilizing effect in a regime, or could even be change obstructive.

In a stable dominant regime groups of actors align to each other by means of rules, thereby contributing to the stability of existing systems (Geels, 2004). The mechanisms maintaining the stability or dynamic stability are specified by Geels (2004, p.910) in relation to regime rules. Geels (2004) views rules and regimes as the deep grammar of socio-technical systems, providing stability by guiding perceptions and actions. Rules tend to be reproduced and reproduction of rules favourable for the existing socio-technical system will contribute to its stability, amongst others this ‘rules’ include: institutional arrangements, regulations, contracts, cognitive regimes, core competences and capabilities (Geels, 2004). The stability that Geels is referring to, is not absolute, but dynamic stability, innovation still occurs but is of an incremental nature (no radical change). Other scholars discussing stabilizing mechanisms explain stability as resulting from the a ‘dominant design’. The

existence of a 'dominant design' is an important feature in studying innovation processes since the 1970's (Kemp et al, 1998 referring to the publication of Abernathy & Utterback, 'Patterns of Industrial Innovation', 1978). They indicate that dominant designs and related dominant regimes bring about various stabilizing mechanisms which slow down the introduction of new, more sustainable, technologies (Kemp et al., 1998). Incumbent technologies have advantage over new technologies, even if they are not necessarily better, but because of increasing rates of return, when technologies are widely used and diffused (Klitkou, 2015). Various processes together result in stable incumbent regimes, favouring incremental- over radical innovations (Klitkou, 2015). Unruh (2002) cites John Maynard Keynes: *"The difficulty lies, not with the new ideas, but in escaping the old ones"*. In line with Geels (2004) this study aims to understand stabilisation in dynamic developments, rather than inertia or complete stability (the latter are more linked with the lock-in concept, while the study at hand uses the regime rules as core concept). Dynamic stability is approached by Geels (2004) with the three types of rules of Scott. The dynamic nature of the three regimes under study, the concept of stabilizing mechanisms linked to the rules, is more applicable than the lock-in concept. The literature on lock-ins is nevertheless useful for it helps to explain developments in regimes, which in this study may not result in lock-ins, but in more dynamic stability. Geels (2004, p.910) proposed to explain stabilisation by three different kinds of rules, see table 2. The lock-in mechanisms of Unruh, which may be at play in a lesser extend but still relevant, since they illustrate extreme stabilizing behaviour a rule can have, are therefore categorized per rule-type in the table below.

Three kinds of rules and related stabilizing mechanisms		
Cognitive rules	Normative rules	Regulative rules
Cumulative learning process, building upon existing knowledge. Investments in competences, skills and knowledge build up in time, radical changes would destroy investments. Shared believe in problem solving by existing system, fitting users' preferences. (Geels, 2004)	Mutual role perceptions stabilize networks. Ideas of proper behaviour, including which issues should and should <i>not</i> be raised. What one ought to talk about or do research on and what <i>not</i> . (Geels, 2004)	Technical standards or subsidies which favour existing technologies. Legally binding contracts. Government regulations structuring economic processes (Geels, 2004)
Organisational lock-ins: Routines, training, departmentalization, customer-supplier relations (Unruh, 2000; 2002)	Societal lock-ins: System socialization, adaptation of preferences and expectations (Unruh, 2000; 2002)	Institutional lock-ins: Government policy intervention, legal frameworks, departments/ministries (Unruh, 2000; 2002)

Table 3. Three kinds of rules and related stabilizing mechanisms

In and among these three rule-sets, rules exist and interact and their embeddedness may create a bottleneck for transitions in institutions (Scott, 2008). The study at hand abstracts the different types of rules and where relevant will reflect on the interlinkage of different rules. The relevance of these interlinkages was emphasised by Giddens (1984) especially explaining how ‘regulative rules’ need support from ‘normative rules’ for gaining legitimacy and vice versa for supporting normative rules with sanctioning power and or incentives (Giddens, 1984). Next to the interlinkage of normative and regulative rules, Suchman links legitimacy to shared socio-cognitive rules *“Legitimacy is a generalized perception or assumption that the actions of an entity are desirable, proper, or appreciated within some socially constructed system of norms, values, beliefs, and definitions”* Suchman (1995, 574). Scott (1995) relates legitimacy to the three types of rules by stating from an institutional perspective legitimacy is a condition in which consonance is perceived with relevant: rules and laws (regulative), normative support and alignment with cultural cognitive frameworks. These three categories resemble the three types of rules of Scott.

This study aims to trace the dynamics that embody a stability, by analysing the existence of the three ‘types of rules’ of Scott (1995) and the stabilizing mechanism they cause in terms of Geels (2004).

2.3 EPISTEMIC CULTURES AND THE ROLE OF KNOWLEDGE

The regulative, normative, and socio-cognitive rules not only bring about stabilization, but also meaning making properties (Scott, 2008 p.57). This meaning making is an important feature of epistemic cultures as well and is assessed in the regimes in the study at hand. The epistemic cultures will be used to analyse the data and trace potential relations between these cultures and stabilizing regime rules. This section gives an overview of distinct epistemic cultures typical for the regimes under study.

Knorr-Cetina (1999) describes epistemic cultures, as determining *how we know what we know*, shaped by historical coincidence, affinity and necessity. The broader concept of epistemology not only refers to the nature of knowledge, but also to beliefs and questions around the justification of knowledge and beliefs or, as Steup (1996) proposes, the question: *“what makes justified beliefs justified?”*. Leeuwis (2004) describes knowledge as the basic means to which we understand and give meaning to the world around us. Wisdom, he says, is about selection of appropriate knowledge in a given situation, the relevant schemes of interpretation, and the use of this in choosing whether and how to act (Leeuwis, 2004 p.94-95). Knowledge can be tacit (practical) and explicit (discursive). Explicit, or as Giddens (1984 p374) calls it ‘discursive’, knowledge can partly be made explicit in language. It is a type of knowledge people know consciously and can write or talk about. Scientific knowledge by definition is explicit knowledge (because it can be written down, presented or consciously studied). In farming there is a lot of practical knowledge according to Leeuwis (2004 p97); many farmers *know* the right moment to sow or how to use a tractor on a particular soil type, even if they cannot explain exactly the underlying physical or natural principles in words.

While knowledge may seem to reduce ignorance, when studying the creation, diffusion and use of knowledge more closely there is an important link between knowledge and ignorance (Leeuwis, 2004). In this respect, Leeuwis (2004) refers to the work of Winograd & Flores (1986) and Long (1987:5) explaining that different schools of thoughts and views give insides about reality, but also *exclude* a range of *other perspectives*. Wiskerke and Van der Ploeg (2004) cite Hobart (1993) that a regime always implies a specific distribution of knowledge and ignorance, dominated by the knowledge which serves the 'privileged way forward', while alternative knowledge stays in the shade or is not often consulted nor developed in the regime. Different groups and cultures have not only different knowledge and perceptions of the world, but also different ideas on how to make or validate knowledge (Leeuwis, 2004). With the help of Leeuwis, (2004, p.98-116) I will investigate the different epistemic cultures (theories of knowing) in the three regimes.

Various scholars (Leeuwis, 2004; Wiskerke & van der Ploeg, 2004; Stuiver et al., 2004; Scott, 2008; Hobart, 1993) emphasize the importance of farmer's knowledge in bringing about sustainable innovations in agriculture (while according to Leeuwis (2004 p.106), many natural scientists tend to believe that their knowledge is universal and generally applicable and therefor superior to farmers' knowledge). Stuiver et al. (2004) explain the importance of farmers' knowledge, for it is a valuable source for understanding ecosystems and the ability to transform them. They state that this has been overlooked for too long: *"the focus on the possibility of using and enhancing farmers' knowledge has remained hidden within the context of the prevailing dominant scientific knowledge system"* (Stuiver et al., 2004 p95).

Leeuwis takes the stance that natural scientists should realize that all knowledge is contextual (even when the laboratory or scientific community are the context). Moreover he underlines that scientific research is not neutral, but serves specific goals and interests, research conclusions are linked to the research questions, *"These questions and problem definitions, of course, are never neutral: they are asked and/or funded by specific stakeholders, for a specific reason, and in connection with specific goals and interests"* (Leeuwis, 2004, p.107), one stakeholder may be in a much better position to influence the research agenda compared to another stakeholder. This is an exemplary statement to show how the working of the three types of rules in relation to the epistemic cultures: *normative rules* are at play in setting the research agenda (Leeuwis calls them the goals and interests), this is regulated by the funding structure (*regulative rules*) and meanwhile the *socio-cognitive* rules safeguard these habits and take for granted the partnerships as the usual business. It is essential to question routines and regular patterns of thinking and acting, since they might impede change processes in institutions (Van Mierlo et al., 2010, p.2). Above all, these dominant patterns of thinking and acting hinder the processes of transforming new ideas into action in a variety of ways: *Via anticipating external „given“ institutional constraints by project managers and participants; Via project managers sticking to the classic roles of researcher and extension provider; Via project managers anticipating and experiencing negative responses of potential participants; and via participating actors anticipating and experiencing negative responses from their organization or constituency."* (Van Mierlo et al., 2010, p2). Corcoran, Weakland & Wals (2017) highlight the interactive agency of the natural world with the human species. They underline the need to integrate that –

again- in Western ontology and epistemology. Especially in agriculture this interactive agency of the natural world with the human species is evident, this deserves a place in the education, science, policies and production practises related to agriculture. This study aims to uncover dominant patterns of thinking and acting in the three regimes (agriculture, science and vocational education) when it comes to knowledge creation, validation, diffusion and use.

2.4 ANALYTICAL FRAMEWORK

For a in-depth analysis of the research data, the analytical framework consists of two main concepts: The three types of rules of Scott (and their stabilizing effects on regimes) and the epistemic cultures.

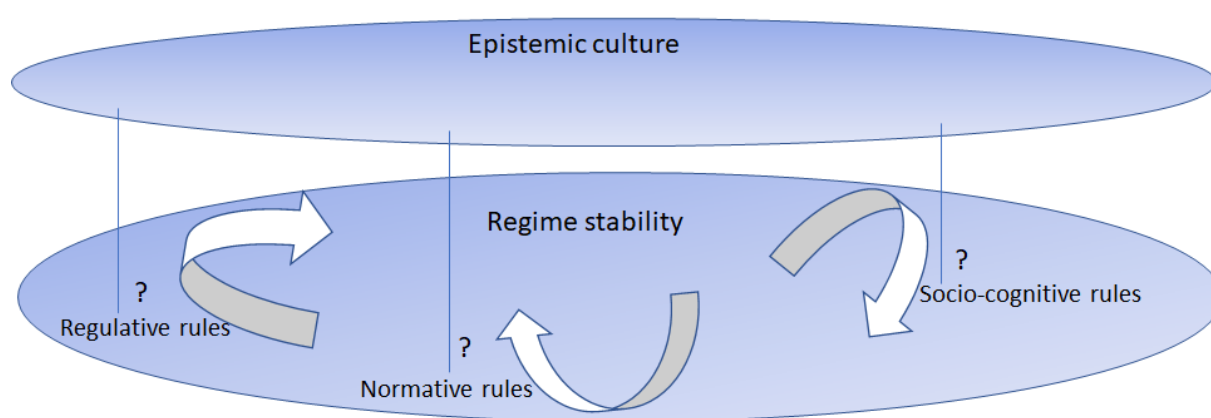


Figure 1 Analytical framework to study regime stability

The figure above presents the analytical frame per regime existing of the two conceptual layers: stabilizing rules and epistemic culture. This framework will be used to analyse each of the three regimes, the vocational education regime, the scientific regime and the agricultural production regime.

3. MATERIAL AND METHODS

In this section the data collection is specified including a description of the methods of obtaining this data and the used materials. This is followed by a section on data analysis and it concludes with the limitations of this study. In the study at hand I look at the creation, use and diffusion of knowledge in the agricultural, vocational education and the science regime.

3.1 DATA COLLECTION

To answer the research question, participatory research and semi-structured interviews with stakeholders from the different regimes was carried out, completed with desk-research.

The selection of interviewees was based on the criteria that they were working on changes. Because they were most likely to have had confrontations at the edges of the regime, indicating the change obstructing rules. For each regime at least one interviewee was selected who was not focussed on making changes. The research sites were selected for the same reason, they were the places where actors came together with the objective to bring about changes. Research site for studying the agricultural production regime were the meetings of Natural Livestock Farming. In the case of the vocational education regime, this were meetings of the AOC consortium on sustainability and the teacher development team on sustainability. For the science regime two events about the Future of Agriculture and a symposium on Resilience were the sites in which change obstructing rules were studied. Appendix IV provides a detailed list of interviewees and participatory research sites. The data collection was completed with desk research, to allow for triangulation (Bogdan & Biklen, 2006).

The interviews and observations were focused on: - actors perception of what change was desirable in the agricultural system, - actor perceptions of what was hampering change processes at the moment and - which knowledge or information was considered legitimate and useful in their own profession and in their interactions with other stakeholders.

3.2 DATA ANALYSIS

Findings were coded, sorted and analysed in Atlas.ti in two distinct phases. First, I coded the texts with codes representing elements of the three rule types of Scott, such as: believe systems, problem definition, bodies of knowledge, knowledge at farm level and regulations. Secondly, to create a more solid structure in my data, the output of Atlas.ti (labelled with codes) was sorted in the three distinct rule types for each of the three regimes. If a piece of text was explicitly referring to the interaction of regimes, I categorized it in a separate section, called after the interacting regimes.

The overview resulting of the three types of rules in the three regimes, was read precisely with the different kinds of stabilizing mechanism set out in table 3. in mind, to trace whether my own data included similar stabilizing rules.

Finally data was analysed by creating an overview of co-occurrence of codes in Atlas.ti (Appendix IV) and where co-occurrence was high, I looked for the relation between the two codes.

For analysis of the epistemic cultures, and overview was created in Atlas.ti based on codes used in the first round of coding, such as 'knowledge in practice at farm', 'specialist/generalist' and 'bodies of knowledge/beliefs'. This overview was used to provide examples which indicate the features of the distinct epistemic cultures.

3.3 RESEARCH LIMITATIONS

It is important to recognize the role and bias of the researcher, since the content of the interviews are determined and controlled by the researcher him- or herself. It is essential to view the interviews as examples of social interactions in which the interviewees create an interactive frame with the researcher. A consequence of this is that the data from the interviews is influenced by certain normative expectations and the end product of the conversation was made jointly by both the interviewer and the interviewee. My bias is my critical view on Wageningen UR and her ties with unsustainable industries, this view results from several occasions: the mixed interests of the University which I was informed about by University staff during my time in the central participation council of the WUR. As well as for example the fact that the Executive Board invited climate 'optimist' Matt Ridley as keynote speaker to open the academic year 2017-2018. Giving him such a stage to speak -with no opportunity for debate- was believed to be a controversial choice as many scientists already counter argued the 'optimistic' statements by which he downplayed the severity of climate change (as referred to in an alarm-letter signed by 23 WUR scientists[1]). Nevertheless, I tried to not be too biased against Wageningen UR in general, although the focus of this study is on stabilizing regimes (not on transitions or academic activism).

[1] <https://centreforspaceplacesociety.files.wordpress.com/2017/08/letter-ridley-opening-academic-year-2017-2018.pdf>

4. RESULTS

This chapter provides an overview of the distinct type of rules per regime, especially highlighting change obstructing rules and the resulting stabilizing mechanisms observed in the data. Per regime a section is added to summarize the most important rules and -if applicable- their interlinkages. Each regime section will end with a section which gives insight in the epistemic culture which dominates the regime. In the conclusion I will address how these epistemic cultures connect with the stabilizing rules.

4.1 THE AGRICULTURAL PRODUCTION REGIME

NORMATIVE RULES IN THE AGRICULTURAL PRODUCTION REGIME

If it comes to change obstructing rules at the normative level in the agricultural production regime, farmers' perception of desired changes was discussed. As the head of the Foundation for Natural Livestock Farming (who worked as a veterinarian for over 30 years) told me, farmers often perceive the term 'sustainable agriculture' as threatening (this was confirmed by several actors in the participatory research). She advised me to avoid using this term and speak of natural- or nature inclusive agriculture instead. Interviewees explained me that this negative connotation of 'sustainability' results from the fact that this term has been used by policymakers to impose restrictions and regulations on farmers. Using this term in efforts to make changes in collaboration with farmers, leads to resistance and thereby obstruct changes (as the observations in this study confirm).

The interviewed farmers who started with nature inclusive agriculture in the Netherlands often focus on creating habitats for pasture-birds. According to the interviewed professor Nature Inclusive Agriculture there is subsidy available for this, but those farmers often feel that they are looked down upon by surrounding farmers in the current regime: *"they find support from each other, while other colleagues often look down at them like 'those meadow bird farmers' and they perceive that network to be really important to indicate the urgency to make changes"*. This negative reaction of colleague farmers points out another normative rule which is not favourable for changes toward Nature Inclusive Agriculture.

The above mentioned finding opposes the claim made by Bouma and Marijnissen (2008) that over eighty percent of the farmers would like to farm more nature friendly and almost half of the farmers strive to make the transition to sustainable agriculture within ten years, but they feel challenged by a lack of clarity in agricultural policies. This claim was discussed in the Natural Livestock Farming WhatsApp group. One of the responses was that this is based on 2200 farmers who responded to a questionnaire, while 12800 did not respond and those 2200 wanted to show their good intentions. Another reaction from a young dairy farmer was, although she believes the majority of livestock farmers would like to work more sustainably and is working toward this, *"it may seem interesting for individual farmers to enter this niche market, like the question is posed 'what will you do at your farm?' but for the sector as a whole this is not a solutions, because where will the bulk*

production go?”. She adds “we have to stay realistic especially about the speed of the transition at farms and the risk that mass production will move to less sustainable places eventually it really needs to improve and not only be ‘not in my backyard’”. This normative rule indicates a farmers consideration of the side effects of a rapid transition in Dutch agriculture in the context of the globalized food market.

Interviewees (including people who worked for Wageningen UR) say that Wageningen University and Research centre (WUR) used to have the farmers as their target group, they worked for farmers, but this has shifted along with the funding of the research and currently the WUR is targeting agro-business and industrial parties who are in a position that they can fund research. This influences the selection criteria for scientists for which research questions they work on and thereby which change they support, facilitate or enable. Meanwhile it makes farmers sceptical about the good-will of the scientific community towards them. Both points create stabilizing mechanisms in the sense that WUR keeps working for dominant regime actors which have no interest in radical change and farmers do not address their practical problems to the WUR while collaboration could help to find sustainable solutions for farmers.

While talking with my interviewees about sustainable agriculture (throughout this research) it was often painfully clear that farmers felt the term ‘sustainable agriculture’ was favoured by consumers and civil society who did –according to the farmers- not even know what agriculture was like in practice. *“The blame is often put at the farmer ‘the farmer is doing wrong and does not have meadow birds anymore and he does it badly’, but in many cases he is also stuck in his own situation, yes, you are also limited within your company by what the possibilities are, so it is always very easy to say ‘you do it wrong or it has to be completely different’, but you have to come up with workable solutions so that a farmer can also earn a good income and that is a bit of a challenge, because it is for a reason that farmers have always become bigger, because the milk price is not very high, the margin is not big, so they do not seek specialization but, they grow bigger and bigger, they go more and more one way and that diversity then disappears a bit so that is a shame”*. This interviewee points at the problem with disconnectedness with farmers and the other groups of actors in society and the blame that is put on the farmers. The International Panel of Experts on Sustainable Food systems reported this as a global trend *“consumers have become increasingly disconnected and disengaged from food systems. As a result, the fact that food choices have implications for farming systems has become less obvious and less important in the hierarchy of daily concerns.”* (IPES-Food, 2016).

REGULATIVE RULES IN THE AGRICULTURAL REGIME

Regarding the regulative rules interviewees mostly pointed out that regulations were setting generalized standards, rules and sanctions on not generalizable factors of running a farm (since each farm and each plot of land is different). Interviewees referred to the mandatory injection of manure into the soils since 1994¹. A rule generally applied to all farmers in The Netherlands, facing resistance for its damaging effect at local level, because the injection damages soil life, structure and soil organisms. Farmers have been openly contesting the

¹ This regulations on manure injection, mandatory in the Netherlands only, facilitated an exception for farmers in the Netherlands from the EU criteria for ammonia and methane emission per acre.

mandatory injection regulation from the very beginning. One of the interviewees told me: *"Farmers on peat soils, said "are you out of your mind? I will not work the soil with such heavy machinery to inject the slurry, that would completely destroy the soil!" "there have been court cases on this, but still the slurry had to be injected".* Still it took over 20 years before the government is coming back at this regulation and made exceptions to it (Foodlog, 2008. 1 & 2) . A former dairy farmer, now broker in agricultural real estate, who visits many farms, explains the striking results of the manure-injection regulations and a farmers' perception of manure as a 'good product': *"If your animals eat healthy, the slurry is a good product, especially in organic agriculture, with pain in their hearts the farmers used the slurry-injection-machine which turned their soils completely upside down, "I was working to improve this soil for so many years" now the soil-life is completely damaged"*. One of the interviewees (who worked in the management of Wageningen UR, currently director of a cluster of AOCs) said that such regulations are made by people who stand too far from agricultural practice. The problem he underlined is the divide between agricultural policy-makers, often educated at Wageningen University, and farmers often educated at AOCs (Agricultural Schools for Vocational Education). The findings point out that the regulations in agriculture are not always in line with what farmers believe to be good at their farms. They have in common: they are too generalized, lack adjustment to different contexts, natural and social environments, not considering the complexity and context at farm level (mentioned by several interviewees). The stabilizing mechanism at work here is the mechanism of policy making based on assumptions which are far from the farmers' practice, which leads to resistance

As mentioned in the section above (on the normative rule type), veterinarians are more reluctant to use natural alternatives instead of pharmaceutical ones. This can be linked to the findings in the regulative rule type: Regulations on the health claims on natural products, made the promotion of these products, as substitutes for, or in addition to, pharmaceutical medicines harder. Mr van der Kooij, retailer of farm equipment and animal feed: *"Indeed there is an obstacle in the regulations for natural products, it is not allowed to make claims on packaging about the beneficial effects (until there is abundant scientific evidence) and besides, there still is a lot of resistance on the part of the veterinarians"*. Another veterinarian added that there were no corporate incentives (for industrial companies), no business model behind the promotion of natural treatments and that was why attention for it rapidly decreased, also in academia and, which in turn led to lack of scientific evidence, which makes it again harder to legitimize.

A special professor Nature Inclusive Agriculture emphasised currently, measures related to Nature Inclusive Agriculture are all optional and there is no regulative pressure. This could enhance the stability that exists in the agricultural production regime, he suggests, because farmers who do not prioritize a more natural farming approach do not encounter sanctions to change their practices neither. Moreover he expressed his disappointment in the European committee, who is not using their sanctioning power: *"when the Netherlands is not doing enough to protect endangered bird-species (like the Grutto), the Dutch farmers still receive certain privileges, like exemptions for rules on how much manure can be produced (derogation). Doing efforts for NIA is too optional at the moment."*

Several interviewees explained how some regulations, to make agricultural more environmental and animal friendly, did not operate as they meant to operate. Especially when farmers disagree, with the implementation of the regulations, or they simply do not have the financial means of implementing the required changes, they will deal with the requirements in their own -inventive- ways. Likewise, two interviewees (a researcher and a farmer) talked about the acres per cow a dairy farmer needs to have: The reality was that on paper the farmers might have enough acres of land, but this land could as well be at the other side of the country, so it could not be used for the cows to graze on. The stabilizing mechanism here is that the targeted change from policies and regulations, including the changes aiming at NIA, will not thoroughly be achieved because of the normative rules of farmers who are not aligned with the regulative rules.

An interviewee working for Nature Inclusive Agriculture gave the example of how certain areas assigned to be open-field landscapes, formed an obstacle for starting permaculture, because in permaculture trees have a very important role, but there were no trees allowed in these areas. *"In such case I do not believe that the regulations serve as they were intended. Where farmers intent to take good initiatives, they are punished for it instead. I believe the government should have more a facilitating role and allow more space to experiment with alternatives like permaculture"*. Here the stabilizing mechanism comes from the regulative rules, forming an obstacle for farmers' initiative aiming at Nature Inclusive Agriculture.

An interviewed researcher from Wageningen UR told me when farmers want to contribute to nature management and biodiversity this is accompanied by lower yields of grass and applying for compensation for this is only possible in the designated areas. The grass production is 30% lower on herb-rich grassland only reaching about 7-8ton per acre (instead of 12 tons) and farmers think this means a loss of income, because they can milk less. They want to see this compensated, which is possible through agrarian nature management agreements, but only if your farm is located in an appointed area. However, this interviewee also adds: herb-rich grasslands can be profitable in several ways, they keep the cows more healthy, for they contain more minerals and trace elements and reduce the veterinarian-costs, and the rumen of the cow handles it differently and then absorbs more of it so milk production stays the same. *"Most farmers do not know this"*, he said, and this has to be taught again, how to integrate it and the added value of this for the cows. This example shows the importance of regulative rules to stimulate farmers to change practices and thereby bring back knowledge, since farmers hold the shared believe that herb-rich grasslands give lower production not taking into their calculations the benefits of herb-rich grasslands.

SOCIO-COGNITIVE RULES IN THE AGRICULTURAL REGIME

The socio-cognitive type of rules includes the rules which make people take certain things for granted and find other things outrageous. Socio-cognitive rules are of high importance in the agricultural regime, the interviews and observations underlined that among farmers in decision making it is very important what 'reasonable others' would do. Like mentioned in the section above on the normative rules, a support network is very important for farmers. Farmers learn a lot from each other and generate tacit knowledge from their practices and observations at the farms from generation to generation. Some practical knowledge which is becoming

relevant again, has disappeared from many farms throughout the era of intensification. As an AOC teacher told me, the knowledge on the management of grazing has in many farms disappeared over the last 2 generations which kept their cows inside.

Farmers are sceptical about the efforts of Wageningen UR to help developing knowledge for sustainable agriculture. Several interviewees also mentioned the farmers feel neglected by scientists. Two interviewees working for Wageningen UR confirmed that their chair group does not often organize conferences or network opportunities together with farmers, rather with their business partners, with whom they also compose the research agenda. This was the case at the Resilience symposium 2017 organised by the Animal Science group, as one of the organisers told me (Van der Peet, 2017 –informal- WUR Resilience Symposium, 2017). Erik Toussaint from the Plant science group confirmed that the same was true for events on Plant sciences in Wageningen, they hardly ever explicitly invited farmers to join. This causes a stabilizing effect, if we assume that a fast transition to more NIA requires collaboration between scientists and farmers. It can even unnecessarily slow down transitions indirectly, via policies that will be based on scientific research, when in both the research and the policies farmers' knowledge is neglected (which according to my interviewees happened repeatedly).

During a discussion with farmers, scientists and other interested actors (after the screening of the documentary 'the mystery of the milking robot'), multiple dairy-farmers expressed that they were wondering what the researchers at Wageningen UR were doing, they did not feel that it served them. One farmer said that farmers have no neutral party to address their questions to. When discussing this with a scientist from the Animal Science Group, he replied that they do collaborate with innovative farmers in several research projects. I asked if they selected specifically the 'innovative' farmers and he confirmed that this is the most interesting group for their research. This could explain/confirm the perception of the 'conventional' farmers, that Wageningen researchers were not serving them or collaborating with them. As one trainer and author of educative material on livestock farming suggested, sometime farmers first discover something and then the scientists follow. Collaboration with innovative farmers may be inspiring and useful for scientists, but is different from researching those problems which farmers are confronted with. This selectivity on the side of the scientists can lead to stabilizing mechanisms in two ways: the research agenda does not addresses the problems which farmers have to handle before being able to make changes at their farm and this can worsen the sceptical view farmers have on scientists and thereby hamper their communication and potential collaboration for change.

The interviews and participatory research in this study, mostly in the Nature Livestock Farming group, pointed out that for Dutch dairy farmers their farm-size is a bottleneck for applying natural medicines and natural treatments as they learned about during their study group. One veterinarian said farmers still use a lot of natural products, but there is little knowledge about it and it is moved to the background. The head of the NLF emphasised that an important aim of her exchange programme with India and Uganda is to prevent them from making the same mistakes as we did in the Netherlands while developing our agricultural system. The 'mistakes' she spoke about mostly concerned input-dependency and farm-size, the growth of this two aspects

drove farmers in the Netherlands away from the Natural farming approach and diminished their knowledge of natural farming. One of my interviewees (a veterinarian, advisor and author of educative material) explained how the role of the majority of farmers in the Netherlands has changed over time: *"farmers became more and more managers, so you see that they transcend the level of operational work, you see the shift of the worker, the operational things of 'how do I do it? how should I organize the work? what exactly is it about ' there is a clear shift to management, so how should we design processes? always analysing management processes, dealing with employees, labour efficiency, things like that became much more important. Methods and protocols are of course more and more important and in the past those farmers did it all themselves or with family members, it was not considered so important that everyone did that in a standard way"*. This focus on technical artefacts and techno-fixes, is also observed in science and policy making (De Nooy-van Tol, 2013 p.213 & Leeuwis, 2004).

SUMMARY OF THE RULES IN THIS REGIME

At large, farmers in this study indicated that they would prefer to run their farm in a more natural way (normative rules), but were mostly restricted lack of resources for making this transition. The lack of clarity about government incentives for change (regulative rules) was mentioned to have a stabilizing effect on the regime. Moreover, the lack of consumers' awareness and therefore their willingness to pay more for more nature inclusive food production was mentioned to have a stabilizing effect on the production regime. direct Contact between farmers and scientist, and their collaboration in problem solving, has decreased (socio-cognitive), due to incentive structures which rather stimulated partnerships between scientists and more resourceful -often industrial- companies instead (regulative rules) which now is so embedded in habits and routines of the science community that they hardly organise conferences or events with farmers any more (socio-cognitive). Farmers expressed that, according to them, scientists (at Wageningen UR and the University of Utrecht) do not really focus on solving the problems of the farmers (normative rules), a certain distrust was ventilated. The two stabilizing effects here are; first the lack of an effective incentive structure to enable change, and second, farmers' distrust in scientists might have a stabilizing effect on the farmers regime. Yet, this second mechanism only exists, with the assumption that collaboration between scientists and farmers would bring about the desired changes more rapidly, which is not proven in the study at hand.

EPISTEMIC CULTURE(S) IN THE FARMERS' REGIME

In line with Leeuwis (2004), this study confirms that farmers 'epistemology' largely consists of practical experience, intuition, comparing farms, discussions with colleagues and additionally, nowadays also at online fora and groups, like the NLF WhatsApp group, used for sharing news, problems and advise.

At the conference on Natural Livestock Farming (2018) farmers and veterinarians discussed the priorities for moving on with natural livestock farming. Farmers proposed to start experimenting and based on this collect 'good practices' while some veterinarians and one researcher preferred to make a research plan that could lead to a scientific publication. One retailer in farm equipment (including animal feed and medicines) and three

veterinarians who are in the Natural Livestock Farming community told me that most veterinarians are sceptical about natural treatments on cows and in their studies of the faculty for veterinary science (University of Utrecht) knowledge on this was hardly addressed. They also referred to the role of the University of Utrecht, where the research agenda and the curriculum are more focused on the use of medicines instead of natural cures or ways of keeping animals healthy. Suggestions were made that this has to do with the financial model which works as a stabilising mechanism on the veterinarians and the veterinary faculty, in which a major funder is the pharmaceutical industry (NLF, 2017). One dairy farmer (Paul) *“That is the problem, it’s all the time about scientific, this, that, but maybe that is not necessary, maybe we can just share what works well for one farmer or what one has experimented with”*. Opposing, a researcher of the Louis Bolk Institute said *“we have to come with a scientific publication soon, to back-up our ideas”*. Dairy farmer Paul recalled *“during the workshop, veterinarians started about making it scientific again.. 10 years have passed now.”* Katrien director of Natural Livestock Farming stated that it needs to be done both ways. This difference in beliefs of what is the best way to proceed with knowledge creation and diffusion was conferred in other interactions as well. Veterinarians tended to be more close to the scientific epistemic culture while farmers had their own epistemic culture building on practical knowledge and expertise. Exemplary for this difference is what a retailer in the agricultural sector (Manager of Agro farm shop) told me that the demand for herbs and natural treatments in dairy farming is growing among farmers, but that their veterinarians are often more reluctant and therefore not all farmers inform their vets about the use of those alternative products. Several interviewees spoke of books about the herbal medicines which they knew of, but even if it was present in their family they said it not often talked about or consulted. One veterinarian stated *“before the invention of penicillin, veterinary sciences was all about herbs and other natural treatments, since the industrialization this knowledge got neglected”*

As underlined during a focus group discussion with farmers, nowadays the tacit knowledge of many dairy farmers no longer covers everything they have at their farm, new systems, technological artefacts are introduced, like milking robots, which are out of the scope of knowledge and expertise of the farmers. The focus group discussion also made clear how this put the farmers in vulnerable positions in which they depend on external experts. In their profession farmers make use of various types of knowledge including tacit knowledge and believes. One example given by multiple interviewees (including three farmers) in this study was the influence of the earth’s magnetic fields on cows. When cows show unusual behaviour, e.g. one farmer’s cows did not come to the feed fence anymore, this was solved by installing a so called ‘source-corrector’. If something is effective for a colleague farmer, regardless of underlying scientific evidence, farmers will tend to try it as well according to an agricultural real-estate broker and former farmer: *“these source correctors are not cheap at all, farmers are not crazy, they know it functions well before they buy one. This is not a particular type of farmers, you see this at many conventional farms. I do not know how it works, the farmers do not know it, but they couldn’t care less, as long as it solves the problem and it does for many farmers. This is a practical example from my experience, I had it at my farm as well”*. Later at a field trip a conventional dairy-farmworker also elaborated on the sensibility of cows for magnetic fields, he said they are much more sensible for magnetic fields compared to people. However, in the audience after the casting of The Mystery of the Milk-robot, there were also sceptical reactions from farmers they said it was going a bit too far

into the spiritual world. One farmer in turn reacted to them by saying *“where else can they go? Where can they find help? also not in Wageningen anymore”*. Neither do dairy farmers contact the Veterinarian Faculty of The Utrecht University according to Jan Hulsen *“if anyone has a question from the farm practice, no one would call the faculty”*.

Several interviewees and farmers in the focus group discussion pointed at the lack of people with general knowledge of farming who could assess problems and give neutral advice in the There is no one with general knowledge on farming who drives around visiting farms in their leisure time, to spot the problems which are present. The advisors, the few actors who visit farms are giving biased advice, they are employed by animal feed-suppliers or suppliers of pesticides, according to two interviewees and confirmed by participants in discussion.

With regard to the role of knowledge and expertise, the head of the Foundation for Natural Livestock Farming (NLF) told me that one of the most important messages she wanted to bring across, from the Netherlands to farmers in India and Africa, was: do not make the same mistakes as we did in The Netherlands while developing our livestock sector. As she explained her NLF exchange program: *“Farmers from different parts of the world can see what lessons can be learned after 60 years of intensification and specialization of dairy farming in the Netherlands and what is relevant for countries like that. So, they do not have to repeat our story and repeat certain mistakes, but they can learn immediately”*. When discussing the role of different types of knowledge, she said: *“The problems that are now in agriculture, are far too big to be solved by Western science alone. You need different knowledge inputs. Both from western science but also from other sciences, like in India the ayur vedic science and a lot of local knowledge from farmers.”*

4.2 THE SCIENCE REGIME

NORMATIVE RULES IN THE SCIENCE REGIME

Normative rules were pointed out by several interviewees when discussing the agenda setting of research at Wageningen UR and the current incentive structure e.g. in the Tenure Track, which creates a bias to certain research which is not by everyone considered to be the most appropriate or desirable, similar issues were mentioned in the context of the Utrecht University. Moreover, multiple interviewees made clear that the board (assisted by the corporate communication department) has strict ideas about how and what could be communicated to the public, by researchers from Wageningen UR. Normative rules also include perceptions of the purpose of a certain organisation. With regard to this purpose the board seems to have a bias (as observed in her strategic agenda's) to profiling the University in a way which attracts resourceful clients from the dominant agro-industrial regime. This bias may slow-down or obstruct the transition away from the dominant regime in agriculture.

Related to these same normative rules, questioning ‘what is the university for?’, several interviewees (including researchers from Wageningen UR) criticized the influence of companies on the research agenda of the WUR, one of them said *“those companies will simply not benefit from any alternative replacing medicines for example, or to find any solutions which make medicines less needed, that’s not it their interests”*. Another interviewee (veterinarian trainer and author of educational material on animal health) suggested that the University of Utrecht also has a bias in the research agenda, he said the faculty for veterinarian sciences focuses on healing instead of preventing diseases or injuries, they hardly pay attention to keeping the animals healthy. Former students of this faculty confirmed this and some of them suggested that this bias was in the interest of the research partners.

One WUR researcher mentioned that many of his colleagues did not dare to speak with the media, especially not about controversial topics. He was asked to speak in a television program and the people of this program told him none of the researchers they called before wanted to join, although it was more their field of studies than his. The interviewed researcher stated that they were all too scared. Later he was asked by the Executive Board of the WUR who authorized him to speak in the television, he replied *“me myself, I spoke on my own behalf”* and got the request back to always inform the Executive Board from now on.

The above mentioned situations exemplify normative rules in the science regime, by pin-pointing what people believe they ought to do. These rules can have a stabilizing effect, since they tend to restrict the research agendas to what is considered acceptable in the current regime. Whereas radical changes require research on divergent topics, which not per se serve the interests of the usual partners of the existing science regime.

REGULATIVE RULES IN THE SCIENCE REGIME

This section reflects on regulative rules in the science regime. In this section results from interviews and participatory research are complemented with results from desk research. Desk research highlighted that many universities in the western world encountered similar barriers to change related to regulative rules over the past decennia (Muscio et al., 2013; IPES-Food, 2016): Change-obstructing regulative rules in the science regime resulting from the budget cuts in government funding over the last 30 years, constraining higher education and agricultural research budgets and increased private funding (Muscio et al., 2013). This leads researchers to follow the agendas set by private sector funders (IPES-Food, 2016) for many of whom radical change would lead to competitive disadvantages. The results from the study at hand are exemplary for these developments, which obstruct radical changes.

Formal documents of institutions can be seen as the embodiment of many regulative rules of an institution (also indicating normative rules). The strategic plan of Wageningen UR 2015-2018 opens by underlining the importance of the Golden Triangle to facilitate the development of agri-food and bio-based expertise (Wageningen UR, 2015). With the term “Golden Triangle” the executive board of the university refers to the collaboration between government, business, universities and research institutes. The Strategic Plan of the WUR (2015, p13) emphasises the importance of being market-oriented in order to maintain revenues *“we are*

becoming even more proactive about seeking new markets and acquiring clients and funding". Business is mentioned as important stakeholder in this strategic plan. It states that Wageningen UR has the objective to strengthen synergy between the components of what they call 'One Wageningen' in order to present the organisation as having a clearly defined profile: *"so that we are perceived internally and externally as a singly, coherent organisation"* (idem, p21). When mentioning the plan to improve ties with prominent partners (p21), many types of partners are summed up, but farmers are not mentioned in particular. The collaboration between Wageningen UR and companies goes beyond attracting research funding together, several professors at the WUR are completely financed by companies including: Unilever, Danone, Nutreco, FrieslandCampina, BASF, Philips (Wageningen UR, 2018). Meanwhile, the scientific research of Wageningen UR forms the basis for government policy and legislation in the domain (Wageningen UR, 2015 p42).

In the context of this relation between the WUR and the government policies, an interviewed agricultural policy expert who works for an NGO, underlined that the emphasis of agricultural policies and research is still on techno-fixes, instead of on a deeper understanding of the ecological processes at farms. *"Wageningen UR is dominated by the agro-industrial interest, that is what WUR is known for, although there are scholars in agro-ecology, these streams are less influential, it doesn't surprise me that WUR is not a pioneer in agro-ecology. They do work on sustainability, but very much from above, starting with science and presenting technology as the golden bullet."* This interviewee indicated that the WUR and other western research institutes have little attention for: *"Food sovereignty and farmers' independence and autonomy"*. He says neglecting these issues and emphasising techno-fix ideas is less sustainable in socio-economic terms. He suggests a stabilizing effect of the science regime at the WUR is caused by the domination of agro-industrial interests and maintained by the technocratic approach to sustainability.

With regard to the regulative rules, the results of this study suggest that a small share of the financial resources of the WUR went to research in the direction of Nature Inclusive Agriculture. Two WUR researchers who did research on natural approaches to agriculture, both told me they were the only ones at their department working on this and they both indicated that the governance structure (project-based funding) decreased the freely assignable work hours. One of them told me he used to have 500 hours per year freely assignable and went back to 100 hours a year, the other 1500 need to be written under a project. Both of them dedicate their spare time to work on natural approaches to agriculture. The organic agriculture researcher was often invited to speak for example at an AOC or at a farm where students would visit, but if he had to charge them for it, it would easily add up to 750,- for half a day, which the AOCs and farmers could not afford. He often accepted the invitation anyways, took a day off and went without getting payed. The other WUR researcher told me she could not go to an event in Arnhem (with many farmers and other stakeholders) to discuss the future of dairy farming, because she could not write these hours under any of the projects (and she did join various relevant meetings with farmers that year in her own time).

Each of the interviewees from the science regime addressed the urge to publish in scientific journals, resulting from the regulative rule in the science regime: for promotion a certain amount of publications in scientific

journals were required. Two of the interviewees indicated that this increased the distance between farmers and scientists. One of them explained: *“the emphasise on writing for scientific journals has increase and what was relevant for farmers is less of a priority, scientists write for scientific journals, whether someone reads it or not does not matter”*. Throughout this study no formal incentive structure to promote scientists’ cooperation with farmers was found, neither much opportunities to communicate directly with farmers. One of the interviewed WUR researchers said this has changed in the past two decades and there used to be direct communication via farmers-magazines/journals: publications of WUR Researchers were a standard element in the magazines, the articles had phone numbers underneath, so farmers could call with the researchers directly. According to my interviewee the board of the university decided that the communication department had to make the articles instead of the researchers themselves and the phone numbers of researchers were no longer underneath.

One regulative rule of the scientific regime had very direct implications for an interviewee from Wageningen UR. As he quotes his colleague who informed him about the rule: *“That first has to go to the ministry 3 months before publication, every article and every report”*, although my interviewee never did that, his colleague insisted it was really mandatory and eventually he did send his report (on animal feed concentrates) to the ministry: *“and what happened: There was a sentence “on these farms we did not measure the use of homeopathic treatments” and they suggested to replace it with another sentence but I said ‘that sentence is not right’ and then they said ‘well then the report will not be published’*. Moreover, he said that one of his colleagues withdrew a good research proposal, because he thought it would not be allowed to do research on energetic fields and cows. This assumption was based on the fierce reaction of the Executive Board (and the main-stream media) about a research in the energetic fields of cows, leading to a newspaper heading: *“for magical dwarfs call Wageningen”*. The former head of the Executive Board, Aalt Dijkhuijzen called the director of this researcher on a Sunday morning to ask justification for this and this researcher had to calm down his director, by telling him there was a proper scientifically sound research plan and there was nothing ‘unscientific’ about it.

SOCIO-COGNITIVE RULES IN THE SCIENCE REGIME

This section will discuss examples of socio-cognitive rules (e.g. habit, assumptions and taken-for-granted-s) related to the science regime and the way they result in stabilizing mechanisms, reflecting the existing frames of meaning making in the regime.

One of the interviewees especially touched upon the different life-world and frames of meaning making between the scientists and the more practice oriented farmers and AOC employees and pupils. This interviewee, a former professor and manager of Wageningen UR, Animal Science Group, currently AOC director, said there is insufficient direct contact between the WUR professors and people in the field, doing the practical work. *“That could be much stronger in Wageningen, to make sure that all those University teachers, who are now trapped in the Tenure Track, would get much more time to let’s say make a walk with a forest ranger, visit a livestock farmer and be influenced by what those people can tell them”*. He did not only speak of

the lack of contact between the scientists and the professionals in the field, but also touched upon how little the university staff knows about what is happening at the AOCs and how little effort is made to inform their students of it, while those students later on in their work need to deal with former AOC students. To explain how this division was caused and how it obstructs changes, he said: *"I have to refer to efficiency-thinking for the AOCs as well as the Wageningen University. The AOCs are in a tight financial framework and the University has the Tenure Track, the publication drift and rankings. This does not contribute to doing things differently".* *"This was one part of the problem,"* he said, *"the other part is that they are in two different worlds, which are basically unknown to each other".*

Some of the interviewees suggested that anticipation of a 'privileged way forward' in the science regime influenced research agendas. A Wageningen researcher said: *"The majority, here in Wageningen, is just about optimizing milk production with the least possible costs, both in the direction of pest control and robotisation, the most important Wageningen research is based on this".*

In the selection of partners with whom to do research both socio-cognitive and regulative rules played a role. Exemplary for this is what an organiser of a symposium from the Animal Science Group told me: *"We invited mostly partners we can compose a research agenda with and who can co-fund the research"* when asked whether farmers were also invited, he responded: *"if farmer-cooperatives take part in network event at the WUR, they do this with their corporate / business-branch rather than their farmers-branch."*

Some examples indicated socio-cognitive rules entangled with normative rules in the science regime on what was acceptable to do research on and what not. One interviewee who worked for Wageningen UR over 30 years explained the strong the domination of normative ideas. He wanted to do a study which could lead to a reduction in the use of anti-biotics, by no longer injecting in the neck for utter infection, but in the utter instead, he reflected on the reactions when he proposed this *"you were just crazy if you would doubt about it, I did some research but you were just crazy to do that, because it simply could not be.. you were a little bit of a gag to even start about it."* Likewise, former Wageningen UR student, now agricultural real-estate broker, talked about researchers he knew in Wageningen, who he considered to be real pioneers, running up front with many insights. He said: *"as soon as they went a bit too much off road, toward alternative agriculture, many doors closed for them"*. Later it turned out that their insights were very valuable and were accepted decades later. He gave an example researcher who already spoke about circular agriculture in the 1990s. *"Those people were easily declared 'crazy', they were ignored and in a kind manner said goodbye to, while these were actually the once who would visit farmers and had a wide network"*. Moreover, this interviewee said there were certain thing ignored too much by WUR scientists, things which seemed to have no scientific backbone, like energetic fields at cow farms, but are very relevant for farmers. He is of the opinion that researchers easily says things are not researchable and therefore not try it: *"researchers would say they cannot measure it, but in that case I think they could at least give it a try and if the conclusion is that it is not measurable, that's fine as well, but not researching it at all is a missed chance I think"*.

One other interviewee referred to a normative situation at the Utrecht University, he said if you wanted to make a reservation for a room and they knew you were going to talk about homeopathy, you would be kicked out. Above all, he said all veterinarians received a letter to warn them, their membership of the society for veterinarian sciences would be terminated if they would work on homeopathy. This was in the 1990's, nowadays it may have improved a bit, he says, but still it is not allowed for veterinarians to use medicines which are not registered. To get a new remedy in the register, a lot of scientific research needs to be delivered, but if there is no money to do this research, it will not be registered and this way "it simply dies out" he said.

In the discussion after casting of Mystery of Milk Robot, farmers expressed their frustration about the lack of support they get from Wageningen scientists. A dairy farmer who had a conflict with the a company about the service contract of his milking robot, especially missed a neutral expert in a court case about a milking robot: *"When the milking robot was not functioning well, the supplier and service-company were not responding, no one home anymore, and when I went with that story to the court, the judge says "well I do not understand that, so uh, so we will not talk about that" well then I think, where is the expertise? Isn't there an expert here in Wageningen who could indicate what is going on' because you cannot expect the judge to understand this all. "* When the techno-fix is not a solution in the more complex reality of a farm, WUR scientists are not there to help out the farmer.

In several reports and policy-letters the lack of research on nature inclusive agriculture and agro ecology is emphasised (IPES, 2016; Directie Natuur en Biodiversiteit (kamerbrief 10 juli 2017 Betreft Natuurinclusieve landbouw). Agricultural research and education has developed in silos, not overseeing the complex interactions between the natural and the societal environment of food systems (Francis & Campbell, 2003).

SUMMARY OF THE RULES IN THIS REGIME

If it comes to attention for nature inclusive agriculture in the science regime, the findings of this study underline that formal incentive mechanisms promote to keep doing contract research for dominant regime actors (regulative rules). In the agenda setting of the Utrecht University, veterinary faculty and Wageningen UR such incentives are present. In the case of the UU it mostly concerned a bias to medicines instead of preventive health research. Interviewees, including veterinarians, mentioned there is more money to make in developing medicines instead of in keeping animals healthy. It was suggested that veterinarians therefore got used to focus their attention on this (socio-cognitive). At the WUR, interviewees mostly referred to partnerships and contract research for agro-industrial companies (socio-cognitive). The impression of farmers that they do not have a say at Wageningen UR, is in line with what two WUR staff members told me; symposia and conferences more often focus on partners who could potentially co-fund research and farmers are rarely invited (socio-cognitive and regulative). There are understudied issues, known by farmers and important in farming practice (like energetic lines on farmlands influencing animal behaviour), but scientists commonly believe they ought to ignore this issues for they do not fit with the epistemic culture of scientists (normative rules). As explained in the next section, the epistemic culture of scientist is based on explicit, discursive knowledge (rather than tacit knowledge used in farming practices widely) .

The results of this study indicate that the epistemic culture of the scientific regime is selective and tend to discredit work which doesn't fit well in the existing base of scientific knowledge, regardless of the relevance for the farmers. Researchers who would like to explore new fields, or research issues which are not yet researched before are criticised by the media, the executive board and their own colleagues (who even claimed the Bible forbids it, which is yet a different epistemic culture, but has had its influences on western sciences). Findings of the study at hand clarified the authoritarian way to define and control what is considered legitimate knowledge and legitimate research at Wageningen UR and what is *not*.

Interviewees suggest that the current governance model of universities does not facilitate research in fields where not much money is made or which are perceived to be unscientific: for example homeopathic treatments on animals, as one of our interviewees explains: *"you will never proof the effects with scientific evidence, no one wants to pay for it. If I see conventional farmers using it anyways, I ask them why they use it, they would tell me simply because it works, from experience. Veterinarian are often opposing it much more, there are a few who like it, but most vets try to stay far away from it"*. In the case of natural treatments or self-medication for cows for example, the current producers of medicines or additives for cows are reluctant to this change, since their income depends on selling medicines or additives and if cows could be cured with products freely available in nature, they would not earn money from this. In one of the NLF meetings a veterinarian told me the same is true for the majority of veterinarians. Veterinarian and researcher Maria Groot, informed me about the fact that 11-20 % of what monkeys eat in the wild, is not 'food' for them, instead this serves as medicines or health enhancers, this can for example be the bark of trees or seeds. However, her research institute (RIKILT) also depends on research contracts and external funding and she said it is hard to get this type of research funded, although it could be helpful for Natural Livestock Farming.

The study at hand pointed out the effect of media attention and external organisations (bond tegen kwakzalverij, with their own interests) who pretend to have a certain authority to legitimize or de-legitimize knowledge. Which seems to worry the corporate communication officers of the Universities and caused them to try to prevent this kind of media-attention by prescribing procedures to their scientific staff to keep control over what they do and say in public.

Interviewees indicated a missing link between curriculum and orientation of studies in Wageningen and the agricultural practice (and the education at AOCs), pin-pointing the distinct epistemic cultures. One interviewee reflected on a field-trip with AOC students and students from Wageningen University *"There were students from Wageningen, who did not dare to ask a single question because they did not know what it was about, they did not know what a cell-number was, they did not know what between-calf period was, they knew nothing, nothing at all and the other students (from AOCs) just talked about it, they were a bit practical and first I thought well does that make sense .. Then a University student drove with me, it was his 4th year in Wageningen, I asked him "what did you learn from this?" he said "I learn a lot from this, because I really do not want to open my mouth, because I would appear really terrible" and he was almost done with the study animal*

sciences, but he had hardly seen a cow". Moreover, the director of a cluster of AOC and former manager at Wageningen UR talked about the different life worlds of AOC teachers and scientists. He said it is very difficult to get teachers with a Wageningen background and explained that AOC teachers are sometimes reluctant to visit the University: "When you drive into the campus there is a very small threshold and if you drive over there you bump into your car and it seems like a very small threshold but a lot of people it is a big barrier to Wageningen at all campus and go to a seminar or go into the library, so that kind, we have to work very hard on the professionalization of teachers, so that they can bring those competences back into their teams". When asked who is informing the policymakers, he replied: "people from Wageningen, yes, yes who have no knowledge of the craftsmanship, exactly, so that is a bit of a circle where we have to escape from."

4.3 THE VOCATIONAL EDUCATION REGIME

NORMATIVE RULES IN THE VOCATIONAL EDUCATION REGIME

If it comes to normative rules in the education regime, several interviewees started discussing the issue of role expectations; who is expecting whom to take the lead in making changes? AOC directors mentioned that changes toward more sustainability-oriented education should be developed in teams of teachers, bottom-up and students should have a say in it. Interviewees from the AOCs also said at their school the teachers did not appreciate too much external groups or project workers who come to tell teachers what they should change, teacher teams will say *"we already have our lesson material"* (according to an AOC teacher). Opposing, one teacher said *"I think if a module 'sustainability' is written, everyone will use it, teachers just lack time to completely dive in to it themselves"*. A former AOC director, now sustainability coordinator, observed that the management team (MT) was waiting for the teachers to hear from them what they wanted with regard to sustainability, while the teachers were waiting for the MT to tell them what to do with regard to sustainability. She emphasized the importance of having members of the management team explicitly dedicated to sustainability). The report 'Nature Inclusive Agriculture and Agricultural Education' (RVON, 2016) concludes that the same lack of clarity exists at the macro level, it was unclear who was taking the lead in making changes in the AOCs' education, what was the role of the government for example? and which decision were to be made by the central AOC council? The aforementioned situation is exemplary for the 'organized irresponsibility' which was observed throughout this study if it came to efforts for sustainability related change at the AOCs. Two of the interviewed sustainability coordinators indicated that the majority of the AOC teachers see sustainability education as a side-project next to the main curriculum. One of them said reflected on the reactions of some colleague teachers: *"they get impatient and ask me when it is finished"*.

Several teachers talked about the normative rule of perceived role expectations. One AOC sustainability coordinator told me her colleagues feel responsible to fulfil their role in preparing the students for the farm work in the way the students (and their parents) expect from them. Yet another teacher believed AOC teachers fear resistance from their pupils when addressing nature inclusive agriculture in their classes. Many students

have a farm at home and the teachers adjust their classes to what they believe is relevant to them and even experience a sort of pressure from the parents to do so. To exemplify this situation one AOC teacher said: *"at this age (his pupils were in the age range of 14-17), they only think of few things: feeding, haying, milking., only the technical part is interesting, after 5-10 years they will start considering the ethical license to produce"*. At the contrary, one dairy farmer (parent of a AOC student) said her son went to an AOC and she was disappointed by the conventional education that was dominating the classes and the little her son learned about organic agriculture. This results indicate that teachers are influenced by the *perceived* role expectations, the expectations they believe their pupils and their parents have from them. Once teachers anticipate these normative rules, they can obstruct changes, for they cause teachers to teach what is relevant for the average farm the AOC students come from (conventional agriculture).

Two interviewees indicated what could change these normative rules: they suggested that the most effective way to get pupils interested in sustainable agriculture was by introducing them to an organic farmer with a very profitable business model. One of these interviewees, a former WUR researcher involved in vocational education at AOCs, indicate a certain resistance but also told how this turned into interest of the AOC students in organic farming: *"The students are interested to see how they can make the farm run well, business wise, in the current regime there is a focus still on quantity and up-scaling, this makes it hard to get the students interested in small-scale (organic-) farming."* He went with a group of students to a small organic dairy farmer and reflecting on this he said: *"students were first a bit like 'what a peasant', just when this farmer opened his administration, the students were shocked and impressed by his business model."* Likewise a AOC teacher told me, one student in her class lived at an organic farm and since he explained very well to his classmates how it was done and the classmates understood that this was more profitable, the classmates no longer downplay it with *"yes, but, this, that.."* but started to admire it. These results indicate that showing viable business models is a good way to get AOC pupils interested in alternative farming approaches. The RVON report (2016) on the implementation of Nature Inclusive Agriculture in education in the Netherlands, suggested that there is a lack of examples of content knowledge for teaching about profitable business models of Nature Inclusive Farming, for two reasons: because current knowledge and interests are focused on business and cost price models associated with a conventional farm management (p.4) and because broader agricultural approaches has long been considered hobbyist-approaches (RVON, 2016 p13).

To come back to role expectations, interviewees mentioned teachers were expected to do a lot with limited time and so it depended very much on the individual teachers how much attention they paid to Nature Inclusive Agriculture in their classes. Teachers have to prepare the students for their final exams, if they want to incorporate sustainability aspects in the general lessons, they need to do it themselves, but my interviewees indicated that some teachers fear for lack of time to deal with the whole curriculum before the exams, so they do not change anything. As a previous AOC director and sustainability coordinator told in an interview: *"for a long time teachers only taught from a method, and especially young teachers who just started, they were very fixated to hold on to the method, but if you stick in there you're in a kind of prisoner and then you will not get out."* A director of a cluster of AOCs indicated a burden on the available teaching time in the current regime:

teaching all regulations that apply to the specific types of farming they are preparing for. Nevertheless, on their own initiative and in their own time, several of the interviewed teachers did pay attention to nature inclusive or sustainable agriculture. One teacher showed me all the journals he reads on his day off, and said this was his own interest and the interest of staying up to date of relevant developments in their field, but he knew not all of his colleagues choose to do this in their free time.

A manifest on the promotion and importance of sustainability has been signed in 2009 by the AOC council and the minister of Agriculture, Nature and Food Quality. The first couple of years after this, no priority was given to it at the AOCs, the management and staff continued business as usual according to one of the interviewed sustainability coordinators reflected on this: *“Once the AOC Council -so all AOCs represented- made a manifesto, well it was also about sustainability, but that was a very first begin manifest, everyone was very happy great, nice, nice, but that stayed 10 years untouched on a shelve, because no one did anything with it”.*

REGULATIVE RULES IN THE VOCATIONAL EDUCATION REGIME

Regarding the regulative rules, there were some measures taken to enhance sustainability; all AOC schools assigned sustainability coordinators and signed a covenant of the AOC-council, but the overall formal incentives were not enabling much sustainable development. Interviewed AOC teachers said, most teachers' efforts to include sustainability in their classes had to be made in their free time. An AOC director told me, the AOCs faced budget cuts of 50 million euros last year, which resulted in a decrease of teacher/student ratio from 1/15 to 1/20 (in one year time). Moreover, the budget cuts meant project money for the Green Knowledge Cooperation (GKC), also for projects which would address more sustainable agriculture, was no longer available. There is a new overarching development agenda for the agricultural education (in a way replacing the GKC) which is signed by the agribusiness firms. It is agreed upon together, but the agribusiness does not contribute money-wise. One sustainability coordinator mentioned that lack of money at her AOC made it sometimes impossible for their AOC to participate in networks or partnerships to collaboratively work on sustainable development. An AOC director mentioned that the lack of available time meant that his employees (the teachers) could hardly visit a farm or visit Wageningen University or a lector of a School for Higher Agricultural Education.

The explicit curriculum of the AOC is in itself the embodiment of regulative rules. Several teachers talked about the formal curriculum, regulative rules, of the AOC and the restrictions and direction this gave to the practices of AOC teachers. As multiple interviewees from AOCs mentioned, the vocational education increasingly focuses on dealing with technical artefacts, protocols and regulations, replacing professional craftsmanship in which farmer relates directly to nature (observing the soil and the animals at eye-sight). The current regime does exactly the opposite from what is required for sustainable agriculture, according to an AOC director: *“in the past we used to learn our pupil much more, animal husbandry, arable farming pupil, how to have a good soil structure, how you could see that, how to judge it, how to put your spa in the ground and look at how deep the rooting was and so on, nowadays we say “you have to know when you are allowed to drive your manure over the field and that is in the legislation from The Hague” while previously that was something a farmer could feel*

and had developed a sensitivity for, now it is prescribed from above". He added preparing the AOC students for nature inclusive agriculture instead requires to teach them again the profession, the ability to work with nature, doing observations and sensing certain indicators, rather than following rules and applying technical artefacts. He emphasised this by stated: *"The craftsmanship is removed from that profession and that has very big consequences for the structures of, ultimately for the structures of the sector".*

Per AOC it differs how much is explicitly invested in sustainability exemplified by the finding that some schools hired a sustainability coordinator for 2 hours a week, three other AOCs appointed expert-development-team members for sustainability for just 20 hours a year, while yet another AOCs employs a sustainability coordinator for 2 days a week whole year long. Part of the available budget for integrating sustainability in education is spend on consortia. The study at hand looked into a consortium of 3 AOCs in collaboration with two scientists and an independent research bureau (the latter wrote the project proposal and applied for the funding). The budget for this showed a vast amount of government budget available for improving education went to the scientists and the research bureau. This consortium involved many external people (consultants, advisors and scientists) and just few of the school's staff (one person from each school). This is contrary to what the interviewees in this research said to be desirable. It even opposes what the own consortium proposes, being 'the Whole School Approach'.

SOCIO-COGNITIVE RULES IN THE VOCATIONAL EDUCATION REGIME

This section will address the socio-cognitive rules, which are the at the deepest level of the regime and difficult to observe (Scott, 2008). Several interviewees mentioned that they, and their colleagues, tend to comply with expectations the pupils and their parents have from them. The technical side of agricultural production is central in these perceived expectations. A socio-cognitive challenge was indicated by an AOC teacher, member of an expert development team on sustainability: the difficulty in defining what 'sustainability' is and what exactly needs to be worked on. In the first year of the expert development team they did not manage to get started, he said, partly because of this lack of clarity (and available time 20 hours for the whole year). To a worse extend, the lack of clarity of what sustainability means, even demotivated one of the interviewed AOC teachers to work on it, she said: *"The term sustainable is used whether appropriate or not, what do you mean by sustainability? if you look at dairy farming, they also talk about sustainable cows, cows that last a long time, but sustainability is, I think, a much broader concept, you have to involve the entire planet, and that is quite a complicated business, but because it is such a buzzword is used all the time. I feed manufacturer also claimed they worked on sustainability and innovation, but the content of that was very vague".* This teacher got demotivated to work on sustainability because it became so hot *"I used to asked my students: 'what is actually well-being? and what is sustainability? and what is innovation?' but now that everyone is getting so excited about it, I do not really feel like doing those kind of projects anymore."* These are speaking examples of stabilizing effects of socio-cognitive rules obstructing or slowing down changes in the education regime. One other interviewee gave an example of 'sustainability' which pointed out that understandings of this concept differ a lot and could according to her even include a farm-size increase of 3000%. When asked whether the

management of her school gave importance to sustainability, she responded *“yes they are very much into this, the embassy of Sri Lanka approached our school to collaborate, because farmers there often have just about two cows and they would like to get more, my colleague will soon go there and assess what they need in terms of knowledge, so they can maybe even scale-up to sixty cows”*. Different frames of meaning making, socio-cognitive rules, among the AOC employees, seemed to make it hard to operationalise developments for sustainable agriculture at the AOCs. Depending on the frames of meaning making and life-worlds of the actors in charge, sustainability at a school can be implemented in different ways. One sustainability coordinator, explained that sustainability at her school was more designed in the physical aspects instead of embedded, she described: *“we are still very much looking at appearances, for visibility, for example solar panels, how do we drain our water, but whether it is .. it is not yet in the genes of our students and of course we have to go there and that requires a change in didactics”*.

Regarding the deep level at which socio-cognitive rules play a role, one of my interviewees speaks about different life worlds, when asked if she and her colleagues collaborate with the Bio-dynamic branch of their school, the sustainability coordinator from the ‘conventional’ branch of the AOC told me *“no we hardly work together, no, it is unfortunate, but you have to understand, this is a very different school of thoughts”*. She acknowledged the bio-dynamic school could provide examples in line with more sustainable development, but it would not fit in the life-world of the conventional school and she seemed to take for granted that ‘reasonable others’ would resist. One interviewed veterinarian, member of the Foundation for Natural Livestock farming, believes it would be good to reintegrate the knowledge on natural products (which many farmers still have) in the curriculum again and in the same time herb-rich grasslands can be addressed.

SUMMARY OF THE RULES IN THIS REGIME

The experienced lack of resources to embed sustainability at the AOCs, there are two main mechanisms which keep agricultural education locked-in to the regime serving conventional farming and the agro-industrial system. Firstly, the ‘organized irresponsibility’ which manifests in the lack of clarity on roles and duties in the transition to more sustainable development at AOCs and secondly, the anticipation of teachers on their perceived expectations from pupils and parents of what ought to be taught at the AOCs. The vocational education increasingly focusses on dealing with technical arte-facts, protocols and regulations, replacing professional craftsmanship in which the farmer relates directly to nature (observing the soil and the animals at eye-sight). Formally all AOC schools in this study had a sustainability coordinator and signed a covenant of the AOC-council to run the school in a more environmentally friendly way and pay more attention to knowledge related to sustainable agriculture. At normative level, the sustainability coordinators noticed a variation in support and interest from their colleagues and from the management team. But at the socio-cognitive level, teachers were influenced by what they believed they ought to do, role expectations. Some colleagues were wondering when the sustainability project would be finished, not realising it was a trajectory without an end-date, aiming for continuous improvements. Budget cuts since 2018, decreased the teacher/pupil ratio which resulted in less time to develop new lesson material. There are no structural formal incentives for teachers to

educate more sustainable- or nature inclusive agriculture. Meanwhile, available project money was absorbed by external actors in consortia. In the current education regime my results suggest that learning about nature inclusive and/or sustainable agriculture is especially successful if students understand the profitability of the alternative business model(s), but this is not yet anticipated in the core of the curriculum of the AOCs.

EPISTEMIC CULTURE(S) IN VOCATIONAL AGRICULTURAL EDUCATION

Various epistemic cultures interact. Many of the pupils at AOCs come from a farm themselves and bring along their insight from home *“they know exactly what is going on in the sector, they discuss this each day at the kitchen table”* as was told to me by an AOC director. Meanwhile, according to one of the teachers less and less of her colleagues come from a farm themselves *“it is a pity, but the number of farms is decreasing rapidly, so the number of people who grew up on a farm also decreases, now I see some colleagues find it hard to understand the life-worlds of the pupils who come from farms”*. She pinpoints the difference in epistemic culture of people who grow up at farms and those who don't.

The director of a cluster of AOCs, underlined the loss of tacit knowledge among AOC pupils due to regulations and technical artefacts. He mentioned the use of lists and measuring techniques to indicate when a pig was ready to go to a slaughterhouse, which de-skilled the farmers from feeling and observing the readiness of the pigs by themselves. An AOC teacher also mentioned the loss of tacit knowledge of his pupils regarding the ability to observe when to graze on which part of the pasture. He said that even when grown up at a farm, this tacit knowledge has disappeared over the last 2-3 generations of farmers at the majority of farms, since they stopped grazing and keep their cows inside. In the words of this teacher: *“so that's what our boys have to work on now. And we first have to start with the basics of grazing and bring that back in thoroughly”*. An interviewed AOC director pointed at the tacit knowledge or skills which disappeared from the AOCs curriculum and got replaced by knowing standards and prescription. *“a decade or two ago the pupil used to learn how to identify a good soil structure, how to see that, how to take out a sample of soil and look in depth at the roots. Now they need to know the regulations from The Hague on when to effuse the manure”*. These developments suck out the craftsmanship from the profession, he said.

The AOC director mentioned the AOC teachers hardly ever go to Wageningen UR, not only because they lack time to do so, also because they do not think they can just go there *“the little threshold when you enter the campus, can appear really high to them”*. He added: vice versa the students and staff from Wageningen UR have no clue of the developments at AOCs. He says this is a pity since graduates from both institutes will have to work together in the future.

Two interviewed teachers I asked whether they would consult the bio-dynamic school, Warmonderhof, for more ideas on nature inclusive agriculture both indicated that this was a step too far, a too different school of thoughts. Moreover, desk research suggested that the AOC teachers perceived knowledge from Wageningen UR to be not in line with the objectives for Nature Inclusive Agriculture and to be more relevant for conventional farming (RVON, 2016). The report further mentions that the reports from Wageningen UR are

hard to integrate in the classes at AOC, because it is written in language which is hard to understand for AOC pupils. The latter obstacle was also mentioned by several AOC teachers in the study at hand.

5. CONCLUSION AND DISCUSSION

In this chapter the conclusions of the research are presented, starting with an elaboration of the three sub questions, together providing an answer to the central research question. In the discussion a reflection is given of the research design and execution. Theories from the conceptual framework together with the major findings are discussed. This chapter will end with recommendations for future research.

5.1 CONCLUSION

QUESTION 1

When studying the stabilizing mechanisms of the regimes, the three types of rules of Scott (2008), were used as analytical tool. Table 4 shows the most important rules per regime or better said; the rules emphasised by a number of interviewees and participants in this research and often confirmed in observations. This provides an answer to research question 1.

	REGULATIVE	NORMATIVE	SOCIO-COGNITIVE
Production regime	Stabilization maintained by: incentive structure focused on intensive agriculture, unclarity on subsidies and policies related to NIA. Moreover, because of regulations and standardisation (by food retailers, industry and government) certain tacit farmers' knowledge was no longer use, because of prescribed practices. (interlinked with socio-cognitive rules)	Farmers' distrust in aims and intention of policy makers and scientists. Justified beliefs of 'good practices' closely related to tacit knowledge, observations and experiences, regardless of scientific proof. No normative stabilizing mechanism indicated.	Modernized farms become dependent on external experts and craftsmanship decreased, which obstructs changes to more natural approaches. Moreover, farmers' knowledge is neglected by scientists and policymakers which obstructs collaborative changes. Long-term trend of intensification and up-scaling (economically and cognitively stuck), led to a loss of tacit knowledge on natural farming.
Science regime	Stabilization caused by incentive structure for collaboration of industry-government-science who's 'privileged way forward' is incremental change, no radical change. No formal incentives to study farmers' problems in science regime. Time restrictions due to project-based funding. (interlinked with socio-cognitive and normative rules)	stabilization enhanced by beliefs of legitimacy of knowledge creation and co-creation with a select group of resourceful partners. Fixed beliefs of what scientists ought to do, exclude perspectives and activities which may be crucial for transition.	Taken for granted collaborations with (conventional) business partners in setting research agenda, while neglecting farmers interests. boundaries to what is believed to be researchable due to epistemic culture of scientists, excluding relevant issues from the farmers. Stabilizing effect: scientific support for currently dominant practices

Vocational education regime	Curriculum predominantly conventional agriculture and new regulations and technical artefacts. NIA related course material need to come from teachers themselves, made in their free time, without formal incentive mechanism.	Unclear responsibilities, neither teachers, nor MT take the lead to embed NIA at the AOCs, 'organized irresponsibility'. Perceived role expectations are biased to teaching for conventional farming.	Hard to find teachable content knowledge, (e.g. profitable business models of NIA) since existing knowledge focussed on conventional farming. Different conceptions of 'sustainable' and of what needs to be prioritized, slowed down embedding of NIA.
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Table 4: Change obstructing rules per regime

QUESTION 2

With the overview presented in the table above we can proceed to research question 2, assessing stabilizing effects of these rules in the regimes. These will be described per regime.

In the agricultural production regime, the most change obstructing factor was the lack of resources farmers perceived to have access to (for changing their farming-model). This can be seen as a stabilizing mechanism related to the regulative rules: there are policies and subsidies to stimulate Nature Inclusive Agriculture, but farmers indicated that the rules to apply for these were unclear and not stable enough. As the interviewees explained, only farmers in certain appointed areas could apply for subsidies for Nature Inclusive Agriculture.

Another stabilizing mechanism is the tendency to increase farm size. This stability results from *socio-cognitive* rules; taken for granted, shared beliefs as well as *regulative rules*, i.e. the incentive structure. Exemplary for the socio-cognitive rules in the production regime is the fact that many farmers perceive upscaling as a proof of success, while still holding on to conventional business model (even if these models are unsustainable ecologically as well as economically). Throughout this study it was confirmed that most farmers aim to produce more, have more cows than their parents and even the banks often require quantitative growth as a criterion for getting a loan. Only after seeing a highly profitable alternative business model of a small-scale farmer, the idea starts to catch more attention and interest (NLF, 2017). Moreover, few interviewees doubted whether a rapid transition to Nature Inclusive Agriculture in the Netherlands would be good (normative), one in the context of the globalized world market, and another because he believed it was not more sustainable resource-wise. Governmental policy makers have been framing scale increase as a solution for the Dutch agricultural system for a long time (Lieshout, Dewulf, Aarts & Termeer, 2013). The process of scale increase went hand in hand with the loss of tacit farmers' knowledge. Knowledge which is relevant for reintroduce natural approaches to farming nowadays promoted under the name Nature Inclusive Agriculture. This underlines the importance of being aware of the distinct epistemic cultures. As will be addressed in answering research question 3 below.

In the science regime, the interviewed researchers and university staff expressed their wish to study sustainable development and/or NIA more in collaboration with farmers. Nevertheless, the research agendas were still composed together with those who contribute in funding the research, i.e. resourceful companies. This practice is maintained by socio-cognitive rules, embodied in the usual partnerships, as well as regulative rules, observed in the incentive structure. These two rules combined enhance stability in the science regime. Resourceful companies from the current regime have little interest in radical change rather in incremental change.

Regarding socio-cognitive rules in the science regime, certain tendencies, habits and frames of meaning making seem to evolve in interaction with regulative rules. The criteria for promotion in the Tenure Track may influence the socio-cognitive level of the scientists, if certain quantitative scores (e.g. number of publications in scientific journals and amount of external funding for research projects) become criteria for promotion, these influence the frames of meaning making and the perceptions of what reasonable others would do. The mentioned criteria to succeed in the science regime, seem to be more directed to incremental change rather than radical change.

In the vocational education regime, we have seen that budget cuts, i.e. regulative rules, cause teachers to have little time to adopt sustainability in the curriculum and expectation patterns regarding AOC educating (normative rules). These two types of rules reinforce stability. With the little hours available to work on sustainability, they faced a challenge at the cognitive level, the teachers took for granted that they had to keep teaching the type of farm management the pupils knew from back home, which was mostly conventional agriculture.

QUESTION 3

With regard to research question 3, on the epistemic cultures and their relations with the three type of rules, I conclude that it is shown that the three types of rules are a great analytical tool to explore epistemic cultures. The overview of the three types of rules in the regimes, helps to answer two questions related to epistemic cultures: *how do we know what we know?* (Knorr-Cetina, 1999) and *what makes justified beliefs justified?* (Steup, 1996).

This study explored the different epistemic cultures, highlighting their relations with the three types of rules. Besides the epistemic cultures of the three regimes, there was a crucial role for the epistemic culture of policymakers.

Policymakers operate in the epistemic culture of the scientists more than the epistemic culture of farmers, because many agricultural policymakers are academically educated (often in Wageningen) and have little practical experience in farming. A problem is the generalizing character of policies (as exemplified by the manure-injection regulations). The conditions of farms and their environments are so diverse that generalized policies do not seem to be suitable, nor functional or effective. As several stakeholders mentioned in the interviews, this is exactly the problem, those in charge of making the policies have too much of an academic

approach, while the logics and organisation of farm practice is determined by tacit, practical and local knowledge. This finding is relevant nowadays, for the changes toward more Nature Inclusive Agriculture require the importance for policymakers to take into account the farmers' knowledge and context instead of implementing generalized policies based on scientific knowledge.

With regard to justified believes, as part of epistemic cultures, research agendas are based on the believe that agricultural systems have to produce for the world market, a believe which is shared by resourceful companies in the agricultural sector (as confirmed by desk- research). WUR tries to communicate these research agenda's as serving the common good, framing it in terms of '0 hunger' and 'feeding the world'. While neglecting the perspective of food sovereignty and the believe that producing for local markets with diversity in agriculture is the way forward.

Moreover, with regard to the role of epistemic cultures in the three regimes, the findings of this study are in line with what Klerkx (2008) indicated concerning farmers' trust in the government. Farmers indicate not only a distrust in government policies, they distrust the intentions and support from Wageningen UR. The same is true for the farmers perception of the University of Utrecht, according to my interviewees, livestock farmers would not count on the veterinarian faculty to address their problems related to animal health. This seems to result from the distinct epistemic culture of the farmers in the production regime and the scientists in the science regime. In the epistemic culture of scientists, a technique or practice of which the functioning cannot be explained in words is easily rejected. In the production regime of the farmers, the practical functioning is more important then the explanation in words of how it exactly works. The research at hand also indicates the lack of generalists in the science regime, which makes communication between researchers and farmers hard, because at a farm (and in nature in general) everything is in dynamic interaction with everything else. If a scientist only has expertise on one detail this is an obstacle for their communication and collaboration with farmers, while exactly this would be desirable to enable the transition to more NIA. There is no formal incentive structure to stimulate communication between scientists and farmers. Articles for farmers' journals from Wageningen UR are written by the communication department instead of by the scientists themselves.

Intensive agriculture, which was promoted by the 'no hunger' discourse after the second world war and later the 'feeding the world' discourse, went hand in hand with a loss of skills and implicit knowledge needed for extensive agriculture. This is supported by examples regarding knowledge on grazing and use of herbal medicines.

The above mentioned regime rules exemplify the mechanism of stabilization of the regimes which slows down the transition to alternative approaches, due to the long captured interest of regime in production and scale-increase. The regimes seem to have integrated this 'privileged way forward' in their epistemic cultures.

MAIN RESEARCH QUESTION

The answers to the sub-questions together answer the main research question:

How do stabilizing rules in the vocational education, agricultural production and science regimes obstruct change toward more Nature Inclusive Agriculture in The Netherlands and how do they relate to epistemic cultures?

Most stabilizing effects found in this research derive from the deepest level, the *socio-cognitive rules*, including routines and taken for granted assumptions, enhanced by *regulative rules* especially incentive structures which stimulate actors to keep doing 'business as usual'. In the study at hand, it was found that this strongly related to the epistemic cultures of the regimes. The distinct epistemic cultures analysed with the rules in each regime, indicated that these distinct epistemic cultures can obstruct changes within the regimes as well as in collaboration among the regimes. The findings of this study suggest that in order for policymakers, scientists, AOCs and farmers to collaboratively make agriculture more nature inclusive, they will have to acknowledge the relevance and importance of each other's knowledge even if it does not fit with the logics of their own epistemic culture. Regulations may be in place (regulative) to promote change in the farmers regime (i.e. for Nature Inclusive Agriculture), but if regulations are not clear, or perceived legitimacy is missing (normative) the regulative rules will be less effective.

5.2 DISCUSSION

This chapter reflects on the main findings of the research in terms of its contributions to: the key issues of the case study, the research methodology applied to these issues, and the participatory approach. Firstly, I have to say, this study gives limited insights in change obstructing rules in the *policy regime*, whereas the findings imply that it was an important regime in interaction with the three regimes I did assess. No interviews were conducted with governmental policymakers. Nevertheless, relevant policies and their effects have been discussed per regime, in the sections on regulative rules. I believe this is sufficient and separate assessment of rules in the policy regime would have led to a lot of overlap in the results. This could also be interesting for showing the interlinkages.

While this study found a strong relation between the rules and the epistemic cultures of regimes, which seemed to mutually reinforce each other, the study at hand did not study the rules especially applying to the epistemic cultures, while this could have been an important focus.

Reflecting on this research, I see that the scope of my research is very wide and caused trouble in collecting data and presenting results in a coherent manner. I believe the study would have been of better quality if it would only focus on rules related to knowledge in each regime. In the best case, I would have done that from the beginning, so I would have collected more rich data with regard to knowledge and epistemic cultures. Also a focus on one element of Nature Inclusive Agriculture e.g. herb-rich pastures at dairy farms, was more likely to give strong results. I could have studied the knowledge and beliefs as well as practices around this specific topic in each regime and then make a stronger comparison and better indicate the stabilizing effects in and among the regimes.

Ten years apart, Bouma & Marijnissen (2018, Trouw De Staat van de Boer) and Klerkx, Grip & Leeuwis (2006), both indicated a similar problem that withholds farmers from making changes at their farm to serve the public interest: a lack of clarity of policies and regulations. Results in the study at hand confirm this and uncover a possible reason for these stabilizing effects. The observed differences in distinct epistemic cultures of farmers and scientists are relevant here. Policies are created by policy makers who often are academically educated and base their policies (partly) on academic research, whereas the characteristics of this kind of knowledge differ a lot from the characteristics of knowledge that is relevant at farm level, farmers' tacit knowledge. Likewise, critical studies emphasise a continuous predomination of developments serving the dominant perception of the 'privileged way forward' in agricultural systems (Lieshout et. al. 2013, Wiskerke 2003, Erjavec & Erjavec 2009). Moreover, the International Panel of Experts on Sustainable Food Systems report (IPES-Food, 2016) underlines, complexity and interlinkages at the farm level are often not recognized in research, since researchers are trained in their own specific discipline.

As the IPES (2016) report mentions that educational systems can act as a roadblock against alternative models and systemic approaches. In the book of Corcoran, Weakland & Wals (2017) Akpezi Ogbuigwe points out that environmental and sustainability education has to rearrange *the 'disorder' created by industrialization, unrestrained technological advancement, and inequities*. The findings of this study do not indicate that this is happening yet at the AOCs. The study at hand indicates that the efforts for integrating sustainability and nature inclusive agriculture in the OAC's education are still marginal and depending on individual teachers. The core of the curriculum is equipping pupil to work at conventional farms. Caution is needed for the reproductive character of vocational education, in times where transition and radical changes are needed in agriculture.

In the study at hand the three types of rules of Scott (1995) served as a useful analytical tool. In line with the suggestion of Geels (2004) the types of rules were used to explore the different stabilizing mechanisms in regimes. Throughout the analysis of the data, I noticed that interviews are not the best way to research the 'socio-cognitive rules'. This is understandable, for this is the deepest level, the beliefs of people about what reasonable others would do, the things they taken-for-granted, assumptions and habits (Scott, 2008). Socio-cognitive rules often exist beyond the awareness of the people involved, leave alone they could tell about it in an interview. This can better be uncovered by long-term participatory research, which was also done in this study by following the study group on Natural Livestock Farming and the consortium on sustainable development at the AOCs. The rules of each rule-type need their own way of approaching them in research, but if done properly, this division gives additional insights in where transitions get stuck. Moreover, when linked with the epistemic cultures from the beginning, the change obstructing rules with this specific focus could have been highlighted. This can give interesting results, because the differences in epistemic cultures stabilize collaborative change in the system.

The study uncovers the stabilisation of rules and routines in the scientific agenda setting and related governments innovation policies, regardless of their lack of effectiveness, which Leeuwis (2000) already warned for and The Netherlands Court of Audit also indicated (Kempkes et.al. 2011). When it comes to publicly funded

R&D, in which the public interest is to development creative ideas in order to facilitate change, Leeuwis (2000) recalls that a strong focus on pre-defined results may be counterproductive. I believe this study gives extra context and new examples which are in line with the finding of Leeuwis (2000) and it is an indication of strong stabilization to observe that almost 2 decades later Wageningen University & Research centre still predominantly composes the research agenda with -and in the interest of- actors from the conventional agro-food industry. They together hold on to a problem definition of 'feeding the world' as something that can be approached at a general level worldwide and can be solved with technological solutions. This is framed as the responsibility of Wageningen UR, by which they legitimize their practices and interferences in food systems all over the world (Wageningen UR Strategic Agenda 2018-2021).

5.3 RECOMMENDATIONS

Based on the findings of this research, especially related to the different epistemic cultures, it would be useful to assess what the role of more practically educated actors, as change agents, could be. This could be non-academic people with experience in farming, operating as knowledge brokers between the scientists and policy makers and the farmers. A study can be done on the changes in farmers' trust in policies when they are communicating with a practically educated and experienced intermediary (former AOC student) as compared to when they communicate with a (scientifically educated) policymaker directly.

Based on this study, I would recommend to assess the difference (i.e. in frames of meaning making) between WUR students with and without practical farm experience. Hypothesis could be that those with practical knowledge also have an increased awareness of the existence and importance of farmers' knowledge (as an epistemic culture distinct from the science culture) and can anticipate this better in their studies. A research site for this study could be The Farm Experience Internship, organized annually by the Farmers foundation, Stichting Boerengroep, in Wageningen.

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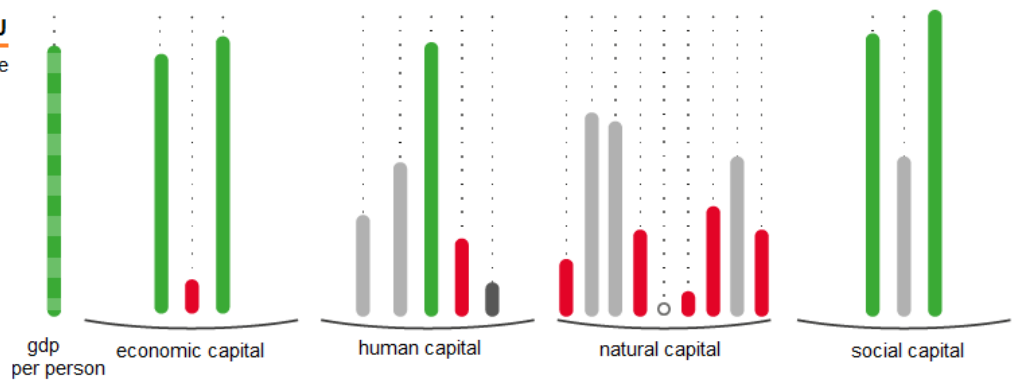
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APPENDIX I

Position in the EU

This figure shows the position of The Netherlands in the European Union per indicator.

- in top EU ranking
- middelposition
- low in EU ranking
- no data
- no color assigned



Source : CBS

Translated from CBS (2018)

Nature Inclusive Agriculture became a new buzz-word, but has similarities with the already existing policies under the name agricultural nature-conservation / -management (in Dutch: agrarisch natuurbeheer) (RMNO, 1998). The government indicates in various documents that it is time to change: transition agenda's, reports on Nature Inclusive Agriculture (NIA) measures & NIA in education. Both the NIA as described above and the RMNO (1998) publication emphasise: the recognition and use of ecological principles, integrated multi-functional land-use, diversity. The parliament's formal recognition of the importance of changes in agriculture, can be seen in the section on 'Living environment' in the Coalition agreement 2017-2021, which refers to the several transition agenda's (Regeerakkoord 2017-2021 p.46). In response to the growing attention for the loss of biodiversity in the Netherlands, the government presented the term 'Nature Inclusive Agriculture' (Erisman et al., 2017). Moreover, the Ministry of Economic Affairs assigned the task to the Louis Bolk institute and Wageningen Environmental Research to give a definition of NIA, create an overview of measures that farmers can take for nature inclusive agriculture on their farms and the effects of those measures and what this would require from the government (Erisman et al., 2017). This resulted in the three dimensions of nature-inclusive agriculture as presented in the table below. In 2017 when State secretary Van Dam (Ministry of Economic Affairs) informed the Dutch Parliament about the developments of Nature Inclusive Agriculture (NIA), he stated that he is not in the position to decide on the level of ambition (and facilitation) of the government for NIA and it was up to the new installed parliament to decide on this.

Three dimensions of Nature-Inclusive Agriculture

1. At the basis of a nature-inclusive system is the biodiversity that makes essential contributions to farm management, such as natural disease and pest control, pollination, water supply and purification, natural soil fertility and good soil structure. This is called functional agrobiodiversity. Nature-inclusive agriculture starts with the maintenance, strengthening and use of this biodiversity and the services it offers to the company.
2. By closing cycles on the basis of these services, more efficient use can be made of raw materials and the negative influence of business operations on the (natural) environment - water, soil and air - becomes increasingly smaller. This creates opportunities for specific species on the farm and in the surrounding landscape.
3. Finally, there is concern for the landscape and specific species on the farm. Due to the construction and maintenance of landscape elements, a green infrastructure on farms is maintained. This is important for the flora and fauna in the agricultural area. Landscape elements in turn also have a function in strengthening the functional agrobiodiversity on the farm.

APPENDIX III

Interviews	date	organisation/function
Remke	11/17/2017	Teacher aoc Citaverde Horst
Bart-Jan	12/7/2017	Agrovista agricultural real-estate broker
Hans	4/30/2017	Veterinarian
Maria	3/9/2017	Rikilt research (WUR)
Heleentje	7/18/2017	Nordwin sustainability coordinator
Rob	9/27/2017	WUR plant research
Geert	10/13/2017	Teacher AOC (expert-team)
Michal	6/29/2017	Groenhorst sustainability coordinator
Hens	10/30/2017	Affiliate Professor Nature Inclusive Agriculture WUR
Anne	4/29/2017	Stichting Living Lab natuurinclusieve landbouw
Gidi	10/24/2017	former WUR researcher
Annelies	6/29/2017	Clusius sustainability coordinator
Jan Hulsen	11/3/2017	Vet-vice en auteur koe-signalen
Esther	10/9/2017	Teacher AOC (expert-team)
Ab Groen	11/20/2017	Director Helicon / AOC-council / former WUR key-figure
Nout van de Vaart	7/29/2018	Hivos expert on agricultural policies
Godert Wytema	7/28/2018	Former AOC – Warmonderhof – HBO student, perma-culture
Harmen Riphagen	8/1/2018	Farm inspector for the Government's NVWA
Participatory research	date	organisation/function
Dairy farmers at Movie-W docu	11/8/2017	Farmers concerned / WUR researcher + PHD / civil society
Natural Livestock Farming group	Apr-May-2017	Farmers - Veterinarians - NGO workers - Researcher
Debate Veetelers	6/13/2017	Animal science students - NLF - WUR lecturer Kees v Veluw
DOTduurzaAOCs	11/8/2017	Aeres + various AOCs + AOC-council
dialogue Wageningen debating	11/13/2017	Animal Science Group
Sustainability at the Farm	3/15/2018	Wageningen Campus Connect
Resilience symposium ASG	12/19/2017	Van der Peet, 2017 WUR Resilience Symposium, 2017
NLF conference 2018	3/8/2018	Natural Livestock Farming
Informants from field	date	organisation/function
A H Kaasjager	12/12/2017	former Farmer / board member productschap milk
Pieter	11/9/2017	Dairy farmers and owner of cheese factory, Remeker
Teus	11/19/2017	Farm worker at various (conventional) dairy farms
Jan Wieringa	4/9/2018	Veld & Beek Community Supported, bio dynamic dairy farm
Erik Toussaint	3/27/2018	Plant Research Institute WUR. at 'Cutting across the Silos'
Van der Peet	12/19/2017	WUR Resilience Symposium, 2017
Rik van der Kooij	3/29/2017	Manager of Agro farm shop. phone call

APPENDIX IV

ATLAS.ti Cooccurring Codes

HU: gecodeerd op rules & knowledge – pressure – initiatives

File: <\\wurnet.nl\\homes\\meer048\\My Docu...>gecodeerd op rules & knowledge – pressure – initiatives.hpr7]

Edited by: Super

Date/Time: 2018-03-14 16:31:24

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