



Motivating Sustainable Agriculture

Change Applied to the Island of Samsø

Thesis to Achieve the Academic Degree of M.Sc. in Environmental Management

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SYNOPSIS

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Conventional has increased food production significantly with less human labor involved but not without entailing high costs for farmers, communities and specifically for the environment – consequences that cannot be carried for much longer.

The transition to more sustainable agriculture is not only desirable but necessary, given numerous long-term benefits arising through this re-orientation. Applied onto a local setting such as the island of Samsø, the focus point in this thesis, more concrete measures are exemplarily investigated and elaborate how local communities can motivate change in agricultural systems.

Based on the principle of change management this thesis gives an overview of the necessity of change and an insight into the complexity of motivating sustainable agriculture focused on the supply side, hence the farming community.







PREFACE

This thesis, *Motivating Sustainable Agriculture: Change Applied to the Local Setting of Samsø*, was written in the period from 01st of February – 10th of June 2010 to achieve the academic degree of Master of Science in Environmental Management in the Faculties of Engineering, Science and Medicine at the Department of Development and Planning at Aalborg University.

The paper aims at identifying the need for change, the alternative to current practices as well as tools and measures that help communicating change in the agricultural sector limited to the island of Samsø in Denmark as an exemplifying setting. The following thesis is thus based on the principles of change management applied to a sector. It analyses how Sustainable Agriculture can be motivated in a local setting and is thus directed at the community of Samsø, groups and organizations such as the Farmers Associations who engage in agriculture with the interest of transforming agriculture into a more sustainable one - environmentally sound, socially acceptable and economically viable. It also addresses professors and students at the university interested in the topic. Furthermore ministries can extract valuable information about local agricultural circumstances and the possible methods that can be applied in a community environment.

Based on a thorough literature analysis as well as ten semi-structured interviews, the report aims at giving a holistic overview through the consultation of various sources, referenced in the Chicago 15th Edition (Author-Date) referencing style.

Pictures used in the paper where no source is indicated were taken during a visit of Samsø in June 2010.

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Enjoy the reading!



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1 INTRODUCTION

“Modern agriculture has brought significant increases in food production. But the benefits have been spread unevenly and have come at an increasingly intolerable price, paid by small-scale farmers, workers, rural communities and the environment.”

(UNEP 2008)

In 2009 the International Assessment of Agricultural Knowledge, Science and Technology for Development issued a report on the global state of agriculture and the need to fundamentally change the way how agriculture is done. Environmental degradation, social injustice, and hunger are only a few problems mentioned in the report. Over the last years voices grew louder calling for a mitigation of agriculture away from a focus “[...] on production alone,” as it “will undermine our agricultural capital and leave us with an increasingly degraded and divided planet [...]” as Professor Bob Watson, Director of IAASTD pointed out. (UNEP 2008; IAASTD 2009)

Humankind has changed the environment ever since its existence. In agriculture this change is even more visible. Forest areas have been clear cut; vast areas are planted with the same crop, leading to a degradation of the environment throughout the world. It is estimated that approximately 23% of agriculturally usable land that has been cultivated is degraded to the extent of not being productive anymore, primarily through soil erosion. (Sachs and Santarius 2007, p 23)

The introduction of this paper is aimed at giving an overview of concepts that are important for further understanding of the paper. This includes definitions of Sustainable Development as well as an introduction about the Danish island of Samsø and the reasoning why it was chosen as an exemplary case. Furthermore the research scope and the limitations of this thesis are presented.

1.1 Sustainable Development and the Extension of its Definition

In order to understand what is meant by sustainable agriculture a definition of sustainability will be provided in the introductory section. The basic definition of one of the most cited and most popular sources for the definition of “Sustainable Development” - the Brundtland report, is then later on used to define sustainable agriculture (Chapter 3: Sustainable Agriculture).

Published in 1987, this report is aimed at not only reviving the talks of the United Nations Conference in Stockholm in 1972 and also to prepare the Earth Summit in Rio de Janeiro in 1992 but also to attract public attentions for the necessary actions due to current problems with issues such as food security, the environment and energy. Our Common future was also the first publication to publicly define the term “sustainability” and “sustainable development” and call for united action at the same time: (Buttel 1993, pp 175-186, p 178; WCED 1987)

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs”
(WCED 1987, p. 43)



(Source: Codeva, 2008)



Despite the world wide recognition voices of criticism were raised. A focus on economic growth rather than sustainability through the combination of the world sustainability and development was criticized by Wolfgang Sachs and also the Club of Rome argued against this focus in the publication “Limits to Growth”. The prioritization of economic growth over environmental and human needs was the core of raised disapproval. (Sachs 1999, p 81-89)

Furthermore the interpretability of the Brundtland report and how the general formulation of the concept of sustainable development leads to false declarations of different concepts to be in line with the definition has been disapproved of. Despite its general definition the report though explicitly states that one of the core problems of current western society is the fact that it lives beyond its means to sustain itself and is thus menacing the planet’s ecological resource base as well as the health of the whole biological system. (Baker 2008, pp 113-133, p 117-119)

The critical voices are important to understand then despite the fact that the Brundtland report was the first to define sustainability, the interpretability is wide and the definition changes with every cultural setting and hence the prioritization for this local community. Consequently, as shown in Chapter 3, the definition of sustainable agriculture is by far not easy and uniform. Rather it again depends on settings and how much different aspects are valued. (Yunlong and Smit 1994, pp 299-307, p 299)

A high importance lies in the statement that sustainability not only looks into environmental sustainability, but looks at the world as a wholesome system. Therefore sustainability includes not only the environment, thus a call for a reduction of the harm done to nature to an essential minimum whilst making sure that resources are not depleted without being replaced, but also the people and the economy, known as the three pillars of sustainability (See Fig. 1.1) announced in the UN Rio Conference in 1992 - environment, society and the economy.



Figure 1.1: Three pillars of sustainability

Source: (WCED 1987)

In the course of an International Conference on Environment and Society - Education and Public Awareness for Sustainability in Thessaloniki/ Greece in 1997, the three pillars of sustainability were expanded to a more complex picture providing a holistic view on the issue. The Declaration of the conference refers to how sustainability can be accomplished with the following words:

“In order to achieve sustainability, an enormous co-ordination and integration of efforts is required in a number of crucial sectors and rapid and radical change of behaviors and lifestyles, including changing consumption and production patterns. For this, appropriate education and public awareness should be recognized as one of the pillars of sustainability together with legislation, economy and technology.” (UNESCO 1997)

The conference concludes that the three pillars alone do not paint the whole picture what should be included to work on a more sustainable world and therefore need to be completed.(UNESCO 1997) Prof Scoullou (2009), Professor at the University of Athens,



states that the initial three pillars of sustainability, representing the areas, where sustainability needs

to be achieved require certain tools. (Scoullos 2009) These tools are defined as the following:

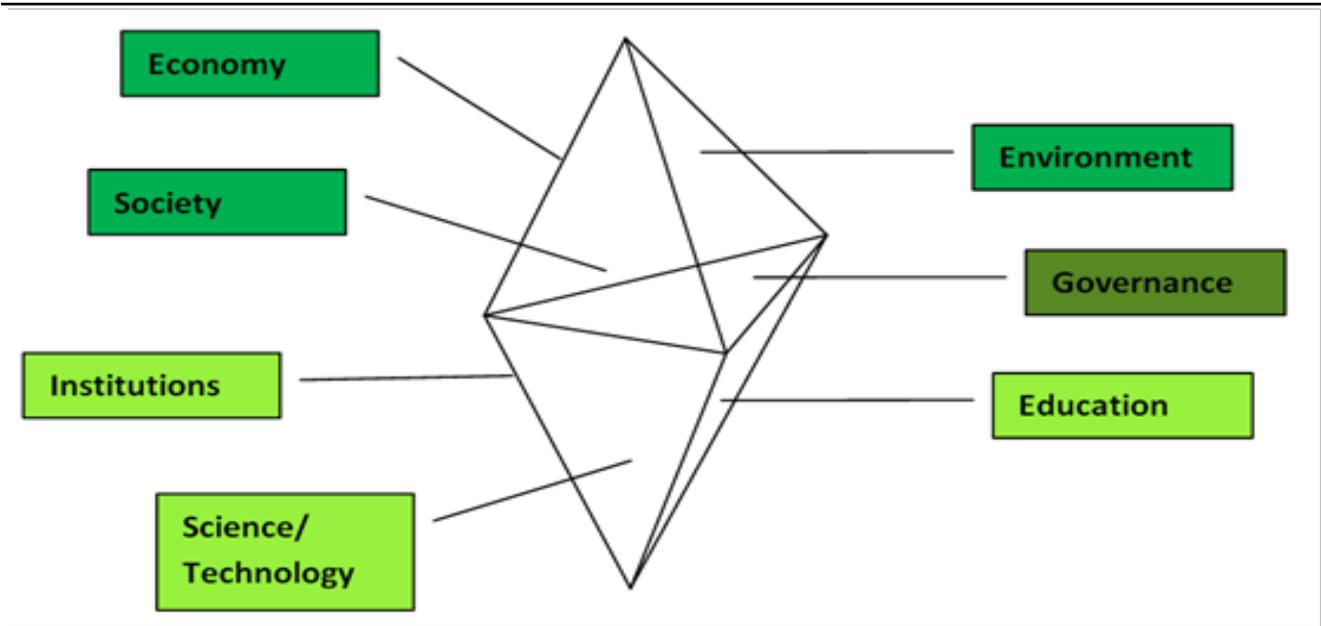


Figure 1.2: The extension of the basic definition of sustainable development

Source: Drawing after (Scoullos 2009)

Institutions

The sustainability tool Institution includes bodies and organizations that are dedicated to work on transforming the society, the economy as well as the relation to the environment into a more sustainable unit.

Education

Education as a whole is an essential part to achieve sustainability. Learning not only requires learning in itself, learning to learn, learning to act and learning to be, but also the process of unlearning to be able to change. This includes an unlearning of wrong behavior or wrong perceptions of different things. Prof Scoullos includes training, retaining, capacity building, public awareness and general education into the toolset for sustainability

Science/ Technology

Science and Technology are additional tools that can help to facilitate the process, such as through

modern communication systems, or the production of items that help e.g. reducing the environmental pollution

Governance

Governance is the connecting entity between the three pillars and the tools. A strong government provides legislations and regulations that facilitate the development and supports action for its achievement. It helps to foster using the given tools to attain more sustainability in the society, the economy and the environment.

Depending on the country/ region a cultural change might also be necessary. Sometimes cultures need to radically change their behavior while other cultures are already living in harmony with nature and pursue a more sustainable lifestyle overall. In general, an anxiety can be recognized in the society concerning change: While part of society perceives the world as not changing, as the same problems are still



occurring and humans are not considered to change their behavior, another part believes that the world is changing so fast that society cannot keep up. (Scoullous 2009)

The extension of the initial three pillars of sustainability underlines the importance of change in all aspects of society in order to be able to achieve sustainable development. Six elements will be visible throughout the thesis: Economic viability, social acceptance, environmental soundness as well as a focus on the education part of sustainability supported by governance, institutions and local communities. This underlines the importance of networks that act in a supportive role.

1.2 Denmark and the Island of Samsø

With a total land area of 4,243,000 ha with 2,663,000 ha agricultural land and 2,306,000 ha being arable land, thus used for crop production, Denmark is dominated by agriculture with in regards to area by 62.76% and 54.35%, respectively (For Graphic Illustration see Appendix A) (FAO 2010). Agriculture, despite the land domination only had a 3.88% share of the GDP in 2008 (Gross Domestic Product) of

Denmark accounting for DKK 67 400 million (StatBank Denmark 2010a; StatBank Denmark 2010a; StatBank Denmark 2010b) . Denmark has a total of 1,419 islands which are bigger than 100 m² of which 433 are named (Danish Ministry of the Environment 2003).

With a total area of 114 square kilometers (Strong 2009) Samsø is located in the Kattegat southeast of Århus, Denmark. The island with its 4,010 inhabitants (StatBank Denmark 2010c) is mostly dominated by tourism as well as agriculture.(Andersen et al. 2003, p 18-22) Samsø is world famous for the achievement of turning itself into a 100% energy self-sufficient island. The project was initiated in 1997 through a governmental competition where its 10 year plan won. Under the lead of Søren Hermansen, a former farmer, the local community engaged together in the task to transform the island and increase the independence from external energy supply. (Balzter 2009; Danish Energy Agency n.d.; Hermansen, Søren 2010; Sustainable Cities n.d.; The Independent 2009; Walsh 2008) After 10 years the island is though not resting on its laurels. Rather Søren Hermansen has already planed further projects such as building a biogas plant to not only supply the island with heating and electricity but also with gas to power vehicles such as

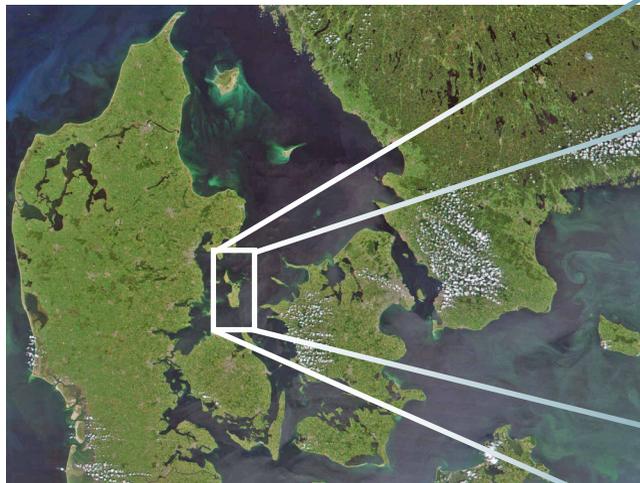


Figure 1.3.: Map of Denmark and Samsø
(Source: EUNIL n.d; Steen 1987, p 284)



tractors and to supply the farmers with local and cheap fertilizer, both for organic and conventional farming. Mr. Hermansen though also sees the necessity to turn the island's agriculture around and produce more high end products such as organic produce to outweigh the downside of Samsø, transporting all the produce to mainland Denmark. This task though seems slightly difficult in regards to common support by the local community, as the response of the farmers was: "You take care of the energy and leave the farming to us." (Hermansen, Søren 2010)

1.3 Problem Analysis

The following short sequence aims at clarifying the reasons up front which led to the investigation of Samsø as a case onto which change management was applied. Despite just shown local scepticism, Samsø has experienced a lot of environmental challenges that were created through the intensification of agriculture and which demand for solutions. These problems expand to a worldwide scale and have thus been investigated before. Samsø is seeing the following problems in regards to agriculture (Hermansen, Søren 2010; Thorling 2010; Ravn Nielsen 2010; Madsen 2010):

Environmental Problems

- Soil compaction, Loss of soil fertility and soil quality
- Soil erosion
- Increased nitrogen content in the soil
- Contamination of ground water with nitrogen
- Fertilizer runoffs into the Kattegat, thus contributing to a die-off of fish and marine life

Economic problems

- Indebted farmers due to High dependency on synthetic fertilizers and pesticides thus a high dependency on oil, high interest rates by the bank to stay in business, low prices for produce
- Rising cost for transport of goods to and from the island

The loss of soil fertility can be solved by fertilizers, but only in the short run. The same dilemma applies for pesticide use which has caused resistance in insects and plants and thus calls for the development of new chemical products as a short-term solution. (Brennan and Withgott 2005, p 268, p 272; McWilliams 2010; Laumer 2010; Duncan Brown 2003, p 215-219) As oil prices are predicted to increase by 60% over the next 30 years until 2030, the prices for synthetic fertilizers, pesticides as well as fuel costs will go up. (Danish Energy Agency 2010) In the long run agriculture needs ne new approach to solve these problems and to escape the dependency on a limited non-renewable resource that will end. (IAASTD 2009; The Economist (Author unknown) 2009, p 82, 2/3p)

These main problems as well as the unique setting of the islands asked for investigation of possible solutions. The following thesis is thus examining how change can be anticipated and how farmers can be engaged actively together with the local community to work on a transition towards more sustainable agriculture. With the context of Samsø the paper aims at supporting the local efforts to motivate more sustainability on the fields of the island and to elaborate which tools could be utilized to try to actively engage to community. Due to the complexity of the situation as individuals are engaged and as it would be rather a voluntary move of a bottom up approach and not a forced transition initiated by the government, the offered solutions are by no means guaranteeing success. Rather than supplying a guide to success the paper aims at giving ideas and suggestions of how motivation can take place.



(Source: IICA 2010)



1.4 Research Scope

This paper aims at clarifying the following main research question and at giving possible methods of resolution to motivate sustainable agriculture:

How can change towards more sustainable agriculture be motivated by the local community in the context of the island of Samsø?

The answer to this question shall contain a process related approach according to the principle steps of change management. (For a thorough explanation of the mechanisms and steps of change management, see Chapter 3: Theoretical Framework, Nr. 3.1. Change Management) The overall goal is to help the community of Samsø to convert their island into an island that is not only known for its energy related self-sufficiency but also sustainable agriculture and thus convert the island more and more into a sustainable island. Benefits as well as barriers for this development are outlined and discussed.

The sub-questions, aimed at supporting the investigations for the main research question, are structured accordingly. The following sub-questions shall help to answer the main research question. The structure of the sub-question is in line with the structuring of the report and thus leans onto the principle steps of change management (Hayes 2007, p 82-87). Sub-question I & II are of general nature and explain the need for change from a general perspective with examples from Samsø in order to view this thesis not as a singular case but as a paper describing an overall necessity for change towards sustainable agriculture. In order to apply gathered knowledge onto a local setting to be able to exemplify the findings, Samsø was chosen. Søren Hermansen referred to questions about the possibility to replicate the Samsø energy case in other areas, not necessarily islands: "There is always the possibility to take parts out of the project and apply it to the local settings. It is not a one-time solution but certain aspects can certainly be tried out" (Hermansen, Søren 2010).



How can a need for change in current agricultural practices be identified?

What are the alternatives to conventional farming?

What are the tools and mechanisms to support & foster change in agriculture?

How can communication be used to motivate change in the context of Samsø?

Figure 1.4: Change management process and related sub-questions



SUB-QUESTION I:

How can a need for change in current agricultural practices be identified?

This question shall identify the current problems that arise in agriculture and puts it into a historical perspective to investigate how these problems evolved and what they were caused by. The question aims also at mentioning the positive aspects of conventional agriculture. These elements shall then help to judge if a change in agricultural practices is necessary and desirable.

SUB-QUESTION II:

What are the alternatives to conventional farming?

The 2nd sub-question examines the possible alternatives to conventional farming, also by putting it into a historical perspective. It looks into the definition of sustainable agriculture and to then elaborate which possible solutions can be provided to the problems found in conventional agriculture, but not without critically elaborating which aspects still needs to be improved.

SUB-QUESTION III:

What are the tools and mechanisms to support & foster change in agriculture?

The third question reflects upon the possible tools that can be found in theoretical literature. Two theoretical focus points will be taken to answer this question: change management supported by environmental communication. It is explored how change can theoretically be introduced and which communicative tools can be used on a community level to motivate this change.

SUB-QUESTION IV:

How can communication be used to motivate change in the context of Samsø?

The fourth sub-questions aims at investigating how change can be applied on the island of Samsø to help the local community to convince and engage farmers in the change process. It examines how Samsø can mitigate negative environmental impacts of agricultural practices and how the local community can be involved in it.

Throughout this thesis, thorough literature review has been undertaken to build the foundation of understanding for the discussed topic. Sustainable agriculture is the overall framework of this thesis, narrowed down to the local applicability on Samsø. The research will focus on sustainable agriculture of crops, disregarding animal husbandry, thus “1st generation agriculture”. Nonetheless important connections between the two sectors with in the agricultural industry will be displayed to underline the dependence of the industry on each other as well as the potential positive change that is possible through an adjustment in agricultural practices.

In regards to the term community, this thesis understands the term as the local group of people, who can help to motivate sustainable agriculture by motivating the farmers. Hence this thesis specifically observes the motivational aspects that associations, municipalities and other organizations such as the Energy Academy contribute towards a more sustainable development.



1.5 Problem Delimitations

Due to resource limitation of this thesis as well as the wish to thoroughly investigate one specific area of the problem the thesis is delimited from numerous aspects that would add to the level of holism and thus present a more diverse picture. The motivation of change, whether it is in agriculture or any other area, requires alterations on multiple levels. Through a focus on the motivation of the local community in regards to sustainable crop production the following factors will not be examined despite their relevance and importance to the topic as a whole:

- Behavioral change on the consumer's side, the anticipation of change, the stimulation and motivation of demand and the contribution to the overall advancement of sustainable agriculture will not be discussed
- Furthermore there is no thorough investigation on what the market regulatory requirements are to support the efforts towards more sustainable agriculture and how local governments and municipalities can contribute financially but also regulatory towards sustainable development. Also an expansion onto an EU level is not being examined.
- As the thesis limits itself to crop production, livestock, its' environmental impacts as well as how sustainability can be motivated will not be reflected upon. An investigation of "2nd generation agriculture" (1st generation agriculture = crop production, 2nd generation agriculture = meat production fed from produce of the 1st generation agriculture) is therefore not part of this paper. This thus also excludes the discussion about sustainable meat consumption thus eating less meat in order to ensure a higher energy conversion by feeding grain to people rather than to animals, as much larger quantities of grain are required, thus leading to a much higher energy balance

- This thesis also refrains from investigating how EU and worldwide policies add to the unjust distribution of food and how policies and requirements by the WTO foster unsustainable agricultural practices in 3rd world countries. (Shiva 2002, pp 11-70, p 13-21)
- Last but not least the complex discussion of genetically modified organisms in agriculture is not included in this paper, despite their topicality.



2 METHODOLOGY

The subsequent chapter aims at clarifying the following aspects:

- How and in which sections the sub-questions (explained in Chapter 1) will be answered,
- Which research methods were applied to answer the main research question and hence all sub-questions,
- The reasoning behind the chosen methods, thus a justification, and
- The fulfillment of social research criteria by the report: reliability, replication and validity. (Bryman 2008, p 30)

2.1 Structure of the Report

This section will highlight the structure of the thesis which supports answering the main research questions as well as all sub-questions. The report is structured into four different parts, providing a step by step approach to answer the research question as well as the sub-questions.

1st Chapter – Introduction: The first part supplies an overview of the problematic, defines the concept of sustainable development and introduces the change focus: the island of Samsø. Furthermore the research focus is presented the limitation of this paper.

2nd Chapter – Methodology: The methodology part aims at providing the research framework that allowed this thesis to develop, including a description and justification of applied methods.

3rd Chapter – Theoretical Framework: The theoretical framework builds the basis for the following

analysis of literature applied onto the case of Samsø. Two major theories were chosen for their applicability in this thesis: the theory of change management and environmental communication theory.

4th Chapter – Change towards Sustainable Agriculture: The 4th chapter stands the scientific basis for the thesis, thus supporting the discussion in respect to change in agricultural practices, identifying the need to motivate sustainable agriculture and reflects upon environmental issues which are not only relevant for the small island of Samsø but also on a worldwide scale.

5th Chapter – Motivating Sustainable Agriculture – A Case Study of Samsø: This leads to the 2nd main chapter and analysis of the local situation on Samsø, the potential for the island through conversion to more sustainable agriculture as well as the solutions that can be applied to achieve this transfer but not without mentioning the challenges that the island is likely to face during the process of motivating more sustainable agriculture. The chapter ends with possible paths for the community of Samsø illustrating how to address this topic.

6th Chapter – Conclusion: The conclusion summarizes the findings as well as answers the research question as well as the sub questions and engages into a short critical discussion about findings and the approach that has been taken for this paper.

7th Chapter – Recommendations/ Perspectives: The last chapter of this paper gives recommendations for further research and puts the findings into a more holistic perspective to open up the discussion for other areas of interest and importance.

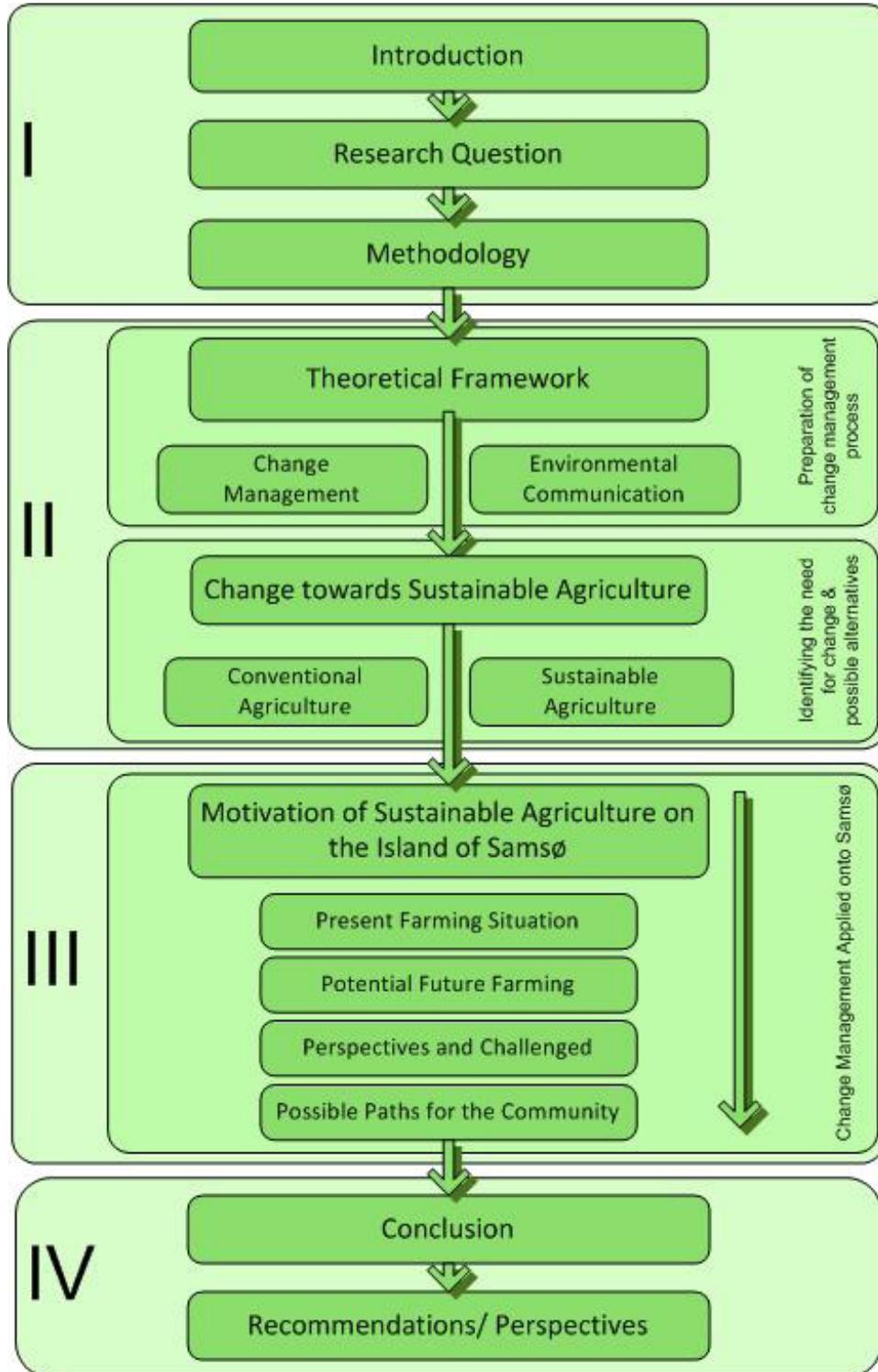


Figure 2.1: Structure of the thesis



2.2 Theory of Science Applied

Different concepts within the area of theory of science can be identified as relevant for the project.

Phenomenology

Phenomenology builds an essential part of the way research was done for this project. Botin (2010) describes phenomenology based on the incorporation of the phenomenology theory, Edmund Husserl [1859-1938]. He points out that phenomenology aims at surpassing the subjectivity of different subjects to replace the subjective research process with an objective procedure. (Botin 2010)

In order to ensure the pursuing of phenomenology three rules need to be followed (Botin 2010, p 30):

1. Rule of brackets: Subjective views on certain subject, hence knowledge as well as predetermined opinions including prejudices have to be excluded and ignored for the time research is conducted.
2. Rule of descriptions: the description of phenomena has to be ranked first before the explanations.
3. Rule of equalities: All sources of information have to be considered of equal relevance and equal truth. Only after the collection, a pre-justice free interpretation can be anticipated.

Part of this paper also addresses questions of the **Empirical-Analytical Methodology**. The methodology can be described as seeing the human mind which can learn only through experience (Botin 2010). Empirical-Analytical research methods aim at observing and drawing conclusions on the observed. A priority is placed onto "critical multiplism" which indicates that it is tried not to rely on only one single source but rather investigate a large variety of sources in order to obtain a more complete picture of the subject. (Connell 1997, pp 117-132, p 120-121) As environmental communication and the success of

change management largely depend on subjective behavior it is acknowledged that the success of solutions provided for the communicative aspects on the island of Samsø are cannot be expressed with 100 percent certainty.

During the research process, three different questions can be asked (Connell 1997, pp 117-132, p 121):

1. Ontological: what is the nature of reality, thus what is the truth?
This question calls for a critical analysis of multiple views about a certain issue before judging and concluding, which was the basis for the procedures in this thesis.
2. Epistemological: what is the nature of the relationship between the knower and the known?
Favoritism for more sustainable agricultural practices has been set aside during the procedure of research. The possibility of influencing the writing was tried to be avoided by openly examining the opinions that are raised against more sustainable agricultural practices as well as investigating the positive sides of conventional agriculture and thus objectively looking at different papers and investigations.
3. Methodological: what are the procedures for finding out knowledge?

Quantitative as well as qualitative data needed to be gathered, as this thesis combines the "hard science", hence natural and engineering science with an analysis of current agricultural practices as well as the "soft science" or social science hence focusing on communication and social aspects that needed to be included into the analysis.

The concepts described in this section were applied throughout the paper, specifically when conducting a comparative analysis of conventional agriculture and organic agriculture, used as one type of more sustainable agriculture.



2.3 Research Design

The different steps of this thesis are designed according to the “main steps in qualitative research” (Bryman 2008, p 370), as shown below in Figure 2.2.

Through focusing on the specific setting of Samsø this thesis is partially conducting a case study of exemplary

nature (Jamison 2010), as a local community is moved into the focus of research (Bryman 2008, p 53) after examining rather general scientific data. Samsø is used primarily as an example to put change management into perspective applied onto the issue of agriculture. This aims at clarifying concepts of change in local area and at answering the questions: how change can be applied and what the difficulties are that local communities are facing when anticipating change?

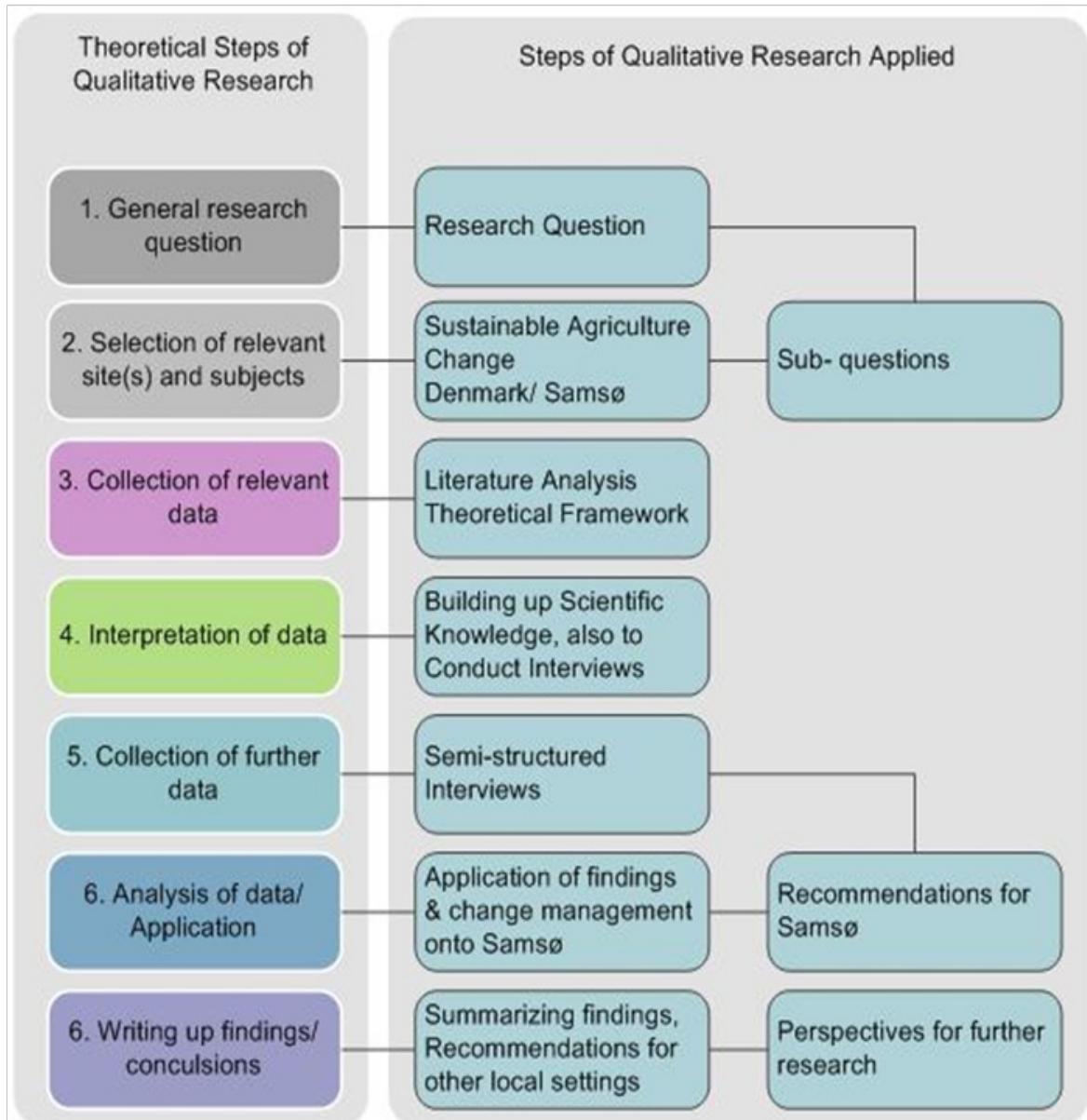


Figure 2.2: Main steps of qualitative research, Source: (Bryman 2008, p 370)



2.4 Applied Methods

As already outlined in the introductory chapter, several sub-questions were defined to support research for the primary question. In order to answer the research question the sub-questions were

fragmented into different chapters aligned to the overall process structure of a change management process. The following table illustrates this division of the sub-questions, the applied methods and how the questions support the goal of answering the main research question of this report:

	Chapter focus	Applied Method	Outcome/ Support for main research question
How can a need for change in current agricultural practices be identified?	4+5	Literature research, Semi-structured interviews	Building the basis for argumentation for the needs for a change in farming
What are the alternatives to conventional farming?	4+5	Literature research, Semi-structured interviews	Laying out the alternatives to conventional agriculture with its advantages, disadvantages and communicative misconceptions
What are the tools and mechanisms to support & foster change in agriculture?	3	Literature research, Semi-structured interviews	Analyzing the possibilities and tools to motivate change on a theoretical basis and then applied onto the research case of Samsø.
How can communication be used to motivate change in the context of Samsø?	3+5	Literature research, Semi-structured interviews	Creation of an action plan to motivate sustainable agriculture through defining tools, measures and participants

Table 2.1.: Chapter foci, applied methods and outcome/ support for the main research question

The methods used stretch from extensive literature analysis in order to elaborate the current state of knowledge about conventional as well as alternative farming. Furthermore comparative studies between papers in favor of one or the other type of farming were undertaken to obtain a more diversified view over current scientific evidence, findings and discussions.

These literature studies were supplemented with semi-structured interviews with various experts on the field. These experts were all based in Denmark, to knowledge about problems occurring in Denmark. In addition to that, semi-structured interviews were also used to supplement only limited literature available about the island of Samsø. The intensive examination of the current agricultural situation on

the island of Samsø enabled an analysis supported by literature research examining the overall state of global agriculture but by retaining focused on the Danish Island case.

By focusing on the Danish Island of Samsø, scientific research in regards to sustainable agriculture is applied onto a real case scenario. This case analysis includes a thorough examination of the needs of the island and possible adjustments that help Samsø to move its agriculture onto a more sustainable path. Furthermore a plan is compiled, designated to help the community of Samsø to communicate with farmers and to stress the need for communication in the first place.



2.4.1 Literature Studies and Document Analysis

Literature analysis was conducted to obtain essential information about supportive theories of change management and environmental communication that were applied.

In Chapter 3 (Theoretical Framework) the discussion about change management is mainly based on Hayes (2003), who has comprised a lot of different views on change management in his publication including several different developed models with different foci.

In addition to that, scientific knowledge in regards to agriculture was acquired through the study of books, scientific articles and relevant homepages. Hereby different polarized as well as well balanced studies were read to obtain information about opinions of authors in favor of conventional agriculture and authors in favor of more sustainable agriculture. Furthermore scientific understanding of agricultural processes and the supportive systems were obtained through literature.

The accessibility of English literature specifically directed at Samsø was limited. The linguistic barrier was especially evident, as the majority of publications or scientific papers by municipalities, ministries and research institutions were mostly solely available in Danish. Occasionally Danish texts were translated as no information was available in English. Hence the translation and the use of information might be subject to slight errors and misunderstandings. Therefore the 5th Chapter: Motivating Sustainable Agriculture with a focus on Samsø is primarily based on semi-structured interviews. (See 2.2.3. Semi-Structured Interviews)

The following literature sources were used:

- Scientific publications
- Books related to the subject
- Reports and documents by Danish municipalities ministries, and governmental agencies
- Documents/ Directives by the European Union

- Documents and reports published by organizations/offices of the United Nations (FAO, UNEP etc.)
- Newspaper articles
- NGO's publishing
- Relevant homepages on the internet

Literature analysis was necessary throughout the report to confirm statements by interview respondents as well as to further investigate specifically mentioned areas of interest.

2.4.2 Semi-structured Interviews

"...typically refers to a context in which the interview-er has a series of questions that are in the general form of an interview scheduled but is able to vary the sequence of questions. The questions are frequently somewhat more general in their frame of reference from that typically found in a structured interview schedule. Also the interviewer usually has some latitude to ask further questions in response to what are seen as significant replies."

(Bryman 2008, p 196)

To obtain expert information the main research methodology next to a thorough literature analysis was the conduction of interviews. As a type of interview semi-structured interviews via the telephone were chosen for the following reasons:

- Predetermine a set of questions that needed to be answered for the thesis as literature as well as case reports on the topic are non existent
- To allow the respondents to answer freely and thus point into directions that need further investigation
- To allow asking further into different areas which were stressed during the interview and thus obtain more detailed information



The majority of the eleven conducted interviews were single time telephone-interviews. Knud Ravn Nielsen, Lærke Thorling, as well as Søren Hermansen were contacted twice for a follow up interview. The order of interviews was partially planned with certain respondents, as some held expertise that was required in order to prepare questions for the next interview. The interviews were conducted in the order as displayed in the table below but varied from the initial plan due to availability of the respondents.

The interviews were recorded and subsequently transcribed. The transcription of the interviews can be found in the Appendices E-P. Interviews were attached in the document due to their importance and frequent use within the paper.

In order to grasp a holistic picture of the current situation on the island of Samsø several respondents were chosen to be interviewed to build upon their expertise and knowledge in the specific field of research.

Organization	Name	Position (Danish term)	Reason for contacting
Ministry of Food, Agriculture and Fishery	Carmen Calverley	Department of Organic Farming Responsible for Inspections of the farms	Initial questions about the development of organic markets in Denmark and reasons for this development
	Jesper Kaae	Department of Organic Farming Head of Department (Kontorchef)	Knowledge about the development of the Organic market in Denmark and the obstacles for farmers to turn organic
Samsø Landboforening (Samsø Farmers Association)	Erik Grenaa	Consultant: economy, real estate, family law (Konsulent: Økonomi, ejendomshandel, familiejour)	Staff member of Samsø based farmers association Close contact with local farmers
	Knud Ravn Nielsen	Department for Plant Cultivation Consultant (Konsulent Planteavlsafdelingen)	Staff member of Samsø based farmers association Close contact with local farmers
Danish Ministry of the Environment	Marlene Linderoth	Special consultant (Specialkonsulent)	Green Growth Agreement - policy part
	Anita Fjeldsted	Danish Environmental Protection Agency Function Manager, Agronomist (Funktionsleder, Agronom)	Green Growth Agreement – Pesticide regulative part
Farmers	Morten Øster Kristensen		Organic Farmer on Samsø
	Åge Madsen		Conventional Farmer on Samsø



Organization	Name	Position (Danish term)	Reason for contacting
Energy Academy on Samsø	Søren Hermansen	Director of the Academy	Former farmer, leading Samsø to a significant change in energy sufficiency through communication and cooperation with the local community and farmers
Økologisk Landforening (Organic Farmers Association)	Sven Hermansen	Advice Manager Technical Team (Rådgivningschef Fagligt Team)	Former Samsø inhabitant and consultant for organic farming
GEUS – Nationale Geologiske Undersøgelser for Danmark og Grønland National Geological Survey of Denmark & Greenland	Lærke Thorling Sørensen	Department: Ground water and quarterly archeological mapping (Afdeling: Grundvands- og Kvartærgeologisk Kortlægning) Ground water monitoring Grundvandsovervågning	Expert in Samsø based projects on nitrogen/ pesticides
Bæredygtig landbrug (Sustainable Farmers Association)	Christian Castenskiold	Chairman of the association	Critical voice of the Green Growth Agreement and Conventional farmer

Table 2.2: List of respondents for the conducted semi-structured interviews

2.4.3 Validation of Sources

In order to enable the evaluation of the chosen research methods, the following criteria are briefly analyzed to defend the methodology applied in this thesis. Chapter 6, the Conclusion, will examine the findings according to the criteria of social research: Reliability, replication, validity.

The validation of sources are based on personal judgment of a high level of scientific evidence as well as the expertise the respondents had who were interviewed for this project. In order to avoid biased scientific articles or books to establish a one-sided picture, multiple sources were utilized.

Misunderstandings are possible in both literature research and in the analysis of conducted interviews. This arises from reading and learning in a foreign language and conducting research on a high academic level. Misunderstandings can also arise due to different communicative issues between the interviewer and the respondent, such as different levels of language proficiency, interpretation of questions in a different way, or due to a low trust level in regards to the utilization of data. Furthermore, as mentioned previously, the probability of misunderstandings in regards to sources that were only available in Danish does also exist.



Another criterion to ensure validity is the acceptance of evidence as the truth that has not been researched or revalidated again. (Bryman 2008, p 32) Several facts were taken as evident through extensive research that has been conducted so far. This includes the fact of global warming is affecting the world and will lead to the change of the climate affecting every eco-system on this planet, varying in severity (Kirby 2009).

According to Botin three criteria need to be fulfilled as well (Botin 2010, p 14):

- **Correspondence** between theory and science as well as research findings: The theory of change management as well as the theory of environmental communication can be directly linked to the problematic of changing conventional agriculture practices towards more sustainable practices. The theories were chosen for their applicability.

- **Consistency** through data that reflect the truth: Intensive literature research as well as interviews were utilized to obtain a large set of data that corresponded with each other and thus was validated through several sources that, there is a need for change in respect to agriculture and that motivational aspects need to be anticipated to help farmers to convert their land to more sustainable agriculture.

- **Coherency** of the paper with reality: Through a diverse set of literature as well as respondents from both the favoring side as well as the opponent side of sustainable agriculture ensure different viewpoints of reality. Reality is individually perceived and is thus difficult to validate. Nonetheless it is taken as given that if a large proportion of scientific evidence shows specific results that these can be taken as for the reality. Therefore a balanced selection of sources is of importance.





3 THEORETICAL FRAMEWORK

MOTIVATION OF CHANGE THROUGH COMMUNICATION

Motivation of change has its theoretical origins in change management in business. The complexity of anticipating change in practice as well as motivating behavioral change is difficult to grasp, as every individual is reacting to motivational aspects in a different way. One of the fundamental prerequisites for change is education, advice and equipment. While, in respect to agriculture, e.g. African regions often find themselves in situations where all three elements are lacking, western farmers often need to relearn farming practices that have been forgotten over the industrialization of agriculture. (WCED 1987, p 124)

Research on sustainable agriculture has been done mostly not by biologists or agrarian-experts but primarily through sociologists and social scientists who understand the nature of motivation and communication, as described in Buttel's article (Buttel 1993, pp 175-186, p 175-176). These researchers focus especially on the implementation of practices that help to preserve resources. Buttel states that the source of sustainable agriculture is a social movement and thus can best be explained through researchers from social science. But problems might arise when there is little or no connection between research on sustainable agriculture and the actual focus individuals in the equation: the farmers. Only if farmers, their concerns, their knowledge, and their goals for the future are known, and understood can motivation of change be tailored to the individual situation to take away fear for unknown practices and system approaches and to fuel the interest in good and sustained farming.

"The serious environmental [...] Challenges faced by societies worldwide cannot be addressed by authorities alone without the involvement [...] of a wide range of stakeholders, including individual citizens and civil society organizations." (UNECE 2008)

There are two different theories of equal importance that help to support the argumentation chosen in this thesis. The focus on change management complemented by environmental communication gives a connected theory to anticipate change through communication. Change management is used to identify which measures could be undertaken to motivate change towards more sustainable agriculture. Despite the importance of motivating the demand of customers for more sustainable products this thesis focuses primarily on how local communities, specifically the island of Samsø can anticipate action and incentives for an alternation of current agricultural practices to support a focus on long-term farming that uses its ability to protect ecosystems, protect the soil, human health and to deliver numerous of the most elementary products of human existence.

Hays states that the *"key to political power is information and the expertise and technologies required to command it"* (Hays 2000, p 232)

3.1 Change Management

The Oxford English Reference Dictionary defines the word change as the following (Pearsall, J. and Trumble, B. 1996) :

- the process of replacing something with something new or different; a thing that is used to replace something
- Substitution or succession of one thing in place of another
- Alteration in the state or quality of anything
- act or an instance of making or becoming different



Hayes states that change is generally happening with the same recognizable pattern, called the evolution of industry. The dimension of change though is different from each case and cannot be measured but nonetheless a categorization is possible into small or large, evolutionary or revolutionary or sought after or resisted. (Hayes 2007, p 3) Despite the fact that Hayes dedicated his book primarily to the change within a business organization “Change Management” can be applied onto every case and thus serves as a good theory to analyze the agricultural industry in Denmark and Samsø.

According to Hayes, change can be separated in two different types of change, a gradually evolving (continuous) (Weick and Quinn 1999, pp. 361-386, p 362) change which is characterized through a steady augmentation and unremitting adjustments, and change which is called “Punctual equilibrium paradigm”. This type shows long and steady periods of almost no change with adjourning periods of time with compact change which can be compared to the pattern of revolution, which is mostly defined by sudden eruption of changing circumstances and can hence be referred to as episodic or discontinuous (Weick and Quinn 1999, pp. 361-386, p 362). During these revolutionary periods of time the deep structures that were established during the equilibrium, the steady times, are fundamentally modified. (Hayes 2007, p 4-5)

“For change, we need three factors: leadership from above, pressure from below, or some exemplary catastrophe” (Crispin Tickell, Oxford University) Source: (Hill 2004, p 199)

Nadler et al. (1995) distinguishes between four types of change that can be differentiated according to the level of activeness, thus pro-active or re-active and the level of change, hence incremental or transformational. Whilst incremental change involves only slight changes, the transformational type of change is focusing on fundamental changes. (Nadler, Shaw, and Walton 1995, p 24)

	Incremental	Transformational
Pro-Active	Tuning	Re-orientation
Re-Active	Adaptation	Re-creation

Table 3.1: Types of organizational change

Source: (Hayes 2007, p 15, based on; Nadler, Shaw, and Walton 1995, p 24)

Change processes follow a certain pattern in order to ensure relative certainty about what the subject and what the aim of the change is and how it is planned to be achieved. Hayes underlines that this change model can be used for organizational change but also for change in groups or individual change. (Hayes 2007, p 82-83)



Figure 3.1: Change management process according to Hayes (2007, p 83)



3.1.1 The Nature of Change/Recognizing the Need for Change

Awareness of present situations, positive as well as negative sides, is elementary to be able to recognize the need for change and consequently start the change process. These situations are mostly perceived as events of high significance or organizational events. It is of importance that concerns or new ideas concerning the current state of an organization or industry are openly heard and (Hayes 2007, p 93-98)

3.1.2 Start of Change Process – Translating the Need for Change into Desire for Change

In this step other parties need to be convinced that change is necessary. Fear for disadvantages arising through change can be softened or erased through knowledge sharing and demonstrating that change is not only indispensable but can also enhance different areas and lead to advantages rather than disadvantages. Support in this process can also be sought from external advisors and consultants, though preferably individuals who are known for their understanding of local situations in order to convince also organizational members or local communities. (Hayes 2007, p 99-105)

3.1.3 Diagnosis – Reviewing the Present State & Identifying the Preferred Future State

In order to be able to judge which elements in the present state are negative, possibly posing a threat to the organization or industry and which elements are positive, different models can be utilized to analyze the situations. The same models can also be applied onto the analysis of the potential future state. There are multiple models that can be applied to a large number of different situations, but only the two most relevant where selected for this paper. (Hayes 2007, p 107-115)

One of the analysis tools which can be used to identify the up-and downsides of different industries

is the SWOT Analysis, an analysis that is looking at the Strengths, Weaknesses, Opportunities and Threats of and to an organization or industry.(Hayes 2007, p 115) The analysis examines external as well as internal factors that influence the organization and enables to then decide upon strategic plans that can follow this analysis to anticipate change. (Simon and von der Gathen 2002, p 214):

		Internal Analysis	
		Strengths	Weaknesses
External Analysis	Opportunities	SO = Use Strengths and Opportunities	WO = Reduce Weaknesses & use Opportunities
	Threats	ST = Use Strengths and prevent risk	WT = Reduce Weaknesses & prevent risk

Table 3.2: Matrix of the SWOT-Analysis, (SO, WO, ST, and WT are strategies)

(Source: Simon and von der Gathen 2002, p 214; Controlling-Portal n.d.)

The SWOT Analysis is being used in this report to analyze the different aspects of conventional agriculture and of organic agriculture, as an example for sustainable agriculture. (See Chapter 4: Sustainable Agriculture for the SWOT analyses as well as a definition of sustainable agriculture)

Another instrument which can support the diagnosis of the current state as well as the possible future states is the PEST Analysis. This model can be used to conduct an analysis of the environment of an organization or industry and includes the following parameters (Hayes 2007, p 114):

- **Political Factors** – comprise legislation, also in regards to environmental management, but also fiscal policies



- **Economic Factors** – include the cost for borrowing money as well as the cost of raw materials, prices for goods as well as the trade
- **Socio-Economic Factors** – contain factors such as shifting attitudes towards education, training, work and consumption patterns.
- **Technological Factors** – include aspects such as the availability of new materials, products, production processes and the means of distribution

industry and especially the farmers are experiencing. Furthermore Chapter 4.1 - Conventional Agriculture observes the different factors when judging the present state of farming.

An additional way of analyzing a current state or an alternative situation is to evaluate the development of an industry and thus extend the analysis by adding a historical perspective to it, rather than only looking at statuses. Hayes (2007) reproduces the pattern of industry evolution according to research conducted by various researchers such as Tushman at Columbia University in the 1970s and Ryan and Gross who observed farmers in the 1940s and examined their rate of change in regards to the introduction of new seed types that promised higher yields. (Hayes 2007)

The listed examples for the different factors have been selected according to relevance for this project. The model itself is used throughout the thesis, especially when referring to the current difficulties the farming

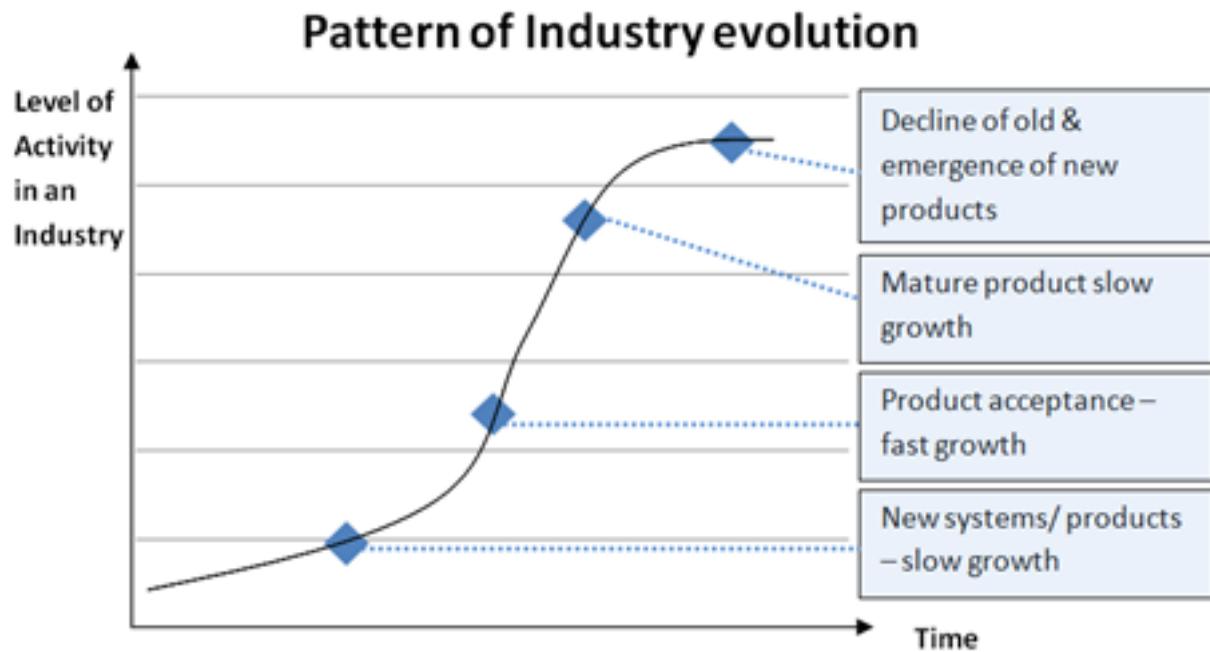


Figure 3.2: Pattern of industry evolution (Hayes 2007, p 4)

This analysis has been utilized to summarize the findings and observation about the current state of organic agriculture in Denmark (For details see Chapter 5)

Information for the analyses of the present as well as the future state can be gathered in different manners. These possibilities include interviews, questionnaires, observations, literature based research, as well as sampling methods.(Hayes 2007, p 129-136) For this



paper interviews, literature research as well as small degree sampling methods were used, by talking to only a few farmers in order to get an insight into their current situation albeit the sampling is of little statistical relevance due to the limited number of interviews.

3.1.4 Communicating Change

Communication of change involves the communication of pieces of information that support the transition between the present state and the future situation. Especially relevant in the context of this thesis is the communication of environmental issues. Environmental communication, discussed in Chapter Section 3.2 aims at clarifying the complexity of communicating environmental concerns in a way that foster change.

Hayes (2007, p 177-182) distinguishes between different features of communication as well as different communication strategies that can be applied. All four features have been filtered for relevance and additional examples have been added to illustrate their relevance:

Features of communication networks

The level of success in regards to effectiveness of communicated information depends upon four different aspects. The direction of information flows in a community or organization, the role of different

communicators, the content of the communicated information and also the communication channel are important aspects of change management:

Directionality – looks into how and what kind of information is communicated top down as well as upwards

Role – depending on the person, information is transmitted in different ways. Relationships between sender and recipient influence not only the content of information transferred but also how it is perceived and processed by the receiver. Therefore some pieces of information is regarded as more reliable and trustworthy because a certain person has spoken about it than if another person talks about it who might not be as respected as the other person. Roles like “isolate/ participants” can be observed. On the other hand also people described as “boundary-spanning” can be identified. These individuals are highly important in a change process as they are able to communicate with different members of an organization or community. Direct communication with the desired recipients is necessary in order to avoid the so called “gate-keepers” who filter and analyze information before passing it on.

Søren Hermansen has been proven to be such a “boundary-spanning” person, as his success to engage the local community in the renewable energy transition of Samsø shows. This ability can be seen as a high advantage in a community setting where so many different characters are joined together. (Hermansen, Søren 2010)

Content – the third feature of communication is the type of communication. Most of the time internal information as opposed to external information is often more familiar and thus more trustworthy. Nonetheless external information is of high value, as new ideas & solutions can be applied. It is important to observe external research in order to see, if other communities/ organizations have the same experiences and hence profit from it and their derived expertise.



(Source: Accesso Hispanico 2009)



Skepticism can be registered in the farming community of Samsø in regards to knowledge that has been brought to them externally. More trust is in place once the farmers experience e.g. success or failure of different techniques, thus in their neighborhood. (Hermansen, Sven 2010; Ravn Nielsen 2010; Hermansen, Søren 2010)

Channel – the fourth feature is the type of communication method. The type of communication varies between settings. On a small community level personal communication is much more appreciated than a written form of information. It increases the level of importance, as when information is given in person, time and effort are two of the elements that need to be put into communication. (Hayes 2007; Hermansen, Søren 2010)

Communication Strategies

This leads to different strategies in regards to communication that can be applied. The “identify and reply” strategy is the most applicable to this paper as it is mainly investigating concerns of members of the community and thus includes a lot of listening in order to analyze the situation and plan further steps.

Other strategies which are less relevant include the “withhold and uphold” strategy where information is kept from the members of the community until it is regarded as necessary to inform them. Furthermore “underscore & explore” as well as “tell and sell” are two strategies that communicate essential information but mostly disregard the processes after informing. The last strategy that Hayes (2007, p 180-181) identifies is “spray and pray” where information is provided but the ability of members of the community to digest the given information as well as the ability to clearly distinguish between relevant and irrelevant information is not questioned.

3.1.5 Training & Development

Training and development can be helpful supportive tools to add positively to the change process. Training though requires an analysis that identifies the people

who need to be trained and the training content. Training needs to be planned and evaluated after it has been completed. (Hayes 2007, p 200)

3.1.6 Motivating Others to Change/ Managing Personal Transitions

Alongside with training, education, participation and involvement, as well as facilitation and support are positive motivators of change. More neutral levels of motivation include direction, negotiation and agreements. Negative ones have also been used, including explicit or implicit compulsion and manipulation. This thesis though focuses on the positive and neutral range of motivators. (Hayes 2007, p 216-219)

Motivating Change towards sustainable development

Change management in regards to sustainable development is being described as more difficult than change management in areas such as in economics, which people have accepted as an important part of human structures. The main reason for this is that sustainable development is a relatively new concept that has yet to be fully grasped and which is despite its frequent use still not fully understood in public hence causes skepticism. Furthermore people fear a loss in comfort, life style and convenience in regards to adapting to requests made in favor of sustainable development, such as a reduction in consumption or a change in practices that people have gotten used to. (WCED 1987)

A concern about changing in favor of more sustainable practices was also mentioned in several interviews, sometimes only subliminally expressed. Changing farming practices also entails a change in perception of nature as well as learning new techniques. Negative examples have discouraged farmers on Samsø even more and have resulted in a stagnation of conversions of land to organic farming. (Hermansen, Søren 2010; Ravn Nielsen 2010; Hermansen, Sven 2010; Madsen 2010; Øster Kristensen 2010; Grenaa 2010)



3.2 Environmental Communication

As an integral part of change management environmental communication is a key part for this paper, as it investigates a change for sustainable agriculture and thus needs environmental communication as a tool to inform about the necessity of change and the aims of change including the benefits.

As such, environmental communication is a multi-disciplinary field, although it is mainly associated with the communication discipline. (Milstein 2009, pp 344-350, p 344) It seeks to find ways to communicate content that is perceived so individually by people that disputes are common (Marafiotte and Plec 2006, pp 49-76; Cox 2010, p 70-71). Yet, environmental communication is used by a variety of different parties in political, social as well as economic contexts, all sharing an interest in the environment and how it is connected with human kind (Milstein 2009, pp 344-350, p 345). Cox (2010) stresses that communication is a key factor with increasing importance to cause action, especially in a world where pressure on the natural environment and hence on humanity as a whole increases. Ways and content of communication has changed over the years and is recognized to have become more urgently pressing and more dramatic. More and more communication channels are discovered of how to reach public and eventually convince them to join working to deal with current societal challenges.(Cox 2010, p 1).

“Environmental communication seeks to enhance the ability of society to respond appropriately to environmental signals relevant to the well-being of both human civilization and natural biological systems” (Cox 2007, pp 5-20, p 15)

The following section seeks to investigate the theory that lies behind such a diverse discipline as well as a short behavioral analysis theory called the theory of reasoned action.

3.2.1 Environmental Communication Theory

The theory of environmental communication firstly appeared in the early 1980s and has its roots in the rhetorical theory in the United States of America but evolved to being a part of multiple other disciplines such as, but not limited to: media theory, cultural theories, system theories, performance theories as well as social movement theories. The application of environmental communication in these disciplines ranges from only looking into the cultural connection to illustrating the public discourse. (Milstein 2009, pp 344-350, p 345)

Cox (2010) though describes environmental communication as forms of symbolic action, expressed through reports, campaigns, marketing, photos, and of course language itself. The concept of symbolic action goes beyond the initial definition of communication only being a transmission of knowledge from a sender to a receiver, as a diverse set of language tools, utilizing symbolic tools to create a better understanding of certain problems and issues. Environmental communication is thus a “pragmatic and constitutive vehicle for our understanding of the environment as well as our relationships to the natural world; it is the symbolic medium that we use in constructing environmental problems and negotiating society’s different responses to them”: (Cox 2010, p 20-25)

Taking this quote the following elements of environmental communication can be extracted (Cox 2010, p 20-25):

- **Pragmatism:** environmental communication teaches content and aims at helping people to make aware and conscious decisions. It aims also at solving environmental problems through giving out information. Thus, environmental communication is purpose driven.
- **Constitutive:** environmental communication helps to transform environmental processes and problems into information that can be understood by the general public, hence help to form sensitivity



(Source: World Changing 2009)

towards environmental issues and reality.

Environmental communication is hence going beyond the investigation of the relationship between humans and nature. The relationship with the natural world is though essential to grasp the reasoning behind action in regards to the environment. Marafiotte & Plec (2006) differentiate between three theories to describe human attitude towards nature:

- **Nature/ Culture Dualism** – is separating nature from culture entirely. This approach constitutes pure domination of nature regarding human kind as being superior to nature and hence does not see human kind as part of the environment
- **Materialistic and Idealistic Monism** – materialistic monism sees humanity as a sub-category of the environment but with materialistic values, putting human kind into a controlling position whilst Idealistic monism views the environment as in the foreground
- **A triad of centrism** – this theory comprises three different orientations:

Anthropogenic/ Scientific orientation: nature is objectified for knowledge and seen as a system in favor of progress and grow and thus privileges humanity over the environment.

Ethnocentric/ Regulatory orientation: nature is seen as a resource in place to be exploited for its richness by humanity and can thus be connected to materialistic monism.

Eco-centric/ Poetic orientation: nature is perceived as valuable and beautiful and humanity is regarded as part of nature

All theories have one common and widely accepted ground: human domination and superiority over the natural environment. Milstein (2009) elaborates that the word “environment” in itself indicates a separation between nature and human kind. He states that by referring to biodiversity, animals, plants and natural processes as the environment materialistic and exploitive interests are attached to them. But not only in western societies can domination of nature be observed. In research itself nature is regarded as an object that is largely explored separately from humans. (Milstein 2009, pp 344-350)

Yet, the natural environment is, as stated before, perceived differently by every individual. (Marafiotte and Plec 2006, pp 49-76; Cox 2010, p 70-71) A general phenomenon can be observed when looking at the relationship of individuals and the actions that are taken or not taken based on the beliefs of a person: the reason-action gap.(Trumbo and O’Keefe 2004, pp 201-218)

3.2.2 Theory of Reasoned Action as Part of Environmental Communication

The theory of reasoned action tries to explain and investigate the phenomenon of the reason-action gap, a gap that refers to human behavior disconnected from the personal beliefs, values and attitudes.(Cox 2010, p 249; Trumbo and O’Keefe 2004, pp 201-218; TCW 2004) Ajzen and Fishbein were the founding fathers of research and discussions that tried to explain this observable fact back in the late 1960s. They attempted to clarify the relation between attitudes, intention as well as values and behavior (TCW 2004).

Trumbo and O’Keefe (2004) see one major aspect of the existence of this gap in a lack of education. When aiming at addressing this gap they see the necessity of investigating and understanding the values and



attitudes and how they have been formed. (Trumbo and O’Keefe 2004, pp 201-218)

Different values can be observed that form the environmental behavior. Egoistic concerns that are centering on one-self, social altruistic concerns that are focus on other people and their well-being and biospheric concerns which deal with the welfare of other living things. Thus depending on the content of environmental communication these values entail different behavioral patterns.(Cox 2010, p 250) It is generally assumed that environmental interest and concern will influence individuals to act in a more environmentally friendly way (Freestone and McGoldrick 2008, pp 445-467; Kilbourne and Pickett 2008, pp 885-893). In this context Freestone & McGoldrick (2008) refer to an internalization of personal beliefs. Yet also environmental consciousness does not necessarily lead to behavior in favor of the natural environment, a fact that is still up until today heavily researched. (Freestone and McGoldrick 2008, pp 445-467; Kilbourne and Pickett 2008, pp 885-893)

3.2.3 Environmental Communication in Communities/ the Public Area

In regards to the focus of this thesis, environmental communication in regards to communities and the public sphere is important to understand in order to be able to apply the theoretical knowledge onto the Samsø case.

Cox (2010) points out that there are several important points about environmental communication (Cox 2010, p 5-6):

- There is a higher probability that communities as well as individuals will act upon their environmental concerns to find solutions to protect local environments when environmental communication is understood as a valid tool to anticipate change and opportunities can be identified.

- Environmental action, especially in municipalities does not need to be bureaucratic but instead should be further facilitated to encourage involvement of the community and to make it possible to speed up the process of change.

- Public involvement is crucial, as valuable ideas and concerns can be investigated. Without the agreement of the public, changes are unlikely to take place, especially if not seemingly reasonable to the public in the case of differing interests and priorities.

Therefore a focus needs to be placed on (Ibid):

- Communication of essential knowledge content in regards to the environment as well as environmental problems
- Facilitation of bureaucratic processes, involving sanctions as well as support
- Public participation and project involvements



(Source: Wenzel Communication. n.d.)

There are different reasons that motivate environmental communication. This depends entirely who the stakeholder is one is looking at. Different stakeholders in environmental communication can be (Cox 2010, p 26-27):



- 1 Citizens and community groups
- 2 Environmental groups
- 3 Scientists and scientific discourses
- 4 Corporations and business lobbyists
- 5 Anti-environmentalist groups
- 6 Media and environmental journalism
- 7 Public officials and regulators

As this thesis primarily aims at investigating the role of communities, thus municipalities and local organizations and how sustainable agriculture can be motivated, solely the stakeholder of public officials and regulators as well as the role of citizens and community groups, namely the farmers will be further explored.

Communities and citizens are primarily oriented towards their neighborhood and their surroundings in regards to environmental issues. Thus there might be a specific motivational aspect caused by development projects or close environmental harm that can also impact people and their health as well as the health of their environmental surroundings. Civil dissatisfaction can generate a chain reaction in environmental communication especially for governmental bodies, as communal concern and protest will pressure the governmental agenda as well as municipalities. (Cox 2010, p 29-30)

Government at all levels is constantly weighing public interest with economic preferences and scientific evidence or research on specific topics. This generates a difficult situation for municipalities or the state government as a whole as mostly these interests and voices vary significantly. Alongside with governmental institutions also regulators need to be in place to assure that guidelines are met; as only laws that are implemented and enforce make a difference. (Cox 2010, p 35-36)

Cox (2010, p 120-122) identifies several different ways of communicating in a public sphere and to ensure public involvement. These types of public involvement are highly relevant in regards to the setting of Samsø as public involvement to motivate change is the key



(Source: Anzetzelt.at 2009)

focus of this thesis. Public comments are a valid and important tool to ensure that the information was correctly transmitted and that the civil society has a chance to talk about their concerns and their criticism. The public comment can be in form of public hearings, workshops, written communications and participation of citizens and interest groups at citizen advisory meetings. These comments can be directed towards draft proposals for laws, impact statements, or other matters of concern that ask for a holistic view on things. (Cox 2010, p 92-97) It is important to utilize local language to not be misunderstood and to communicate on the same level. John Dewey (Cox 2010, p 302) warns that the complexity of environmental problems and their connection with human and natural welfare can take interest away from citizens. Public hearings though often lack numerous aspects, such as adequate forums where stakeholders can communicate as well as the security that the comments raised by the public is actually being taken into account and has an impact on the results of decisions. (Cox 2010, p 122)

Søren Hermansen has succeeded to communicate in a way that the community of Samsø engaged in building a renewable energy island. (Hermansen, Søren 2010) He listened to concerns and wishes and translated this into directed action, which is also a



central part of change management, as identified earlier in this chapter. (Hayes 2007)

Another way of public involvement is collaboration between the different parties with representatives from each party involved. Walker describes collaboration as “constructive, open, civil communication, generally as a dialogue; a focus on the future; an emphasis on learning; and some degree of power sharing and leveling of the playfield.” (Walker 2004, pp 113-135, p 123) collaboration often continues until everybody was able to speak out, thus until there is a consensus reached. (Cox 2010, p 120) Apart from collaboration and public hearings, multiple other forms of public participation were established, such as: scoping meetings, focus groups, listening sessions, advisory committees, blue-ribbon commissions, citizen juries, negotiated rule making, consensus-building exercises, working groups, and professional facilitation. (Ibid, p 122)

Other tools that Cox refers to include the set up of advisory committees, resource partnerships as

well as collaboration which is community based. (Cox 2010, p 142). With these tools and insights Cox delivers valuable aspects of how change towards more agriculture can be motivated. The last section of this chapter gives a short insight into aspects of how change in regards to sustainable agriculture can be motivated through communication.

3.3 Communicating Change for Sustainable Agriculture

Change management is a process that is by no means easy and there are a lot of variable steps that can influence the level of success. Nonetheless the theory also provides numerous options that can be applied onto a case such as Samsø. In order to go cause change in peoples behaviors Norden – the Nordic council of ministers (2006) state that it is of absolute necessity to move beyond solely talking about the environment when addressing environmental concerns. A direct link with people’s lives and thus a



Figure 3.3: Distinction between levels of interest (Source: based on Norden 2006 p9)



connection on which levels they will/ can be affected needs to be established and its content communicated. (Norden 2006) The interest in the environment can hereby be linked to other areas of interest that affect every person, such as health and quality.

This connection of environment with other aspects can be directly applied onto the farming sector, where environmental concerns which are tentatively long-term oriented can be connected to prices e.g. for fuel or pesticides. As predictions by the Danish Energy Council and the International Energy Agency illustrate prices for oil are prices going to rise significantly over the next years and decades. This can be linked not only to expected decreases in supply capacity of oil but also to a rising demand in the world. (The Economist (Author unknown) 2009, p 82, 2/3p; IEA 2008, p 9-20; Danish Energy Agency 2010) More sustainable farming refrains from using a lot of pesticides and synthetic fertilizers if even consumed at all and thus presents an attractive alternative in this respect to fuel and oil-based product intensive agriculture. This though requires knowledge about the alternatives which will be elaborated in Chapter 4: Change towards Sustainable Agriculture.

In regards to farmers and adult education “transformative learning” a concept is used to described learning that aims at encouraging further learning processes. These learning processes lead to a critical reflection of each individual on personal beliefs, actions, own values but is also looking at other people’s perceptions of things and thus important for more sustainable life styles and behavior. Transformative learning can embody personal discussions and reflection occurs specifically when problem solving is required (Mezirow 1994, pp 222-232, p 224).

Transformative learning theory distinguishes between industrial learning, which incorporates the knowledge about how the environment or people can be manipulated and controlled, and communicative learning which includes the comprehension of purposes and beliefs but also of values and intentions.

(Kerton and Sinclair 2009) Both theoretical learning approaches serve as valuable for this paper. Farmers not only need to obtain knowledge about the technical and scientific aspects of more sustainable agriculture as well as the legislation behind it, but also need to learn how to approach different problems and aspects of farming together, thus learning aspects of strategic methods and communication with other parts of the community. These learning processes can be of slower nature or rather rapid depending on the individual. (Kerton and Sinclair 2009). Foley (2004) states that most adults learn through happenings in their everyday lives and through observations of their environments. Negative happenings might draw adults away from trying a similar path while positive situations can encourage them to attempt the same. Facing a “Disorienting dilemma”, learners engage in the process of transformative learning. This dilemma can be an experience, but also new set of information that the individual encounters which expands critical thinking, a differentiation of perspectives, as well as including experiences in the points of view. (Foley 2004, p 61-62)

“[...] knowledge must be shared among different actors, including farmers, users and consumers.” (IAASTD 2009, p 98)



4 CHANGE TOWARDS SUSTAINABLE AGRICULTURE

As knowledge and thorough understanding about agriculture, current practices as well as sustainable practices is an essential part of motivating the move towards more sustainable agriculture, the following chapter is aimed at gaining an overview of the development of agriculture and how the new movement towards more sustainable agriculture was initiated. Furthermore this part of the thesis shows the positive as well as the negative sides of both the conventional as well as the more sustainable agricultural practices to enable a more profound discussion and to show the need for change. This discussion will enable to judge that the problems that occur with current agricultural practices can be applied not only on the island of Samsø. Nonetheless the chapter only looks into problems which can be related to the island of Samsø. The paper desires to support the community of Samsø through providing a structured overview of a change process aimed at turning local agriculture into more sustainable farming.

This chapter is contributing to answer Sub-Question I and II and can thus be associated with the diagnosis stage of the change process presented in Chapter 3: Theoretical Framework. The chapter serves as a review of the present state of agriculture as well as an identification of a future state that is necessary in order to achieve the various goals such as: environmental, social and economic sustainability. Hereby a short historical overview is presented in order to be able to see which circumstances lead to the present state. Furthermore it serves as a knowledge tool with which farmers can be convinced that farming more sustainably goes beyond short-term thinking and is not only achievable but also less costly. These recommendations and the knowledge building are the basis for the creation of educational information as a

tool to encourage sustainable development and to convincingly communicate to the agricultural players.



Figure 4.1: Foci of chapter 4 in the change process based on Hayes (2007, p 83)

The IAASTD (International Assessment of Agriculture, states in their latest Report about Agriculture that *“We have little time to lose if we are to change course. Continuing with current trends would exhaust our resources and put our children’s future in jeopardy”* (UNEP 2008; IAASTD 2009)



4.1 Conventional Agriculture

Husbandry has been part of human life ever since the settlement and agricultural occupation, the so called agricultural times, 10.000 years ago. Traditional agriculture, as it can be called defined farming that was either solely aimed at sustaining a family or a little more intensive with the help of animals to allow the produce to be sold on a market. Though, ever since the beginning of the industrial revolution 200 years ago, there was an intensification of agriculture, combining the industrial thinking with food production. The introduction of fossil fuel combustion and thus the mechanization of farming allowed farmers to substitute animals with more powerful machinery that enabled them to speed up the work and make processes less labor intensive and with an increased productivity. The gain in efficiency increased even more when synthetic fertilizers and pesticides were launched. (Brennan and Withgott 2005, p 230-231; IAASTD 2009, p 98)



(Source: CUIK 2007)

The following chapter shall introduce agriculture especially the agricultural intensification and the resulting problems from the increased use of fertilizers and chemicals but not without mentioning also the positive aspects for a more holistic picture. Ultimately these subchapters clear the way for the introduction and analysis of sustainable agriculture, slowly replacing the “conventional” type of farming. The term “conventional farming” will be used to signify the common use of an ambivalent term that refers to an agricultural system no older than 200 years, while the tradition of agriculture has always been the more sustainable way up until the intensification. (Perkins and Jamison 2008, pp 59-83, p 59-60)

This Chapter also aims at highlighting the need for change and thus puts priority on the negative aspects of conventional agriculture. Nonetheless the main arguments for conventional are named and explained, although the problems that this farming style entails outweigh the advantages in number in this report.

4.1.1 The Intensification of Agriculture – the Green Revolution

Between 1950 and 1985, for the first time being, the amount of harvested wheat grew faster than the world population. Through the intensification of agriculture, a significant rise in yield and thus food output was possible. The increase in output can largely be ascribed to a nine-fold rise in fertilizer use as well as the utilization of pesticides. (Hawken 2005, p 23) This increase in production was though not equally distributed and primarily occurred in the industrialized countries. This left humanity with the possibility to meet the increasing needs arising from not only a rising number of people but also from the increase of earnings especially in industrialized countries, which led to a higher meat consumption and thus required more grain and corn to support a larger meat production. Furthermore the high yields helped to feed a growing livestock industry especially for meat production. (Bittman 2008; Rohwetter 2007) Within 30 years, since the 1950s, meat production for export has increased more than fivefold, reaching 11 million

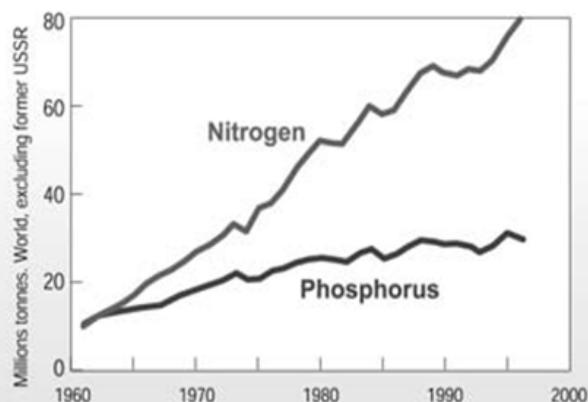
tons. With over 1.4 billion cattle, 1.6 billion sheep and 800 million pigs, back in 1984, the increase of grain production was fueled even more. This development resulted in outweighing the proportion of land used for grain production for human food for grain production to feed livestock. (WCED 1987, p. 118-120)

With an increasing decline of available farming land due to the spreading of urban areas as well as climatic changes causing e.g. an advancing desertification, farmers have focused solely on the amplification of productivity. In order to keep a high efficiency level within the industrial agriculture single-type crop fields need to be cultivated. (Brennan and Withgott 2005, p 231) Through planting monocultures, the use of crop varieties devised for higher output and an increase in farm size as well as the augmented use of pesticides and synthetic fertilizers and artificial irrigation contributed significantly to the growing yield. (WCED 1987, p. 120; Carson 2002) The growth in production and industrialization of agriculture has witnessed different development steps in food production systems; e.g. an “industrial agriculture” especially in western countries such as North America and Europe followed by the “green revolution”. The alteration of farming was brought about by the understanding that output through the extension of cultivated land, to feed a growing world population, was not possible infinitely. Consequently scientists searched for other methods to increase yield, discovering the power of fertilization and pest abatement with chemicals; (WCED 1987, p 120-122; Brennan and Withgott 2005, p 265) despite the name, the green revolution does not indicate an environmentally friendly type of agriculture evolving but rather the opposite. This revolution, advocated amongst others by the World Bank and the International Monetary Fund, describes:

- The skyrocketing use of chemicals in the agricultural sector, such as pesticides and synthetic fertilizers (as shown in Figure 4.2)
- The cultivation of one-type crop fields applied onto large areas of land

- Disruption of the tradition to sow and harvest only once per year/season for the sake of higher yields

Global total use of nitrogen and phosphorus fertilizers.



Total global pesticides production

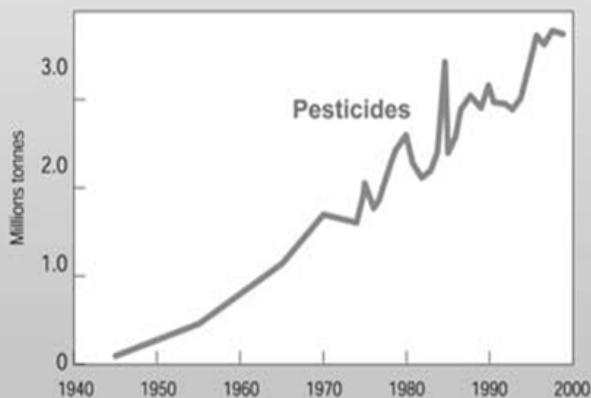


Figure 4.2: Global total use of nitrogen and phosphorus fertilizers as well as pesticide production from 1960-2000 (millions of tonnes)
(Source: IAASTD 2009, p 7)

This was a systematic attempt to replace the traditionally, labor and nature based input output balance of agriculture with a fossil fuel based one that allowed short-term productivity gains. (Brennan and Withgott 2005, p 232; Hill 2004, p 393; Sachs and Santarius 2007, p 174-179) Therefore



the intensification of agriculture, is similar to other industries in regards to social and economic consequences, but offers unequal opportunities when it comes to environmental and ecological implications (Duncan Brown 2003, p 221-222) . On a world wide scale 25% of croplands are cultivated in an industrial manner.(Brennan and Withgott 2005, p 231)

Despite a continuously rising output surpassing population growth, hence providing more food per person every year, this development has stagnated in the 1980s and has been on decline ever since. This can specifically be observed when analyzing the global annual grain production. The majority of scientists relate this process to a drop in the health of the environment and agricultural land attributable to the industrialization of farming. (Brennan and Withgott 2005, p 267; Duncan Brown 2003, p 253)

But as the following sub-chapter shows there have been numerous advantages arising from the intensification of agriculture.

4.1.2 Positive Aspects of Industrialized Agriculture

As shown in the historic overview, the industrialization has significantly increased the yields per hectares. Due to an increase in agricultural produce without extending the land area used, the rate of deforestation decelerated significantly whilst more people were fed off the same size of land. (Brennan and Withgott 2005, p 265-266) The use of chemicals allowed it to fight pests and diseases that have posed risk to agriculture and thus secure a certain output per hectare depending on the crop planted. (Duncan Brown 2003, p 221-229) Conventional agriculture harvest on average 30% more crops than an equivalent organically farmed field. With grass this percentage is lower whilst wheat experiences a higher loss in output through a conversion to organic agriculture, at least in the first few years after the conversion. (Hermansen, Sven 2010, Øster Kristensen 2010, Ravn Nielsen 2010)



Source: (Danish Ministry for Food, Agriculture and Fisheries 2009)

Hill (2004, p 377-378) summarizes the positive aspects of the use of pesticides as the following: It enabled humanity to:

- grow crops in areas that they are not designed for (ecologically inappropriate regions)
- at times of the year that was prevented by insects in earlier days (ecologically inappropriate times)
- grow crops in form of monocultures (ecologically inappropriate forms)

but its use also makes it possible to:

- store fruits and vegetables longer,
- increase the productivity and the agricultural output through plantation of monocultures

This has also permitted to support a population growth that would likely not have been possible with less food being produced. Due to the intensification and thus the need for bigger machines hence resulting in an automation of agriculture has reduced labor intensity a commonly known process in industrialized sectors. This has liberalized labor to work in other industries and thus reduced the costs for the agricultural sector and at the same time enabled to have more work force available for other sectors such as research or technology sectors. (Duncan Brown 2003, p 221-229)

For the remaining labor force it was less work and effort to control weeds and pests as well as to harvest the grain, as machines could be used to replace most manual tasks. Conventional farmers and other knowledgeable respondents interviewed for this thesis confirmed that one of the reasons that they are hesitating to convert their land to organic agriculture or to adapt more environmentally friendly practices, was that they feared more work – work that they were not familiar with anymore (Madsen 2010; Hermansen, Sven 2010) and which thus included more knowledge about the land. More sustainable agriculture requires farming to turn from re-active, thus spraying pesticides that kill pests that might have been arising due to the plantation of monocultures, to develop towards a more pro-active approach which tries to avoid weeds and pests through different cropping techniques and through fundamental knowledge about their fields. Furthermore industrial agriculture reduces the risk of crop loss due to pests or diseases that cannot yet be fought with natural products. (Castenskiold 2010; Hermansen, Søren 2010; Hermansen, Sven 2010; Madsen 2010; Øster Kristensen 2010; Ravn Nielsen 2010)

Nonetheless the intensification had great negative impact on the environment and species through the application of highly toxic chemicals, disrupting natural cycles to the extent of collapse of eco-systems where agriculture could only be maintained through even more application of fertilizers. (Brennan and Withgott 2005, p 265-266) This will be elaborated extensively in the next section of this chapter.

“The success of modern agriculture in recent decades has often masked significant externalities that have positively and negatively affected natural resources.” (IAASTD 2009, p 517)



4.1.3 Problems with Current Agricultural Practices

“Industrial agriculture has not produced more food. It has destroyed diverse sources of food, and it has stolen food from other species... using huge quantities of fossil fuels and water and toxic chemicals in the process” - Vandana Shiva, director of the Research Foundation for Science, Technology, and Natural Resource Policy, Dehra Dun, India)
(Brennan and Withgott 2005, p 261)

Ever since the agricultural revolution environmental as well as social problems related to agriculture have increased significantly. The Brundtland report states growing output was the centre of attention of farming policies specifically in western countries. Nonetheless the desired growth of 3% p.a. that was achieved in the 1950s became unreachable over the years, as environmental crises connected with the economy, were incapable to absorb the overproduction in food produce. (WCED 1987, p 122) Dan Barber explains that the food security is primarily threatened by the loss of fertile land, the pollution of fresh water and diminishing resources in general. He calls the current agricultural system a “business in liquidation” as it is based on the erosion of ecological capital. (Barber 2010)

Agriculture around the world is facing several problems, but the severity and type of problem is changing from region to region. While Asia, Africa and Latin America experience a diminishing resource base through deforestation and desertification, North America and Europe are rather facing soil erosion and soil acidification, respectively. Land degradation has reached a cover of 22.3% of the total land area in Europe, mainly due to a long agricultural history. The deprivation of soil has impaired global grain production by 13% within the last 50 years. (Brennan and Withgott 2005, p 228-229)

The following disadvantages outline negative aspects that affect environments on a worldwide



scale, but are also occurring on Samsø. This is to ensure a tailored selection of numerous problems to help to analyze the situation on Samsø and thus enable recognition for the need of change on the island.

Oil Dependence of Agriculture in Times of Peak Oil

First and foremost a problem is stated that is only investigated from the side of the farmer in regards to economic disadvantages. The environmental costs that arise through the drilling and fermentation processes as well as the production processes of synthetic fertilizers and pesticides are excluded from this review.

Agriculture counts towards one of the most fuel intensive industries in the world. The energy intensity for one calorie of food is ten times higher in terms of calorific value. (Lappé 2008, p 51) The oil consumption mainly derives from the utilization of synthetic fertilizers as well as pesticides which are based on a fermented product of crude oil. Furthermore the cultivation of land especially in western countries is largely operated by machinery which runs with diesel. The transportation of food is also a major culprit. Duncan Brown (2003) estimates that diesel fuel consumption on a farm accounts for approximately 85% of the total energy consumption, excluding the fuel intensity of transport to and from the farm, and the energy consumption within the fertilizer production industry (Duncan Brown 2003, p 226).

Oil prices have been predicted to go up by over 60% until 2030 (Danish Energy Agency 2010). (Predictions are based on official world price predictions from the IEA (International Energy Agency) published by the Danish Energy Agency) Although always denied, the director of the IEA now firstly acknowledged that world oil supply growth will hit a peak before 2020 (The Economist (Author unknown) 2009, p 82, 2/3p). The steadily increasing demand has already exceeded supply.(IEA 2008, p 9-20) (For Graphs concerning future oil predictions, predictions about oil supply and demand as well as demand growth for oil: see Appendix B) This is predicted to affect farmers in three areas:

Cultivation with machines, pesticides and synthetic fertilizers which will increase production costs even further. An increasing dependence on fossil fuels will cause production costs to steadily increase as well thus farmers will be more pressured (Hermansen, Søren 2010).

Also Samsø has experienced rising financial pressure on the farmers, as oil prices and thus prices for fertilizers have increased. The unique setting of being an island also adds transportation cost to the purchased products which results in higher prices. In order to decrease the dependency on oil the island has, as already described in the introductory chapter, converted itself into a 100 % self-sufficient island in regards to energy excluding transportation. A currently planned project of building a biogas plant is further trying to not only generate energy but also to decrease the dependence on synthetic fertilizers, as the organic matter that has been processed in a biogas plant can then be applied onto field. These measures are taken on Samsø, as the prices already impair the farmers' ability to earn a living with their farm. (Hermansen, Søren 2010; Øster Kristensen 2010)



(Source: Permaculture Research Institute of Australia 2008)

Implications of Synthetic Fertilizers and Pesticides

Monocultures, one of the most common aspects of industrialized agriculture, do not comply with principles of natural plant growth and are thus threatened by pests and weeds. This requires the application of chemicals, as a one single type of food is a not existing "phenomenon" for insects that cause them to reproduce in large numbers as a virtual abundance of food is available. Agriculture has though experienced an increasing number of resistant insect

and is consequently required to either apply more pesticides or to develop new ones. (Duncan Brown 2003, p 226-227) Chemicals as well as fertilizers impair the quality of soil, water, air as well as harming organisms in different ways. These applied pesticides can be distinguished according to their target: fungicides, insecticides, herbicides and larvicides. Neither pesticides nor synthetic fertilizer provides the soil with organic material to enhance the soil quality and fertility. Rather a significant decline in biological activity in the soil can be observed, indicating a dropping health level of the eco-system. Heavy machinery does not add a positive value to the quality of the field either as it makes the soil more compact increasing the risk of runoffs. (Hill 2004, p 374-376)

It is known that runoffs of nitrate, phosphates and ammonia, elements of fertilizers, damage water sources and that the use of pesticides can be directly connected to human and animal health implications. Not only does the increasing use result in different cancers, but also endangers species, as insects are eliminated and thus breaking the natural food chain. But the use of chemicals not only kills and harms different species but it also a rising number of resistant insects are posing problems. The biological capability to adapt to changing circumstances forces companies producing pesticides to develop new chemicals on a continuous basis. This specific problem can be identified in areas where there is an overuse of chemicals. (Brennan and Withgott 2005, p 251-253; WCED 1987, p 125) In general Hawken (2005, p 23) regards it as evident that a continuous increase in fertilizer use and a resulting rise in agricultural output is saturating at some point where little or no benefits at all become palpable. A total of 5-10% of harvest is lost globally due to pollution and counting, as with every additional application of fertilizer which cannot be entirely absorbed by the plant, the level of fertilizer remaining in the soil increases (Duncan Brown 2003, p 228). (Hawken 2005, p 23)



(Source: Natural buy.com. 2009)

Pesticides

“Farmers’ misconceptions also contribute to the use of pesticides, which are often viewed as progressive and modern – a legacy of preaching from agrochemical sales people and agricultural extension agents who paid little heed to the practical limits and substantial risks of the chemicals they were peddling. Many farmers regard pesticides as cheap insurance against the risk of crop loss, one of the few concrete steps they can take to reduce natural uncertainties of their trade” (Duncan Brown 2003, p 215)

Aimed at increasing productivity and output as well as proving human health through killing pests that affect food supply, pesticides have numerous negative consequences. Ever since agriculture formed the main method to gather food, people have been fighting pests. (Hill 2004, p 392) Different experimental pesticides such as sulphur, powdered Chrysanthemum flowers used hundreds of years ago, and lead arsenate and calcium arsenate applied in the first half of the 20th century, have been used over the years before the Green Revolution (Duncan Brown 2003, p 214). The first effective pesticide was introduced in 1942, called dichlorodiphenyltrichloroethane (DDT) and was widely applied until serious signs of chronic human health implications, bioaccumulation in animal fat and persistence in the environment were detected, also displayed through Rachel Carson’s book *Silent Spring*. (Hill 2004, p 392) Most of the pesticides are neurotoxins, hence highly toxic to any living creature



that is exposed to it, though depending on the pesticide bioaccumulativity, water solubility and persistence in the environment vary. (Hill 2004, p 372-373, 377-378)

One of the latest significantly impairing problems is a growing genetic resistance of insects towards pesticides, due to their overuse. This creates a vicious cycle as it forces the farmer to apply different pesticides or increase the amount of chemicals applied, leading the insects to develop further resistance and in case of a higher quantity applied great damage to the ecosystem, organisms as well as soil quality. The increased dieback of bees, also called the colony collapse disorder (CCD), in the US and Europe is likely partly originated in the very same problem of pesticide usage. The level of severity is barely graspable as bees, bumblebees, and a lot of other insects are vital for the pollination of fruits and vegetable and thus the most essential organism to generate food. Multiple causes rather than one singular culprit are seen to be the reasons for CCD. Organic beekeepers have though not experienced a die-off of their hives, which gives an indication that pesticides are part of the problem. (Brennan and Withgott 2005, p 268, p 272; Duncan Brown 2003, p 215-219; McWilliams 2010; Laumer 2010)

Knud Ravn Nielsen states that in a European comparison Denmark is using a lot less pesticides as opposed to Germany, France or Holland. His personal experience has shown that for every liter of pesticide used in Germany only $\frac{1}{4}$ of a liter is sprayed in Denmark, which is mainly due to a different climate and different temperatures. (Ravn Nielsen 2010) Other European countries like Germany have observed an increase in pesticide use since the 1990s. (FAO 2010)

Fertilizers

Furthermore fertilizers are increasingly utilized in modern agriculture; globally an increase of 70% until 2020 is predicted. (Hill 2004, p 230) The main content of fertilizer is nitrogen and phosphorous. In general, the nitrogen cycle of the planet is perfectly supplying the soil with sufficient nutrients – elementary nitrogen

builds up the atmosphere with 80%. The need for additional application solely indicates that too much nutrients are being taken out of the soil due to intensive agriculture.(Duncan Brown 2003, p 189-191) If applied in minimum amounts to secure the nutrient balance of the soil not a lot of harm is done. Problems though arise when an over-fertilization takes place, such as in between 1950 and 1984 with a 900% increase in fertilizer application, which has the potential to significantly harm waterways. This problem occurs, as the plants are not able to take up all the fertilizer. Depending on the amount applied more or less fertilizer will remain in the soil (Duncan Brown 2003, p 228). (Hawken 2005, p 23) The main issue is a following eutrophication which can lead up until the elimination of lakes; through an accumulation of nitrate in the water bodies, algae growth is stimulated, leading to algae blooms. Algae blooms suppress other plants and eliminate ground grasses by covering the water surface and preventing sunlight to penetrate the water. The decomposition of dying plant and animal material then ultimately leads to a drop in oxygen in the water, causing a collapse of the eco-system. Next to conventional algae blooms and their associated problems, there is also the possibility of harmful algal blooms, such as the red tide, which produces toxins eaten by shellfish and fish and ultimately threatening birds, other animals as well as human health.(Brennan and Withgott 2005, p 251-253; Hill 2004, p 204, p 233)

Denmark has already experienced algal blooms in the Kattegat Strait ever since the 1970s. The attempt to limit nitrate and phosphorus input failed despite incentives and a national plan to reduce it by 50% and 80%, respectively. While industry actively participated in reducing phosphorus to achieve the 80% reduction, the nitrate goal needed support through governmental action, purchasing land off farmers and giving farmers a monetary compensation for using less fertilizer. This resulted in a significant improvement of the oxygen levels in the Kattegat Strait. (Hill 2004, p 234) Nonetheless even up until today a die-off of fish can be observed especially in October though dependent on wind and weather and thus how much oxygen and

nutrients can be found in the water. Knud Ravn Nielsen from the Farmers Association on Samsø (Samsø Landboforening) underlines that constant efforts to reduce the nitrogen runoff in Denmark has lead to a lot of success, but fish die-off can still be registered. He states that in some years no problems are detected as more fresh water from the Atlantic Ocean is flowing into the Kattegat and in other years marine life is dying as the wind is different. (Ravn Nielsen 2010)

Implications on Water

A severe problem is the pollution of groundwater especially if it is shallow groundwater. Depending on the type of soil more or less pollutants can and will reach the groundwater. Groundwater pollution is an increasing problem and even if possible to clean then only at high costs. Often times it due to the size of groundwater reservoirs a cleanup is not possible, even if undertaken for many years. Therefore prevention is the key rather than relying on end-of-pipe solutions. Tight pesticide and fertilizer regulations need to be introduced and a monitoring system has to be put into place. (Hill 2004, p 225-226) Also because high nitrate concentration in water can cause health implications on humans especially on infants, often causing death as oxygen transport is being impeded. (Hill 2004, p 243) But even an overuse of animal manure for fertilization, resulting in runoff can threaten water sources, especially critical if used as drinking water. Animal manure can carry different bacteria such as the pathogens which are known to cause different diseases such as respiratory diseases and intestinal sickness. Drinking water treatment can though eliminate these bacteria. (Hill 2004, p 243)

On Samsø different problems can be registered in regards to water sources, depending on the location on the island. Whilst the northern part has one bigger aquifer the Southern part of the island can source multiple small aquifers, which have little surface water contact and can thus be considered as "old" with the problem that the water only slowly gets renewed. Water quality testing by GEUS (National

Geological Survey of Denmark & Greenland) revealed that the northern part has been experiencing a constant increase in nitrate in the ground water source, approximately 200 mg/liter of ground water, a value that is considered as extremely high. (Thorling 2010) Lærke Thorling from GEUS also points out that treatment is necessary before the water can be utilized as drinking water. A contamination with pesticides has not been the case in the testing, although she states that the water has not been tested for every pesticide. (Thorling 2010)

Implications on Soil

Soil erosion causes different problems that mostly result in financial losses for the farmers. Land which suffers from soil erosion is less able to keep water and is less fertile as nutrients are reduced. Furthermore deep-rooted plants are less likely to grow, as the layer of fertile soil is less thick. Rich soil, important for agriculture is then blown into rivers, lakes and reservoirs, where it diminishes the ability of water plants to do photosynthesis and the reservoirs to hold water, as the earth particles sink to the bottom. As fertile soil disappears from field, farmers are likely to abandon the land which cannot be used furthermore and to overuse the remaining property. (WCED 1987, p 125) Soil erosion is though first and foremost caused by water, which washes fertile soil away. But soil erosion also depends on other factors, such as: the density of the plant cover as well as the type of plant which grows, climate, a specific season, the structure of the soil, and the physical and chemical composition of the soil. (Duncan Brown 2003, p 175-176)

Other major problems with soil are the lack of organic matter in the soil as well as a phenomenon called soil compression which is caused by heavy machinery used on the land. Organic matter is also a preventative for soil erosion while it primarily acts as a depot for essential nutrients of soil and a binding agent of water in the soil. It is known that organic matter can hold up to three times more water than clay in the same quantity, due to different structuring



of the soil. The content of organic matter can be enhanced through management techniques such as ploughing plant remains into the soil and practicing “no-till” agriculture. Most soils in countries with heavy agriculture have an organic matter content of 1-2% in the soil. (Duncan Brown 2003, p 184-186)

Samsø also experiences problems with soil compression (Madsen 2010), soil fertility as well as

little bioactivity in the soil (Øster Kristensen 2010), and soil erosion. (Hermansen 2010)

The following SWOT Analysis, in theory explained in chapter 3, shall give a summary of all negative as well as positive aspects of conventional agriculture and thus enables to compare it with a second SWOT analysis conducted on organic farming in this chapter at the end of section 4.2.

4.1.4 SWOT Analysis of Conventional Agriculture

This SWOT Analysis tries to comprise all mentioned aspects in one figure and thus aims at summarizing the findings of chapter 4.1.

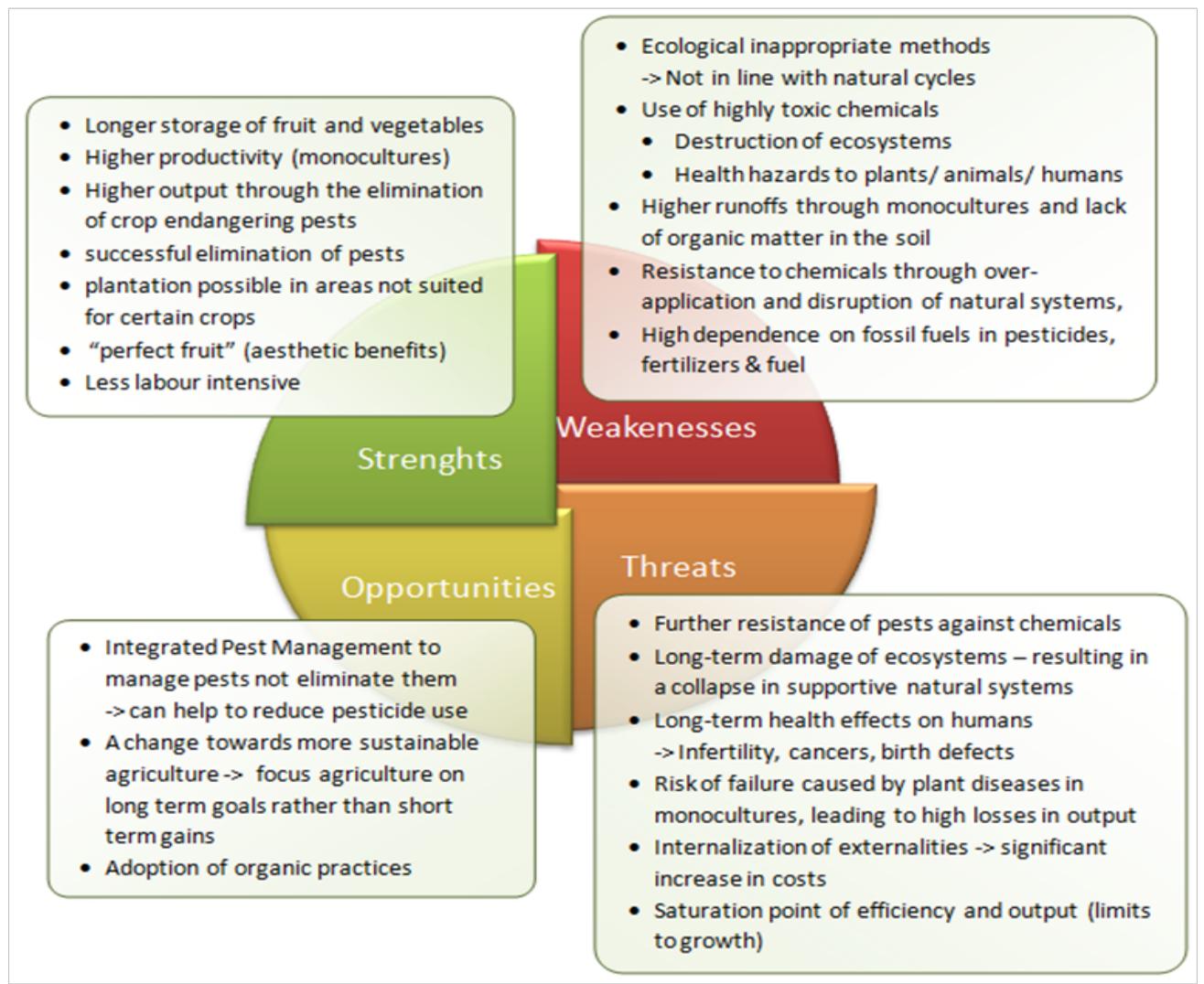


Figure 4.3: SWOT-Analysis of conventional agriculture



4.2 The Rise of Demand for a Change in Agriculture

The following chapter builds the second part of the diagnosis level in change management and aims at clarifying the potential of the preferred future state of more sustainable agriculture. Before defining sustainable agriculture a short historical introduction is given to clarify the evolution of the new-age more sustainable agricultural developing which influenced the defined perception of the term sustainable agriculture. Later on this chapter will look at different types and variations of sustainable agriculture, not without pointing out disadvantages, also in relation to Samsø to end this chapter with a SWOT Analysis of Organic Agriculture.

Despite the fact that agriculture, in accordance with natural principles, was common practice from the early start of settlement of human kind up until the industrialization of food production, only in the 1980s research began to focus on questioning the intensification of agriculture again to find alternatives. This timing was in line with the environmental movement of the 80s where a lot of voices were raised for more environmental justice and a change in business practice, caused by several environmental disasters such as the die off of the German forests due to acid rain. (Buttel 1993, pp 175-186, p 175; Doyle and McEachern 1998, p 55-57;

Rasper 2009, pp 22-28, p 22-24) Obvious declines in species, as well as the an increase in environmental problems were directly associable to agriculture the environmental movement concentrated more and more on agriculture and the potentials to improve practices for the sake of the environment as well as humans. (Buttel 1993, pp 175-186, p 178) A significant leap forward was achieved due to the financial crisis in the 1980's where the famers experienced a large increase in interest and thus were facing huge debts. At the same time the prices for their products decreased, leaving the agricultural community with even higher liabilities. With a high financial burden on their backs farmers were very receptive for new ideas that included a lower raw material input, such as pesticides and synthetic fertilizers. Furthermore at a time of overproduction of agricultural goods the governmental regulatory body welcomed practices that helped to initially decrease the food production and therefore pushing the commodity prices up through lower supply. (Buttel 1993, pp 175-186, p 178; Buttel, Hawkins, and Power 1990, pp 57-66, p 63; Schaller 1993, pp 89-97, p 91) Another reason that caused increasing interest and popularity in more sustainable agricultural practices was the publication of Our Common Future, from the World Commission on Environment and Development, as mentioned in the introduction of this paper. (Buttel 1993, pp 175-186, p 178; WCED 1987)

By the end of the 1980s a growing body of evidence showed the trend towards a global warming accompanied by droughts. Environmental movements were now concentrating on the request of lowering greenhouse gases through demonstrating the dangers of increasing temperatures. With a global problem uniting numerous other issues under one roof the environmental movement was able to demand and foster solutions that could help to tackle the overall dilemma. The urgency of the problem was well understood especially when connected to a potential loss of comfort and an alternation in human life style. (Buttel 1993, pp 175-186, p 179-180)



(Source: Flickr 2007)



(Source: Flickr 2009)

Despite a slow down at the beginning of the 1990s (Buttel 1993, pp 175-186, p 179-180), the movement was gaining momentum and continued to grow mainly through a change in policies. These policies were the adoption of measures aimed at improving the environmental condition that had been suffering due to industrialized agriculture. These agri-environmental measures were primarily aimed at small farmers, subsidizing potential output losses in order to encourage a transition to organic farming. At the end of the 1980s beginning of the 1990s standards, control systems, and certification schemes were established. (Scialabba and Hattam 2002, p 5-6) Although the land area cultivated according to organic standards grew by 300% from 1995 to 2000 in the US, Europe, and Latin America, on a global scale still only 1 percent in land area is used for organic agriculture. The share in global food sales is approximately 1-2%. Nonetheless the concern for health as well as the environment and an increasing mistrust for conventional farming and its' produce further fuels the demand for organic produce. Animal diseases, such as the Bovine Spongiform Encephalopathy (BSE) and foot-and-mouth, as well as food scandals also contributed to turn the organic food sector into the currently fastest growing segment. (Scialabba and Hattam 2002, p 5-6)

Organic food can be regarded as a premium segment in regards to pricing. Prices for produce are approximately 10 to 50% higher (globally) than for similar industrialized produced food items. Due to high demand, organic food sales grew by a global average of 20 percent annually since 1985. (Ibid; Brennan and Withgott 2005, p 290) Yet, Jesper Kaae, head of the organic farming department of the Danish Ministry

of Food, Agriculture, and Fisheries, points out that despite the steady rise in demand production has stagnated in Denmark. (Kaae 2010) Food distributors in some western countries still consider organic food as an elite purchase decision, primarily as prices are usually higher than for conventionally farmed produce. Although prices in supermarkets remain higher, the last years have shown a significant decrease in prices that is passed on to the farmers. According to Carmen Calverley, Organic Farms Inspection (Calverley 2010) responsible at the Ministry of Food, Agriculture and Fisheries (Ministeriet for Fødevarer, Landbrug og Fiskeri) in the Department for Organic Farming, this price drop is partly because of price pressures from supermarkets, to increasing the profit margin for the supermarkets/ retailers. Furthermore a lot of food is being imported from Eastern European countries as well as Russia, significantly impacting prices for Danish farmers. This led to a fall in organically certified farms over the last 7 years, since 2002 in Denmark, where the number of organic farms peaked at 3714 and decreased to 2689 farms in 2009. (Calverley 2010; Danish Ministry for Food, Agriculture and Fisheries 2009)

4.2.1 The Definition of Sustainable Agriculture

Originated in the farming crisis during the 1980s where farmers started trying to reduce resource inputs to decrease their costs, a basic definition for sustainable agriculture was formed: i.e. low (chemical)-input agriculture. (Buttel 1993, pp 175-186, p 177; Brennan and Withgott 2005, p 289) Buttel (1993) states that sustainable farming was accepted and implemented based primarily on social grounds. Sustainable agriculture revives the tradition of farming in accordance to natural cycles and natural terms. Thus the definition of sustainable agriculture goes far beyond the type of farming or the resources use, but also includes education, motivation, and other social factors.

The encyclopedia of biodiversity (Robertson and Harwood 2001, pp 99-108, p 99-100) states that sustainable agriculture has to be holistic and hence needs to touch upon the following aspects: Agriculture is sustainable when

- It is viable in an economic sense,
- It is safe for the environment, and
- When it is accepted by society

In line with what Robertson stated, Yunlong & Smit (1994, p 299-302) call the three pillars of sustainability that sustainable agriculture is based on: Biophysical, socio-political, and techno-economic dimensions.

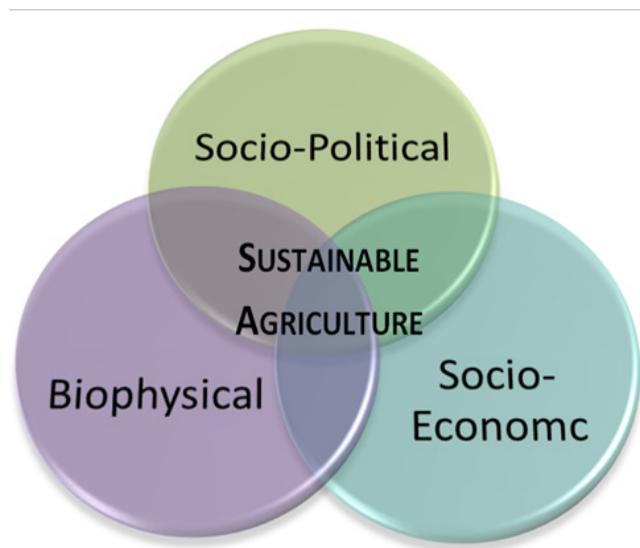


Figure 4.4: Three pillars of sustainable agriculture based on Yunlong & Smit (1994, p 299-302)

The biophysical sphere asks for sustaining a relationship with the natural world that is healthy and ecological with the best interest of nature in mind. The socio-political pillar includes concern for society and the provision of food for its well-being, thus providing products in a sufficient quantity and quality. The third aspect of sustainable agriculture is asking for the economic feasibility of the agricultural system. (Yunlong and Smit 1994, pp 299-307, p 300-302)

Given these three factors (Yunlong and Smit 1994, pp 299-307; Schaller 1993, pp 89-97), the actual definition of sustainable agriculture and what it entails is not specifically mentioned. Reliant on the society and cultural setting, different things are socially acceptable. A balance must be found, but even this balance varies in between cultures and might consequently be judged sustainable by some societies, while others deny it this status. Robertson states that one of the key factors of sustainable agriculture is its scale dependence. Hence one always needs to analyze each case individually to grasp the level of sustainability and thus be able to judge if the capacity to sustain is exceeded or not. (Robertson and Harwood 2001, pp 99-108, p 99-103) Sustainable agriculture “does not deplete soils faster than they form”. (Brennan and Withgott 2005, p 289) It does not impair eco-systems and reduce biodiversity as well as diminish fertile soil and water with the ultimate goal of being continuously practicable far into the future. (Ibid) According to the Brundtland report, agriculture can be called sustainable if it refrains from degrading resources like water, land, and forests. (WCED 1987, p 133) Economically more sustainable agriculture is moving partly or totally away from the use of fossil fuels or fossil fuel based products and thus escaping the dependence on this non-renewable natural resource.

Due to the open definition of sustainable agriculture which only gives guidelines or what should be considered, the definition of the perfect system remains unaccomplished. (Yunlong and Smit 1994, pp 299-307)

Depending on the priority that is put on each individual pillar of the definition, different farming systems can be tried to rank, as shown in Fig. 4.5. This Figure establishes a ranking system that is individually perceived and based on the evaluation of farming types that were explained in chapter 4.1 and will be explained in the later section of this chapter. Sustainable agriculture, not specifically definable is a desired state which remains difficult to achieve.

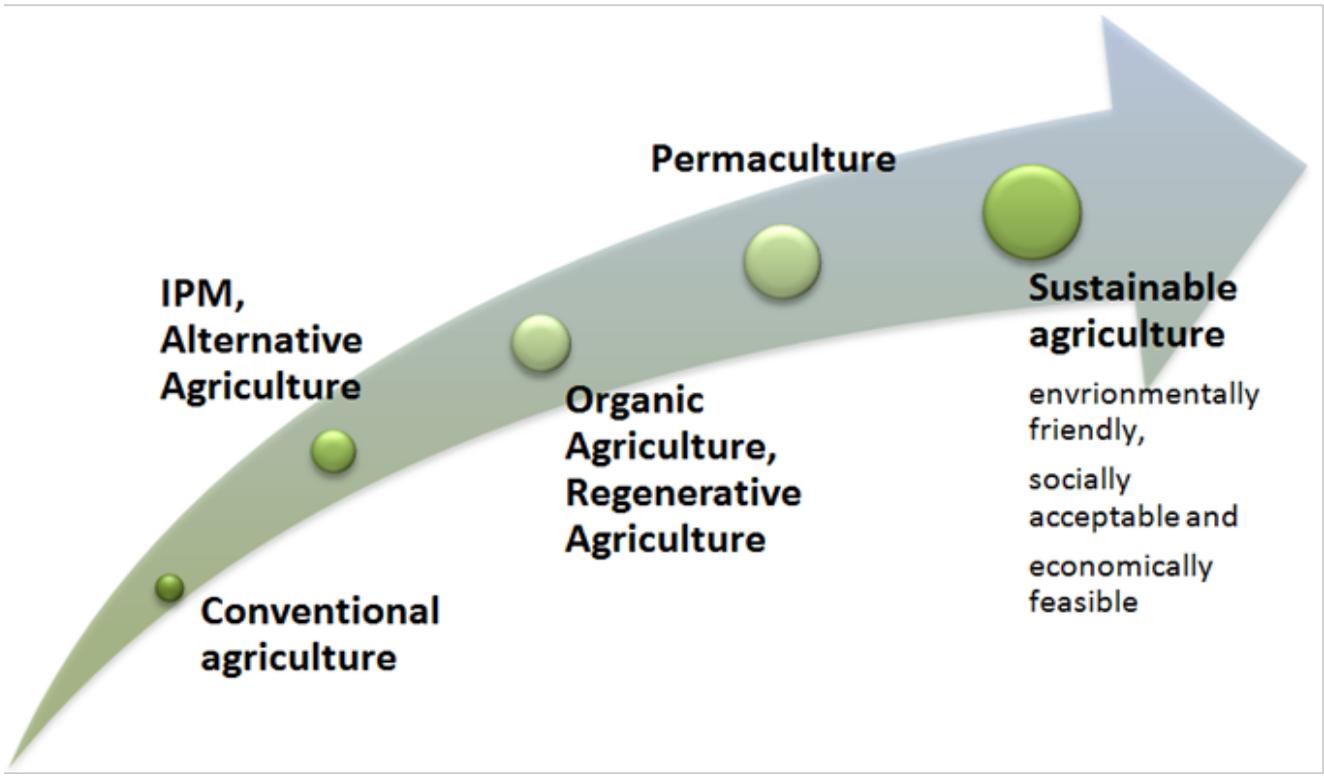


Figure 4.5: Different stages of sustainability in agriculture (based on numerous sources from the next section of this chapter)

The following sections are trying to briefly explain the different stages of sustainable agriculture according to Figure 4.5. This list is not finite and can always be extended, as farming systems vary depending on the region, farmer, governments, etc. Other farming systems include Perennial Polycultures or Agroforestry (Bates and Hemenway 2010, pp 47-53, p 51). These following examples will be used as possibilities in regards to Samsø to explain which different kind of options the island has to move towards more sustainable agriculture.

Integrated Pest Management, can help to reduce the use of synthetic pesticides and thus improve the health of soil, other organisms as well as humans, alongside with a change in agricultural practices that can prevent pest from spreading. Integrated Pest Management (IPM) incorporates the active observation of where and which kind of pests

occur on the field and to work according to need rather than a fixed schedule with the intention to apply the minimum amount necessary. (Hill 2004, p 387) IPM evolved as an undeviating reaction to the increasing human health and eco-system problems due to synthetic pesticide use. (IAASTD 2009, p 99)

Tools for changing agricultural practices can be viewed from organic farming (Hill 2004, p 390):

- Growing crops in areas that are ecologically suitable
- Controlling weeds without herbicides but through mechanical methods
- Integration of crop rotation, hence a change in crop in a given year from year to year. This not only controls pests, as they only

survive on crops that are present season over season, but also allows the soil to replenish itself with nitrogen and organic matter, as not the same nutrients are used every year.

- Another technique is called intercropping, growing more than one type of crop on the same land at the same time which decreases the attractiveness of crops for pests.
- Destruction of breeding places of pests
- Also biological control agents can be introduced, insects that feed on the pest that needs to be fought. The introduction of insects, possibly exotic ones, needs to be studied intensively to avoid introducing an organism that then evolves to another pest.

Current research is investigating pheromones and green chemistry to manage pests. The aim is to develop products that are low in toxicity to non-target organisms and humans while fighting pest in a “gentle” manner. (Hill 2004, p 390)

According to Knud Ravn Nielsen (2010) farmers of the Lammefjord region in Denmark, famous for their carrots have managed to reduce their pesticide use by 75% over a period of time of 20 years. IPM is already being used on the island of Samsø, thus only occasionally. (Ravn Nielsen 2010; Madsen 2010)

Alternative Agriculture is commonly used in North America and refers to a middle stage between conventional agriculture and organic farming. This type of agriculture looks into more natural processes and incorporates them, alongside with using the potential existing on farms in respect of cropping patterns, potential of plants. Alternative Agriculture also emphasizes a reduction in inputs that cannot be generated on the farm, such as synthetic fertilizers and pesticides and it also stresses the importance of soil conservation and other essential components such as



water, energy and resources derived from biological origin. (Robertson and Harwood 2001, pp 99-108, p 101)

Organic Farming shares common ground with alternative agriculture, but goes further in regard to restrictions and effort. (Robertson and Harwood 2001, pp 99-108, p 101) It has a set of principles dedicated towards minimal impact on ecological factors that needs to be followed when the products should be declared organic produce. (Hill 2004, p 385-386; Mäder et al. 2002, pp 1694-1697) One of these guidelines is using no synthetic pesticides and synthetic fertilizers. Instead microbial insecticide or copper fungicides are occasionally used but pests are rather handled through adjustments in farming techniques. Intercropping and crop rotation are only two of the various possibilities of how to control pests. Synthetic fertilizers are replaced by manure and compost. Organic matter and nutrients are added through crop rotation with legumes which provide nitrogen to the soil. (Hill 2004, p 385) This builds upon the understanding of the essential provision of nutrients for plant growth by fertile soil. (Mäder et al. 2002, pp 1694-1697, p 1694) Organic farming is said to be a driver for local economies, guarding the principle of family farms as well as enrich communities and at the same time contribute to the improvement



of environmental conditions through protection and creation of eco-systems. (Kerton and Sinclair 2009)

Regenerative Agriculture builds upon exactly these basic elements as organic farming. This type of farming aims at primarily self-sufficiency and the production for local markets, to avoid transportation, overuse of natural resources in the same area, and to grow crops according to ecological principles hence looks at the localization of production and market place. These principles include a simultaneous growing of crops through intercropping, a rotation in planting areas for crops, creation of the right microclimate to enhance not only crop growth but also supportive systems such as forests, and a non-reliance on synthetic fertilizers and pesticides. Regenerative Agriculture thus has a higher cost-efficiency, as it is less dependent on fossil fuels with a similar output. (Sachs and Santarius 2007, p 174) Sachs also describes that more sustainable agriculture will not only restore grazing land and arable land but will also help to enhance natural areas such as forests, wetlands, and water bodies. (Sachs and Santarius 2007, p 175)

Permaculture designs human ecologies in a system approach, intending to replicate natural connections within natural biomes. Elements of Permaculture were taken from organic farming, no-till farming, but also from sustainable forestry and village design observed



(Source: YogiZenDude 2009)

from indigenous people. A set of principles such as 100% recycling and no waste generation are deeply rooted in the beliefs of Permaculture. The system itself nourishes without intensive farming and follows the natural pattern of producing food. With decreasing labor input as well as declining energy input, the system increases the density of food, as it grows older. Synergies in nature are actively used and often result in two to three times as much yield as in an equivalent area with conventional agriculture. (Bates and Hemenway 2010, pp 47-53, p 52-53; Nyadie and Kruse 1999)

To find a common ground with all these definitions is hardly possible as, depending on the scale of farming and the location different deviations from the actual definition might be necessary. The different types of agriculture are rather building up on each other with each state adopting more from the previous one such as it is demonstrated by Permaculture.

The different agricultural systems can easily be approached in a step by step adjustment. Despite all positive elements that have been demonstrated in the last part of the chapter criticism remains to be stated. Hence the following section mirrors the main disadvantages perceived by critics but not without arguing against them in case they are a common misperception and can be disproved.

4.2.2 Challenging Sustainable Agriculture

Up until today sustainable/ alternative agriculture is seen as not compatible with the world's needs for food as it is not productive enough. Furthermore people who believe in the possibility of low-input agriculture are discounted off as too idealistic, unfeasible, involving too many costs as well as being unscholarly. (Buttel 1993, pp 175-186, p 175) Dan Barber takes it even further and sees in the denial of possibility a clear verification of the logic of current food systems. (Barber 2010)

Various long-term studies have shown that the number one claim in the discussion of whether conventional farming or organic farming is better has little grounds in a long-term perspective: a significantly higher yield with conventional agriculture. (Hill 2004, p 385-386; Mäder et al. 2002, pp 1694-1697) A Swiss group of scientists has undertaken 21 years of comparative studies of efficiency and environmental benefits of organic farming and conventional farming. Results have shown that despite a 20% lower yield the overall efficiency of organic farming was significantly higher than in conventional agriculture. Varying from crop to crop, e.g. winter wheat even reached 90% of the amount of yield produced through conventional farming. Nutrient input was between 34% and 51% lower in organic farming, the energy input was 20% to 56% lower, and the soil aggregate stability 10%-60% higher with more calcium and magnesium shown in the soil. Furthermore the organic farming plot showed a higher biological activity in the soil than the conventionally farmed plot. Other elements showed a smaller difference, such as soil chemical and physical parameters, as well as food quality. Overall the researchers conclude that the resource utilization is significantly more efficient while at the same time organic farming enhances the diversity of flora and fauna as well as the overall biological activity in soil. (see Fig 3) (Mäder et al. 2002, pp 1694-1697) Other

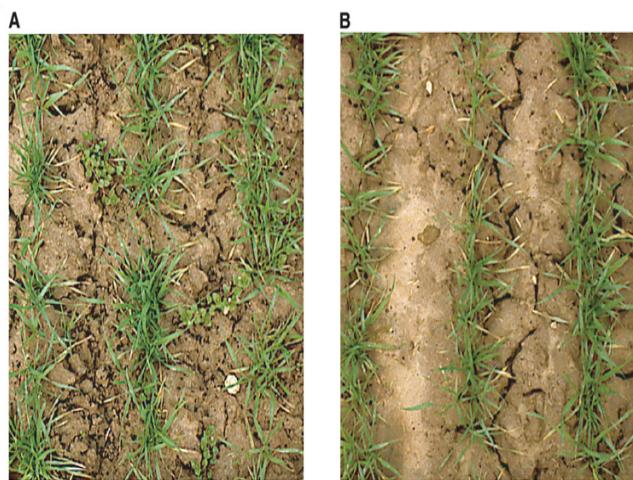


Figure 4.6: Biodynamic (A) and conventional (B) soil
(Source: Mäder et al. 2002, pp 1694-1697, p 1696)

studies carried out over a time period of 15 years by the non-profit institute Rondale concluded the same but had even equal yield results on both sides while organic farming was using 30% less fossil fuel. (Hill 2004, p 386; Rich 2008, p 52)

Organic farmers on Samsø have not yet experienced an equal yield but rather a drop in output by 50 percent since the conversion of land from conventional to organic farming. Morten Øster Kristensen has experienced a significant lower yield which is normally balanced through higher prices at the market for organic produce (Øster Kristensen 2010). This is reconfirmed by Sven Hermansen, Team leader of the technical department in the Organic Farmers Association (Økologisk Forening). Hermansen's intensive work together with farmers around Denmark, as well as on Samsø has shown that the first years do experience a drop in yield, depending on the crop planted (Hermansen, Sven 2010). Through the exclusion of the use of herbicides and chemical in general the organic farming community is facing the problem of a plant type that is highly competitive with crops: weed. The Farmers Association on Samsø confirms that weed remains a problem that cannot be dealt with efficiently besides mechanical or manual tillage. Weed poses a specific problem, as it spouts quickly even after tillage and mechanical control even through small pieces left in the ground and thus competes with crop for space and nutrients. (Ankjær Rasmussen n.d.; Ravn Nielsen 2010)

On a local perspective problems and solutions differ if one is concentrating only on local production. Nonetheless it needs to be stated that despite the fact that local initiatives have less influence on global food production the bigger picture should always remain in the background. Thus even though a local farmer is not primarily concerned with the changes in the world's climate in other regions or the food scarcity in African countries, he/ she needs to keep in mind that by him/ her acting in a responsible way, an example is set. It needs to be also signaled to the municipality and the government, as local initiatives can encourage



national politics to adjust according to the demand of citizens.

Tim Lang, Sustainable development commissioner Professor, is stressing that there needs to be a new framework for farming in the interest of the environment that needs to be set by the government.

4.2.3 SWOT Analysis of Organic Agriculture

Exemplarily, as not every type of sustainable farming can be analyzed in a SWOT Analysis (theoretical explanation see chapter 3) within the scope of

Farmers need to be encouraged, to change farming practices as it will ensure output in a long-term perspective. The adaption should be undertaken now, as it is still easier to adapt as opposed to when tight regulations are in place when climate change worsens in the future. (Lawrence 2009)

this thesis, organic farming has been selected as a representative for sustainable agriculture. This is also due to the fact that it is most commonly known by most people. As the first SWOT Analysis, it is based on the findings in chapter 4.2. and the utilized sources.

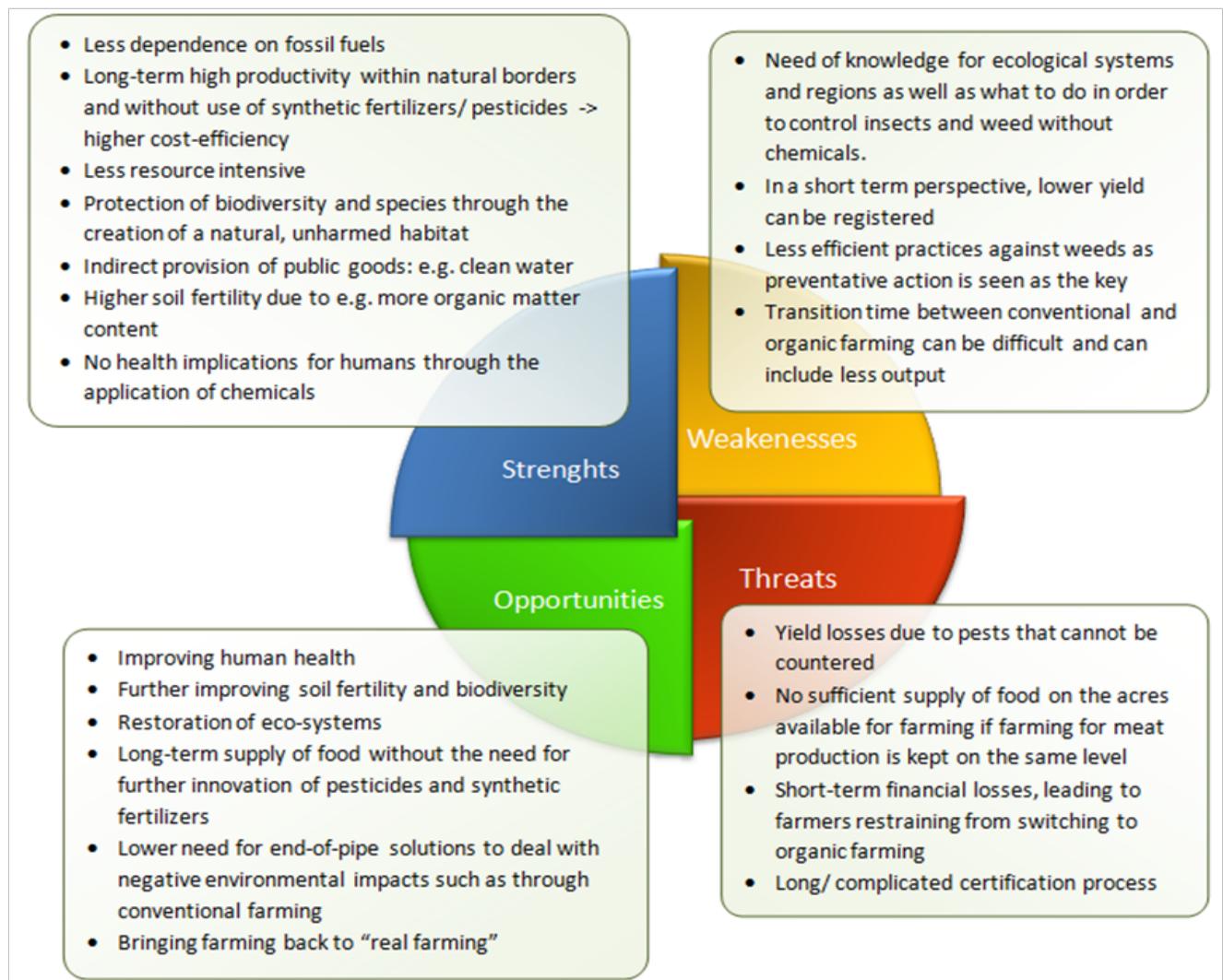


Figure 4.7: SWOT-Analysis of organic agriculture



4.3 Fostering Further Development of Sustainable Agriculture

It is estimated that there are approximately 80,000 plant diseases, 30,000 weeds, and 10,000 insect pests. It is thus illusionary to think that human agriculture can fight them all. Nonetheless the problematic has lead to the development of Fumigants, not targeted towards any specific species but which are lethal for all life forms. Great care is of absolute necessity in case of application, as fumigants, mostly used in form of gases, affect biochemical respiration in many organisms and are thus deadly also for humans. (Hill 2004)

This shows a new development in chemicals which are demonstrating that the conventional system is “loosing” the upper hand over all the pests and cannot handle them in any other way than with toxic substances. Duncan Brown (2003) sees an immediate need for change, but acknowledges the difficulties that the change could bring along during the process of change. (Duncan Brown 2003, p 252-252)

He says that: *“we have succeeded in producing a system that, by some criteria, has worked very well for a limited period but cannot be “sustained”. No matter what else we might do, there are two fundamental processes which, if allowed to continue, will certainly lead to the widespread destruction of our habitat, the collapse of civilization(s), and perhaps the extinction of our species.”*

- The viscous cycle (Duncan Brown 2003, p 252-254)– increasing soil degradation through the attempt to increase production leading to more soil degradation and eventually results, if not halted, in a collapse of societies

Duncan Brown sees two major problems in regards to global ecosystems in case demand continues

to remain at the current level in regards to system management and husbandry

- o The habitat will be simplified to such an extent that vulnerability and sensitivity to certain types of stress will increase
- o A deprivation of natural habitat to a degree that it will not be further possible to support the number of people currently inhabiting the planet
 - The use of some essential nutrient elements in a way, for all practical purposes, is irreversible. Organic farming has been proven to have a much higher level of soil conservation than conventional agriculture (Duncan Brown 2003, p 259)

Duncan Brown observes the necessity to alter the management of land significantly in order to ensure a long-term supportive role of natural systems. Soil degradation leads to less land being available for productive agriculture, putting further pressure not only on land but also on the people. (Duncan Brown 2003, p 254)

As the past chapter has shown a lot of problems are entailed with conventional agriculture despite the higher yield and the higher efficiency. Eco-system will not be able to sustain the weight off chemicals and intensive agriculture for a long period of time. As shown in chapter 4.1 there is already a significant decrease in soil fertility which cannot be replenished by synthetic substances. Bioactivity is decreased as well as the remaining rich soil is victim to soil erosion.

More sustainable farming practices which have been used for thousands of years and which have been backed up by research are the more reliable alternative to conventional agriculture. The transition is not going to be facile, as decreasing yields will be observed, which is mainly due to the fact that the soil and the land needs to recover. Sven Hermansen is positive that organic agriculture is an essential part



of the future. (Hermansen 2010b) But in order to facilitate the transition, a number of stakeholders need to be involved, such as demonstrated in the initially elaborated definition of sustainable development by Prof. Scoullos. This includes education, institutions as well as technology as the tools and governance to connect the tools with the three pillars. (Scoullos 2009)

After thoroughly recognizing the need for change as well as specify the possible alternatives, necessary and elementary steps in the change management process, this thesis moves onto the application onto a specific case, as it was already mentioned throughout the chapter. Samsø as an island constitutes an interesting example as it is already forward thinking and farmers have been opened up for new technologies and investment possibilities in regards to the renewable energy project. A change process towards more sustainable agriculture would increase the independency of the island even further. Different projects have been planned already and different instruments as well as a certain level of trust have been already established on the island, as illustrated in the next chapter. (Hermansen, Søren 2010)



5 MOTIVATION OF SUSTAINABLE AGRICULTURE: A CASE STUDY OF SAMSO



Figure 5.1: Map of Samsø
(Source: Kort & matrikelstyrelsen 1995)

As one of the first islands to become fossil-fuel independent in regards to energy production, Samsø is taking the lead to a more sustainability through renewable energy. The island, engaged in a 10 year plan to convert itself into a 100% self-sufficient island and is currently overproducing electricity by 10%, thus “exporting” excess electricity to the main land of Denmark.(Strong 2009; Sustainable Cities n.d.) Started in 1997 by winning a governmental competition to

become an example for a community that can solely run on renewable energy(Strong 2009), the energy movement has succeeded in transforming the island into a more sustainable island, though issues like transportation on the island remain yet to be solved. (Sustainable Cities n.d.) Back then the island faced an increasing pressure through low prices from big farms from mainland Denmark with which it was difficult to compete, as Samsø has an additional cost through the transportation from the island. (The Independent 2009; Hermansen, Søren 2010). With the lead of Søren Hermansen, individuals have invested in renewable energy such as wind turbines and solar panels and thus supported the movement for self-sufficiency from below. As a local Mr. Hermansen succeeded in engaging communities to actively get together and to discuss possibilities of achieving set goals. By having a personal “relationship” with the new energy system in form of investments and ownership people on the island were more receptive to the improvements. (Sustainable Cities n.d.; Walsh 2008) Farmers have been an active part in this process, as a lot of windmills and solar installations are owned or partly financed by farmers. Furthermore some of the farmers such as Kim Andersen have already gone over to produce their own fuel for farming machinery out of rapeseed oil (Sustainable Cities n.d.).

The success of the introduction of renewable energy was achieved through a good base for argumentation: a significantly lower price for energy/ electricity as opposed to an oil-based energy production and all involving the local community, which was commonly perceived as an advantage.

“People began to realise that they were doing something unique in the very place where they live. It was not something that was imposed from above. It belongs to them.” states Søren Hermansen (The



(Source: Samsø Kommune. 2009)

Independent 2009). A bottom up approach helped to turn a common viewpoint against wind turbines into a positive opinion, as locals were personally engaged in the transformation (NIMBY – not in my backyard to IMBY) (Ibid).

When the project was initiated over 10 years ago the price per barrel was at approximately US\$ 30 to 40 per barrel while the price has climbed up to US\$ 130 per barrel today. The price increase was predicted and thus convincing enough for the farmers to support the initiative to convert the island to a 100% self sufficient island. Nonetheless the process was not easy and Søren Hermansen spent a lot of time on talking personally to people as well as to opinion leaders in the villages who then facilitated the process, as their opinion was generally respected.

Despite the established success, Hermansen seeks to extend the involvement of farmers even further by e.g. building a biogas plant which runs on organic waste from conventional as well as organically certified farms. This will enable the island to not only generate additional electricity but also to produce fertilizer which can be utilized by the local farmers. Mr. Hermansen hopes to decrease the dependency on fuel based fertilizers that are currently purchased by farmers on the island, constituting a significant cost for them. (Hermansen, Søren 2010) Hermansen as well as Andersen see further challenges for the island which go beyond the energy independency but look at energy consumption, waste, and agriculture (Balzter 2009).

The following section will elaborate the potential for Samsø to engage in more sustainable farming, the challenges as well as the possible solutions of how to motivate this change. The analysis is based on semi-structured interviews, introduced in the methodology chapter, as well as supported by theoretical models for change and environmental communication. The analysis aims to be a supportive tool for the municipality of Samsø, the EnergiAkademi of Samsø, as well as institutions and organizations such as farming associations on the island as well as on mainland Denmark to engage in a change which will bring the island closer to Hermansens' and Andersens' ideal (Balzter 2009) of turning Samsø into a Green Island. The chapter addresses the potential support that different parties can contribute towards the change process: Farmers, Farmers Associations such as Samsø Boforening, and Økologisk Forening (which is also engaged on Samsø), EnergiAkademi as well as the municipality of Samsø.

Chapter 4 builds the essential knowledge foundation for this chapter, as judgment about the necessity of change as well as the identification of alternatives was enabled through the thorough analysis. The following chapter shortly revises the present farming situation on Samsø before continuing to follow the structure of the in the theory chapter (chapter 3) introduced change management and thus emphasizes a possible way of change for the island of Samsø.



5.1 Farming Situation on Samsø – Reviewing the Present State



With an annual precipitation of approximately 200 mm per year (Rambøll 2005), Samsø has approximately three times less rain water than the rest of Denmark, which varies between 609 mm (Bornholm) and 823 mm (South Jutland) of annual rainfall (DMI n.d.). Due to a very temperate climate and special soil, Samsø is also referred to as the vegetable garden of Denmark. Farming on Samsø is mostly defined through vegetables, such as beets, onions, but also has a few livestock properties with cows. Samsø's unique setting as an island has made farmers aim at high end products, such as vegetables to compensate for the transportation costs that need to be added when bringing goods to the main land. (Thorling 2010; Hermansen, Søren 2010)

The farming on Samsø is influenced by three factors:

- by Denmark/ outside, in regards to regulations, prices for goods, as well as concerning financial support from the Danish government , and
- by their own internal environmental conditions as well as support mechanisms on the island, such as the planned Biogas plant,
- and by the farmers' own mindsets

The following section examines the two areas to shortly review the present state of farming.

5.1.1 Influences from Denmark

Currently about 7% of Denmark's farming area is organic (Danish Ministry for Food, Agriculture and Fisheries 2009c) (See Appendix C for a Graph). Samsø has approximately the same ratio in regard to their agriculture, with 10 organically certified farms with approximately 100 farmers in total (Calverley 2010; Grenaa 2010; Ravn Nielsen 2010). Until 2007, the Danish market was constantly growing for organic food with considerable high prices for produce. Sales grew by 33% in 2007 and the quantity sold rose by 13%. This difference indicates a rise in prices for organic products. (Danish Ministry for Food, Agriculture and Fisheries 2009b) Yet, ever since the financial crises, prices have been falling to a level of 1/3 of the price level before the crisis (Calverley 2010; Ravn Nielsen 2010; Hermansen, Søren 2010; Øster Kristensen 2010) This lead to a decrease in the number of organic farms (since 2002 over 1000 farms less are registered by the Danish government) (Danish Ministry for Food, Agriculture and Fisheries 2009a; Danish Ministry for Food, Agriculture and Fisheries 2009a) mostly due to reconversion to conventional agriculture. The Ministry as well as farmers judge this situation being caused by the low prices as well as by a bureaucratic certification process. (Calverley 2010; Hermansen, Søren 2010; Kaae 2010; Hermansen, Sven 2010)

Samsø has not experienced a decline but rather no further conversion. This has mainly the same reasons that can be observed all over Denmark. Sven Hermansen, also sees a lack in confidence about being able to handle the land without pesticides as well as fear for the potentially higher risk of yield losses, as reasons that halter development in that area. As prices for organic produce in Denmark, which are normally about 30% higher than prices for conventional products, have plummeted the economic reasons are not evaluated as so strong anymore to convince farmers to accept a yield loss but compensated by



higher prices.(Ravn Nielsen 2010; Hermansen, Søren 2010; Øster Kristensen 2010; Hermansen, Sven 2010; Castenskiold 2010)

“A crisis makes people much more open to new ideas.” Søren Hermansen in (The Independent 2009). Yet, if the financial situation does not improve, he sees little hope for conversion ratios to come up, unless farmers are financially unburdened in another area.(Hermansen, Søren 2010) Sven Hermansen on the other hand says that with better input-output ratio, as fewer raw materials need to go into the soil, conversion is a matter of knowledge and belief into the capabilities of the farmer himself. Knowledge about the farming type is essential to tear down prejudices and show the farmers that organic farming is not difficult or complicated, which is a common according

to Hermansen. (Hermansen, Sven 2010)

When analyzing the current development of organic agriculture in Denmark, the graph showing the evolution of industry development (See chapter 3) can be applied onto agriculture. The analysis of the rise in organic and more sustainable farming practices and the current crisis can be translated into the graph which shows a similar curve as in the theoretical model, but with slight divergences. (See Fig. 5.2) The situation on the market in Denmark has, like in a lot of other European countries stagnated, to the extent that demand is still rising, but the supply side is not adjusting to the purchase behavior of the population. Rather the additional organic food is being imported from other countries.(Hermansen, Søren 2010; Kaae 2010)

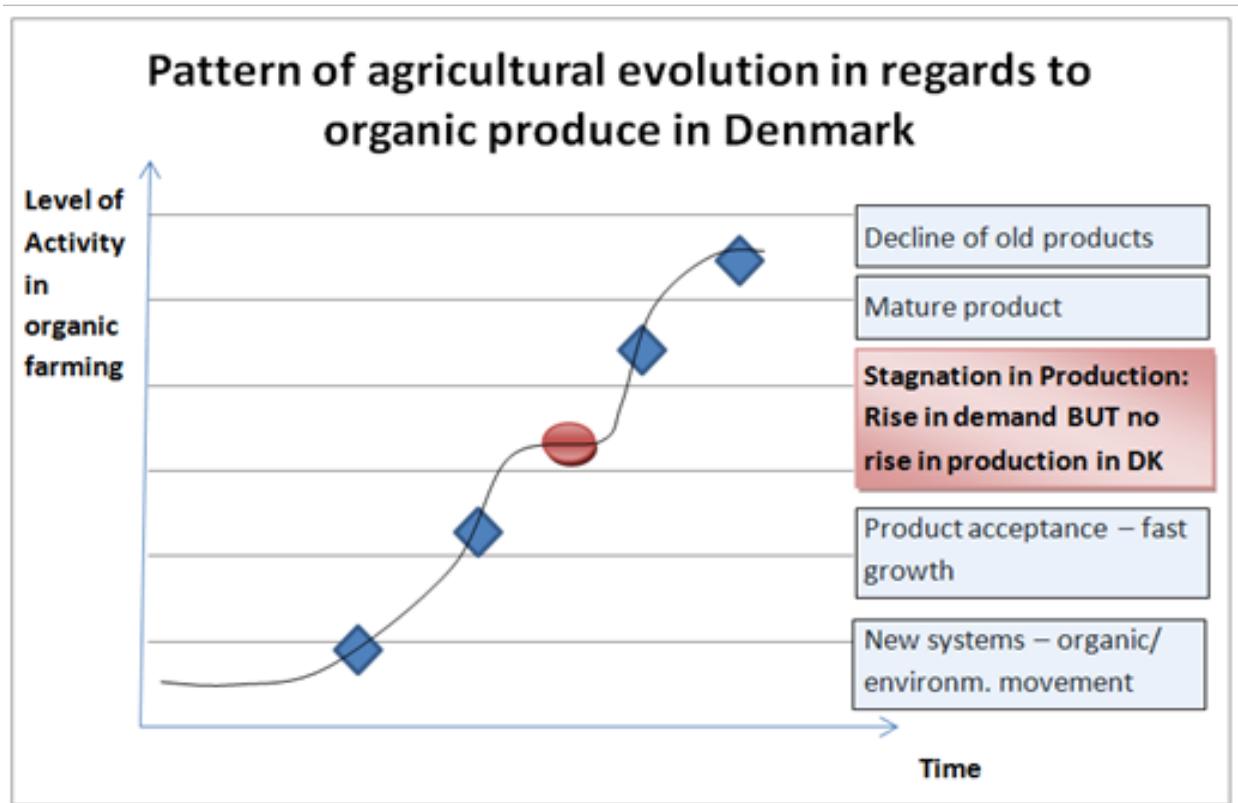


Figure 5.2: Pattern of agricultural evolution in regards to organic produce in Denmark, based on market data of organic food industry and inspired by the Pattern of industry evolution by Hayes (2007, p 4)

A heavily debated piece of regulation, called the Green Growth Agreement which is likely to influence conventional farmers in Denmark and thus on the island of Samsø as well. Opinions differ with some claiming it is a historical event and others calling it a disaster for Danish farming.

Green Growth Agreement – leap forward for the environment but potentially harmful for Danish farmers

In 2009 the Danish government passed an agreement that aims at helping to foster more sustainable agriculture through decrease of the negative impact on the environment through agricultural activities. With this agreement the government voted in favour of Green Growth, thus focusing on prioritising environmental protection together with the Danish People's Party (Dansk Folkeparti). While environmental Minister Troels Lund Poulsen calls the agreement "a historical event and a completely new way of combining environmental and agricultural planning" (Danish Ministry of the Environment 2009a, pp 1-19, p 2; Danish Ministry of the Environment 2009b) other farmers such as the in the Sustainable Farmers Association (Landsforeningen for Bæredygtig landbrug) refer to it as "[...] the opposite of sustainable" and a destructive element for Danish farming through a heavy financial burden (Castenskiold 2010). Official ministry sources say that Green Growth accounts for a raise in investment by 50% with a total budget of DKK 13.5 billion being directed towards fulfilling set environmental goals as well as ensuring healthy growth of the economy aligned with amplifying employment in Denmark. (Danish Ministry of the Environment 2009a, pp 1-19, p 2; Danish Ministry of the Environment 2009b)

This plan specifically includes (Danish Ministry of the Environment 2009a, pp 1-19; Danish Ministry of the Environment 2009b; Danish Ministry of the Environment 2009, pp 1-36):



- a reduction of used nitrogen by 1/3rd (19,000 tons), (See Appendix D for a graph)
- a reduction of phosphorus by 210 tons as well as
- a decrease in Pesticide usage until 2015
- Furthermore the agreement wants to introduce nitrogen quotas to be traded on the market
- and introduce a tax on pesticide use which differentiates between the levels of risk exposure. This will likely effectuate a reduction in pesticide consumption and at the same time lower the load on the environment. The tax will be solely used to help improve environmental conditions and support the agricultural sector in form of lower land tax
- a reduction of greenhouse gas emissions
- the goal to protect plant and animal species in order to reduce the loss of biodiversity

The Danish government also introduces a new index aimed at measuring the impact of pesticides, which is calculated on the base of area and amount of applied pesticides as well as non-sprayed patches of land rather than on the frequency of application. The



new index is also accompanied by a reduction. (Danish Ministry of the Environment 2009a, pp 1-19, p 3)

5.1.2 Environmental Problems with Farming on Samsø

As already discussed in chapter 4 there are numerous problems that Samsø is facing in regards to agricultural practices affecting the environment and thus having a negative rebound effect, as it will affect farming again, if environmental conditions worsen. The following problems are being shortlisted, as they have already been thoroughly described in chapter 4:

- The northern part of the island has high levels of nitrate in their single existing aquifer in that area. The results of measurements are considered extremely high, with a concentration of 200 mg/ liter of ground water. (Thorling 2010).
- Decrease in bioactivity in the soil throughout the island (Madsen 2010; Hermansen, Søren 2010; Øster Kristensen 2010)
- Lack of organic matter and charcoal in soil, thus lower fertility of soil (Madsen 2010; Hermansen, Søren 2010; Øster Kristensen 2010)
- Soil erosion due to wind (Madsen 2010; Hermansen, Søren 2010; Øster Kristensen 2010)
- Soil compression (Madsen 2010; Hermansen, Søren 2010; Øster Kristensen 2010)

5.1.3 The Farmers' Mindset

A third aspect that influences the farming situation itself on Samsø is the mindset of farmers. This section is not aimed at stereotyping farmers but rather expresses views that have been observed during the interviews conducted for this paper. In this respect mindset describes the attitude, fears as well as opinions on farming and specifically organic farming but also mirrors the knowledge that the farmer has that causes this mindset. Knud Ravn Nielsen says that in order to foster more development towards sustainable agriculture is necessary to “change the mindset of farmers and show them that it can be a success” (Ravn Nielsen 2010)

One of the most mentioned concerns of farmers was the loss in yield through a conversion to organic farming as well as more work that needs to be done on the far. (Madsen 2010; Hermansen, Søren 2010, Hermansen, Sven 2010) Fear was expressed that lower yields and the risk of pests and diseases can heavily affect the farm and in case of pest or diseases nothing can be done to fight it. (Castenskiold 2010, Madsen, 2010, Hermansen, Sven 2010) These concerns can be directly linked to a lack of knowledge about organic farming (Hermansen, Søren 2010; Hermansen, Sven 2010) as well as negative examples that farmers have witnessed, such as the bankruptcy of an organic farmer on the island 15 years ago. Back in the days the farmer was challenged to turn 150 ha into organic farm and did not succeed. Søren Hermansen though says that this was rather due to the inability to run a farm than the fact that it was organic farming. Yet this event is remembered and cited when farmers are asked if they ever considered converting to organic. (Hermansen, Søren 2010; Madsen, 2010; Ravn Nielsen 2010) In





case an organic farmer is successful like Morten Øster Kristensen, he earns the recognition of the other farmers on the island but the organic aspect is rarely discussed. (Hermansen, Søren 2010; Øster Kristensen 2010)

In regards to current applied practices and the status of sustainable farming, Samsø can be categorized in a transition, where most of the farmers are practicing

conventional agriculture with occasional application of IPM and organic farming aligned methods, such as catch crop plantation (to remove excess nitrogen from the soil) and ploughing down the remaining plants on the field after harvest. Only approximately 7 % of Samsø is organically certified. (Hermansen, Søren 2010, Madsen 2010, Øster Kristensen 2010, Ravn Nielsen 2010, Grenaa 2010)

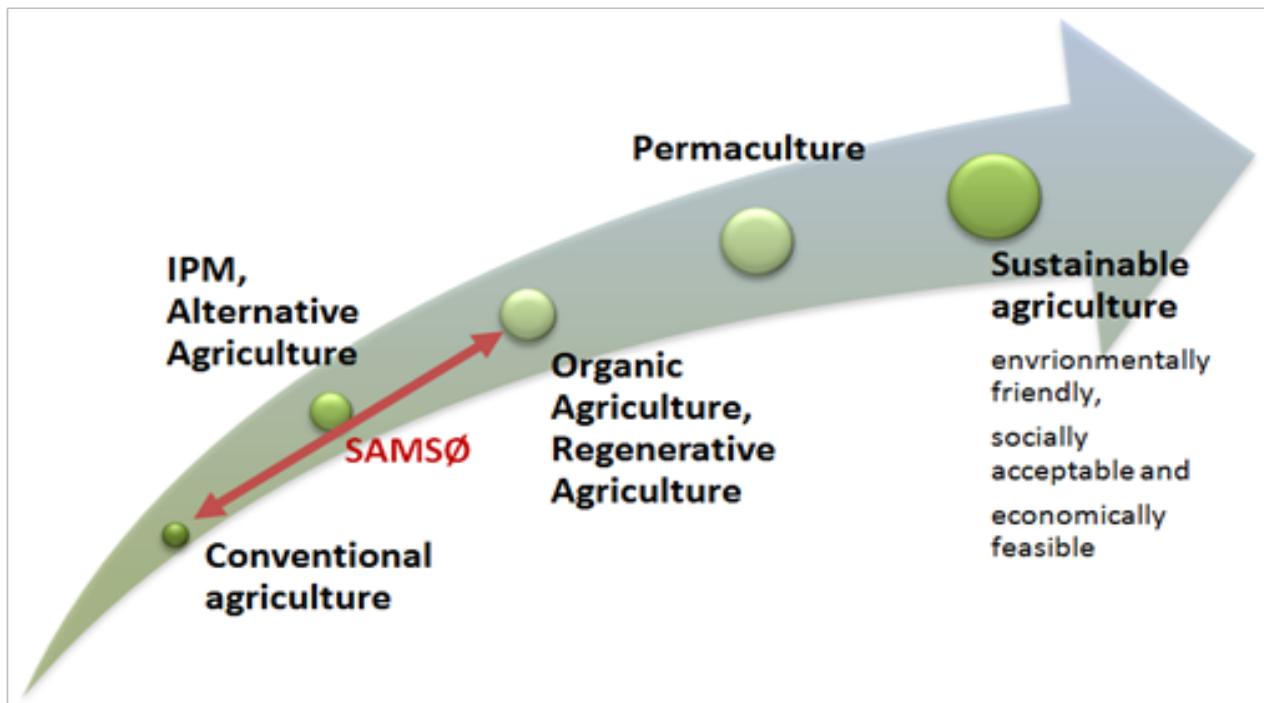
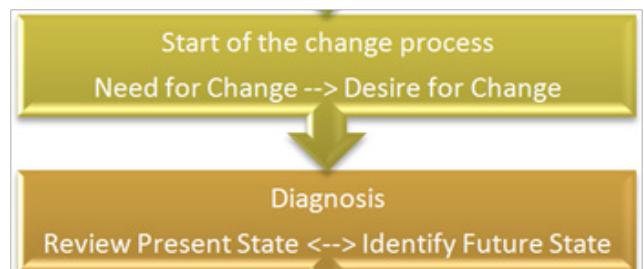


Figure 5.3: Different stages of sustainability in agriculture in regards to Samsø based on the model developed on chapter 4.2.1 (Definition of sustainable development)

5.2 Potential Future Farming – Identifying the Preferred Future State

After reviewing the need for change and the environmental problems that are occurring on the island, a potential future scenario can be drawn to see, where Samsø as an island could go in regards to sustainable agriculture



For Samsø a Pro-active approach (See Chapter 3: theoretical Framework Table 3.1) can be not only



beneficial image wise but also helps them to adapt earlier to future restrictions and thus develop their knowledge even further in regards to sustainable handling of land. As the island has mostly conventional farming it would be a transformational change for most farmers thus a Re-orientation in respect of agricultural practices. Other farmers who have already looked into more organic farming and have applied certain techniques, such as using catch crops to get rid of excess fertilizers in the ground or working with integrated Pest Management rather have “only” a tuning task.

Part of the Green Growth Agreement is a promotion of the organic sector through market-based mechanisms which aims at increasing the share of organic produce from 6% in 2007 to 15% in 2020 thus more than doubling farming area. In order to achieve this goal the Danish government promised an increase in area-based funding for the organic sector. Part of the Green Growth Agreement is also a Green Development and Demonstration Programme (GUDP - Grønt Udviklings- og DemonstrationsProgram) which aims at solving some of the pressing questions through research, development and demonstration projects. Issues such as how to achieve a more sustainable crop production, how organic production can be based on market-driven instruments as well as how higher productivity can be realized, shall be investigated. A budget of DKK 40 m is aimed at supporting the research annually. (Danish Ministry for Food, Agriculture and Fisheries 2010; Gribel Vorum 2010)

With the “disadvantage” of being an island and thus calculating with higher costs, as transportation to and from the island needs to be added (Thorling 2010), Søren Hermansen sees the necessity to focus on high end produce, thus products that have a higher value on the market, as the farmers are not able to compete with neither big farmers from mainland Denmark nor with farmers from other European countries. Through the financial support of the Green Growth Agreement to convert to organic as well as to, if not converting entirely, to use methods like crop rotation, strip



farming, as well as integrated pest management. With, as forecasted, rising energy prices the dependence on fossil fuels is only going to increase. Morten Øster Kristensen, that he pointed out as he was doing the calculations to convert his farm to organic he saw the only chance as soon as possible, as otherwise he would have faced increasing dependency on synthetic fertilizers and pesticides.

The conversion to organic farming is not without difficulties, as the farmer needs to readjust to different requirements of his land and to learn new techniques and new knowledge about his farm. (Hermansen, Sven 2010, Hermansen, Søren 2010, Øster Kristensen 2010) Therefore a step by step approach facilitates this transition process, where farming practices are adapted little by little, with the result of better soil fertility, a higher bioactivity in the soil as well as the improvement of water quality on the island. In this respect Samsø is going to face challenges but not without opportunities that lie beyond the benefits of sustainable farming, such as the image of being a Green Island and thus set an example for others just like in regards to energy.



5.3 Perspectives and Challenges for Samsø

As mentioned before, Samsø is a special case, such as most islands, when it comes to the downstream supply chain of food as all products which cannot be sold locally, which is the majority, need to be shipped to the Danish mainland. (Thorling 2010, Hermansen Søren 2010) Farmers on the island do not have the possibility to sell their produce at local farmers markets like in Copenhagen, Aarhus, or Aalborg. This increases the transportation costs significantly. (Thorling 2010, Hermansen, Søren 2010) Søren Hermansen observes this as a reason why the farmers on Samsø are focusing on high end crops such as vegetables. (Hermansen, Søren 2010) Knud Ravn sees a further need to expand this high end production by switching to organic food production which is approximately 30% more expensive on the market than conventionally produced food. But it also requires more man power which is mainly supplied by Eastern European countries. (Ravn Nielsen 2010)

To convince farmers to convert is also going to be difficult, as unlike energy, agriculture poses a more complicated problem, as the market is currently unpredictable and as prices for produce are considerably low while bank loans for the farmers have been at a high level until the financial crisis hit in 2008. Søren Hermansen states that there is no possibility to certainly predict where the market is going, although everybody is confident that prices will go up again once the financial crisis has passed and economic recreation sets in. (Hermansen, Søren 2010)

At the same time, when financial burdens are laid upon farmers in order to give incentives for a change towards more sustainable agriculture, the transition phase needs to be facilitated and more subsidies need to be directed towards organic farming, permaculture and other forms of more sustainable farming practices. Furthermore an open dialogue and exchange between farmers as well as between the Ministry of Environment

and the Ministry of Food, Agriculture and Fisheries (Ministeriet for Fødevarer, Landbrug og Fiskeri) as well as Organizations like the Farming Association on Samsø and the needs to be established to provide all help needed Organic Farming Association (Økologisk Forening) to ease the transition period to cushion eventual decreases in output or change in equipment for different cultivation methods. Currently farmers talk in private but no meetings are organized to discuss concerns, problems but also solutions for common issues, as many farmers on the island are facing the same problems.

As Sven Hermansen pointed out a fact which was confirmed by several interview respondents, that the lack of knowledge is a big problem, which prevents farmers from even considering a conversion to organic or an alteration of farming practices. This knowledge gap needs to be bridged in order to erase the skepticism, fear and concern of farmers to adapt more sustainable practices. (Hermansen, Søren 2010, Hermansen Sven 2010, Madsen 2010, Øster Kristensen 2010, Ravn Nielsen 2010)

Therefore not only governmental frameworks are essential but also local initiatives taken to ease the transition and to clearly demonstrate that a concentration more sustainable agricultural practices is not only necessary and desirable but also achievable including financial opportunities.

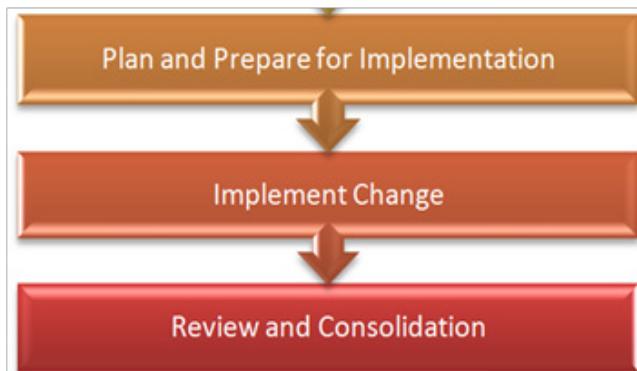




The benefits of a transition though are numerous, as already pointed out in chapter 5.2. Samsø can further decrease its dependency on oil and oil based products and can improve the status of its environment. Furthermore farmers can reconnect with their farmland, as Sven Hermansen underlined that farmers have become detached from their land and have little knowledge about the natural processes that are in place to support their farming. Sven Hermansen calls organic farmers the “more clever farmers”, as they really know their land. His hopes are that farmers also start to be proud of their profession and their work again, as in the last years farmers have mainly been heard when they were complaining (Hermansen Søren 2010). With increasing knowledge about land and farm, farmers will be able to reestablish their self-confidence states Sven Hermansen.

5.4 Possible Paths for the Community of Samsø

After having examined the status of current agriculture, thus recognized the need for change, as well as identified a preferred future state including the challenges and possibilities arising from a transition, this last chapter of the case study aims at clarifying which instruments (found in chapter 3.2) can be applied to Samsø.



The complexity of today’s worlds reveals itself when thoroughly thinking about how to motivate change and which instruments, tools and mechanisms are needed

to achieve a change in any direction. Sustainability and environmental issues add to the complexity as any frequently discussed topic that causes so many voices to argue and so many subjective views being revealed during these discussions. Different parties are necessary to motivate change and to give incentives that facilitate the transition between a system that is only 50 years old but thanks to successes and advancements imprinted in societies as the only possible way to produce food for the world and a system that manages a better balance between the interests in sustainability. Different players need to be identified in order to distinguish who can be involved in an active leap forward to anticipate more sustainable farming in regards to knowledge and training sources but also as a financial supporter.

As referred to in the introductory chapter sustainable development cannot be achieved by relying one single pillar, but a united action of all pillars is necessary. This includes the three main aspects in regards to economics, society and the environment, as well as the supportive elements of governance, institutions, education, and science/ technology. Samsø’s effort to transform its agricultural sector into a more sustainable one needs to touch upon all elements of sustainable development to ensure a long-term success. Though, as Samsø is not an independent country, governance needs to be ensured by the Danish government and regulations need to be put in place that give incentives to transform agriculture and make it economically feasible to do so.

The following suggestions are based on information and insight obtained about the island through literature as well as primarily interviews. Therefore the suggestions have room for improvement in case local farmers have additional ideas of how to share knowledge and help themselves in the transition phase for more sustainable agriculture.

There are three possible areas where a local community like Samsø is able to influence a transition to more sustainable agriculture:



Communal Exchange

One of the first steps to be taken is a thorough analysis of farmer interest on the island of Samsø. This includes concerns, environmental/ general problems with the land or livestock, views on where they see future problems and how they personally think they can solve them. This personal risk assessment (Cox 2010, p 201) makes farmers think about their impact on nature and what they regard as future problems that they want to avoid. It is important to not patronize farmers and tell them all the things that they have caused, as this will likely decrease their interest in continuing the conversation. Rather an open and personal discussion is necessary. These assessments should take place in regular meetings where farmers can discuss common concerns and possible solutions, with mixed farmers in it, such as Morten Øster Kristensen as well as Kim Andersen (both organic farmers) and Søren Hermansen (a former farmer) as well as his brother Sven Hermansen (organic farming association). They are possible persons to observe the conversations and openly talk about the concerns and problems, as their level of expertise as well as their Samsø origin make them highly suitable dialogue partners. The island also needs public meetings for all the farmers together with the farmers association of Samsø (Samsø landboforening) and the organic farming association (økologisk forening) where problems can be discussed with people that have expertise in regards to different and alternative farming techniques. Different types of framework can be set up for the farmers to communicate with each other, such as integrating committees, partnerships and community-based collaboration.

A Farmer committee could be established aimed at the enhancement of farming practices towards more sustainable agriculture, which is lead by farmers, thus increasing their level of importance due to responsibility. Furthermore this tool could serve as a platform to establish trainings, seminars, workshops and other instruments that enable active learning and knowledge transfer.

Knowledge Transfer

Knowledge transfer involves offered trainings and talks with experts about farming practices in order to eliminate prejudices and to establish a certain level of confidence that organic farming can be achieved. The complexity of natural processes as well as how farming influences the environment should not be underestimated. Lecturing farmers with accusatory looks will not succeed in them wanting to learn more. Rather it needs to be on a discussion level with hands-on experience, through e.g. demonstration sites. Teaching can take place in the framework of a local farmers committee, where farmers themselves share their experience together with experts, that communicate knowledge in an understandable and practical way.

Furthermore knowledge transfer needs to be established concerning marketability and new markets. Marketing organic products from Samsø in a communal organization would increase the level of influence in price negotiations with supermarkets, as currently every farmer has to do this by himself, hence not representing a big lobby. A new market could include collaboration with Årstiderne – a company that does home deliveries of organic food in boxes and which had large success and made the company already expand outside of Denmark to Northern Germany and Sweden. The IAASTD mentioned even its success in the global report about agriculture and stated that the company, which has contracts with farmers, but also produces their own produce, was selling approximately 22,000 boxes per week, equalling annual sales of Euros 20 million in 2005. (IAASTD 2009, p 184)

Knowledge transfer needs to focus on the future state that is desired to be achieved. Problems and solutions on a local level have to be stressed, as global issues might be of interest but as long as it does not concern the farmer there will be no point of argument in talking about these issues.



Adjustment of Municipal Position

Søren Hermansen does not see the possibility of the municipality to be directly involved in organizing meetings for farmers, but if Samsø would be definitely be able to support actions, such as redefining public procurement, thus only buying organically or more sustainably farmed produce for schools as well as for the organization.

Yet the municipality can act as a supporter for these developments in regards to the creation of public demand (Cox 2010, P 234) and thus constituting a public support in favor of certain farming practices or farming types.

To facilitate the understanding of the process, similar concepts like Søren Hermansen has undertaken in regards to the energy conversion of the island, need to be established and presented in a step-by-step approach. This involves the formulation of reachable targets, including a plan and a picture of where the island wants to be in 10 years time. When solely looking at a possible target such as the conversion of 50% of conventional agriculture into organic farming it might seem too ambitious at the beginning, but broken down into steps it can be viewed that by adapting IPM and organic farming practices over the years, the transition to organic farming will be less hard than if a sudden conversion is anticipated. Furthermore step-by-step approaches enable the farmer to see the opportunities in adapting the farming techniques without much more effort and increase the likelihood of change being accepted than in case of an immediate conversion. This also works against their fear of risking a lot by converting (Hermansen, Søren 2010; Hermansen Sven 2010; Ravn Nielsen 2010). Therefore a thorough but adjustable plan is needed that displays in a simple manner how to transform the island's agriculture into a more sustainable one, such as e.g. converting a majority of the farming land to organic.

With a predicted rise in oil prices, the price for fertilizers and pesticides is likely to go up. (Danish Energy Agency 2010) A solution for the fertilizer could

be the current project that Samsø is working on: a biogas plant with two lines, one organic manure line and one manure line from conventional farming where electricity is generated and where the remaining dry matter will be used for organic fertilizer from the organic line and fertilizer for conventional farming from the conventional line. (Hermansen, Søren 2010) These projects are vital to indirectly transform agriculture by offering them alternatives that are not criticising their farming practices but rather give them economically attractive alternatives.

The last chapter has introduced the local setting of Samsø to investigate the complexity of motivating change in a specific setting, by identifying a need and possible future solutions for farmers to adapt more sustainable farming practices.





6 CONCLUSION

This thesis has not only shown that there is a severe problem with the current way of agricultural practices but also that there are viable alternatives which are already practiced in different parts of the world, different areas of Denmark and also of Samsø. Albeit alternative agriculture requires knowledge about how pests and weeds can be fought, there are numerous sources of information such as farmers associations for the farmers to draw on to obtain the necessary information. The new farming practices not only significantly improve the environmental and ecological conditions but also enhance social components, such as local communities as well as the relationship between farmers and their properties.

Samsø as a case and specific example of how sustainable agriculture and hence the change from conventional, fuel intensive agriculture to low-input/ ecological agriculture places an extraordinary setting, as an island faces numerous difficulties that mainland Denmark does not primarily have to deal with. This includes:

- Higher transportation costs to deliver the goods from and to the island, on which itself only a limited amount can be sold locally. The rest needs to be transferred to the main market on the mainland of Denmark including large islands like Fyn and Sjælland
- A more isolated setting thus potential risk of ground water contamination as only a few aquifers are available on the Island
- An inequality when it comes to competitiveness with big farmers on the Danish mainland, thus Samsø has to create a niche which currently includes vegetables.

- Increased costs for transport of pesticides and fertilizers to the island

Furthermore the island is a unique setting in regards to forward thinking specifically in matters of energy due to the conversion to self-sufficiency. Therefore inhabitants see the importance of developing independence to external sources that present a risk to the islands financial status as world prices fluctuate.

The following part of the conclusion aims at briefly answering the main research question, as well as the sub-questions that were defined in the introductory part.

6.1 Summary of Results for the Main Research Question as well as the Sub-questions

Although extensively researched this part shall provide a short summary of the main findings that helped answering the research questions.

Main research question:

How can change towards more sustainable agriculture be motivated by the local community in the context of the island of Samsø?

Change can be anticipated through various elements, such as communal exchange, knowledge sharing and municipal support in regards to adjusting local settings like public procurement. The fact that change needs to be motivated implies that farmers are not convinced of this path and fear risk, work, financial losses, and lack of knowledge to handle all



three components. Hence a focus on these issues provides the possibility to eliminate the fear and replace it by support through expertise, knowledge building as well as a communal structure that supports transitions and engages the farming community as a whole in discussions about possible solutions and paths.

Sub-Question I:

How can a need for change in current agricultural practices be identified?

The necessity of change can be recognized through a thorough analysis of the present state, thus observing advantages as well as disadvantages. In case disadvantages outweigh the advantages as well as when other more sustainable farming techniques provide similar results with a lot more advantages, then a need for change can be identified. In the case of agriculture it is the impairment of natural habitat, soil, water as well as human health. It is viewed as evident that agriculture based on short-term gains is by no means sustainable and cannot be continued for much longer without fearing that natural systems do no longer support current dominating practices.

Sub-Question II:

What are the alternatives to conventional farming?

Alternatives to conventional farming are of various kinds and depend on the level of transformation that wants to be achieved. Whilst e.g. Integrated Pest Management only changes one aspect of farming, Permaculture is a revolutionizing concept that goes beyond the core of agriculture. Most research conducted on the practicability of alternative farming practices reveal, that the advantages outweigh the few negatively perceived aspects. Organic or more sustainable farming not only has the possibility to provide food security, as it is based on preventative techniques to avoid crop loss, but is seen as possibly one of the only ways to continue farming in a long



term perspective.

Sub-Question III:

What are the tools and mechanisms to support and foster change in agriculture?

Tools range from management tools such as change management to communicative support which enables to not only transfer the need for change into a desire for change but also listen and teach. Communication is one of the most vital aspects when it comes to motivation. The right channel of communication must be found. The change management process enables to communicate step by step what is necessary to change towards more sustainable agriculture and thus provides a tool that gives structure and provides understanding of different aspects that need to be analysed.

Sub-Question IV:

How can communication be used to motivate change in the context of Samsø?

Samsø and its local setting with all the individuals that live there pose a challenge for the motivation of sustainable agriculture, especially in regards to communication. Trust is a necessary element for people to believe told facts and thus putting knowledge



into action. Local structures thus need to be activated. Local opinion leaders need to be engaged and the channels of communication are on a very personal level and thus a lot more time consuming but also more effective than e.g. writing. Communication also needs to be used as a tool to transfer lacking knowledge about organic farming and that different techniques prevent or at least reduce the risk that they fear. Advisory committees, resource collaboration as well as community-based collaboration are only three of various possible ways that can enhance communal communication and establish a network in between experts, farmers, and organizations engaged in these tools.

“We must cooperate now, because no single institution, no single nation, no single region, can tackle this issue alone. The time is now.” stated Professor Judi Wakhungu, co-editor of the global report issued by the IAASTD and affiliated to the African Centre for Technology Studies. (UNEP 2008)

Nonetheless local initiatives can and need to act as an example and demonstrate that change is possible. Just as the island of Samsø received international recognition for its energy efforts and accomplishments that encouraged other regions/ islands to do the same, agriculture can serve as the next story of success that the island achieved.

6.2 Validation of Findings

The following three criteria are the basic guidelines to validate the findings:

Reliability

The criterion of reliability examines if the results of a study can be repeated and thus corresponds to consistent concepts known to social science (Bryman 2008, p 31)

The findings of this research fulfill the criterion of reliability, as all sources have been carefully selected

and the analysis has been conducted in the most objective way possible. Interview respondents have been perceived as trusting and open in regards to concerns, problems but also in regards to solutions. Hence the answers received in the interviews were accepted as individually as true perceived information.

Replication

Replication is interwoven with Reliability, as according to Bryman findings are only reliable if they can be replicated, thus a thorough description of the research process is necessary. Although applicable this criterion is highly valued by the research community and is most applicable to quantitative research rather than to qualitative research, it is not a very common aspect of social sciences. (Bryman 2008, p 32)

Replication of this study is possible, although qualitatively selected data might vary depending on the interviewer. The study can be conducted in other settings using the same approach, as the application of change management, connected with environmental communication can be utilized in any setting, given that the localities are examined and observed.

Validity

The third criterion observes the completeness of the results of conducted research. Three different criteria are relevant for this thesis: internal validity which demonstrated causality between different findings; external validity, which looks into the possibility to apply research findings onto external cases which are not included in the research focus; and ecological validity, which is concerned with the findings being of value for people in their everyday lives. (Bryman 2008, p 32-33)

Validity as a final criterion is also met by this report, as for internal validity a connection between change management, environmental communication as well as environmental issues in general as well as on the specific setting of Samsø, has been established. The applicability of this study onto other cases and settings through a specific set of criteria based on the process



of change management is meeting external validity. Adjustments would need to be made, as other regions might be dealing with other environmental problems and thus the outcomes of the examination of the present state of farming. The criterion of ecological validity is also met, as a direct connection between farming practices and environmental problems that affect humans has been established. Furthermore the report investigates the concerns, problems that farmers need to handle in their everyday life.

Nonetheless the results can be discussed and its statistical relevance questioned. The next section critically observes the approach as well as the findings.



6.3 Critical Discussion of the Project Approach and Research Findings

The project, which aims at clarifying which different communicative tools can be utilized in regards to change management has delivered a number of suggestions that can be evaluated by the local community of Samsø if they are applicable for them. There has no investigation been done on the social structure and setting of the island and hence opinion leaders in regards to farming were not identified. Hence the suggestions have not been comprised in a plan that the community can follow to achieve more sustainable development. Eleven interviews were conducted, yet two were directed at current farmers on Samsø, while two others were former farmers on Samsø and one respondent was a farmer in Jutland. Yet, it can be criticized that only two actual Samsing farmers were contacted to obtain information about problems, and concerns, as well as their motives and

possible incentive triggering instruments. A more thorough analysis of the farming situation could have been undertaken by conducting a survey including all of the farmers on Samsø. This would have required additional language skills in regards to the Danish language, as the two interviewed farmers were contacted by Erik Grenaa from the Farmers Association on Samsø up front in order to ensure a certain level of English.

The language barrier has also lead to a reduced possibility to find literature about the island of Samsø and hence might have led to an oversight of important information on e.g. environmental issues, social structures as well as communal action that has already directed towards more sustainable agriculture. Albeit the limited knowledge of the Danish language interviews were spread over a variety of people to ensure that important issues such as potentially established communal action for sustainable agriculture was not passed up.

The thesis has a strong focus on the change process step of identifying the problems in the current state of agriculture as well as on the potential and preferred future state. There is a tendency towards a demonstration of primarily negative aspects of conventional agriculture brought about by a personal negative view on the philosophy of conventional agriculture will all the implication it entails. This has been tried to be avoided through intensive research of literature to be able to discuss the benefits of conventional agriculture. Yet more literature was found arguing against conventional high-input agriculture. Hence questions might have been posed in a way to reveal mostly negative aspects of conventional agriculture. Yet, when given the chance to openly evaluate the positive and negative aspects of conventional as well as more sustainable agriculture, respondents which were asked to state their own opinion mostly named negative aspects of conventional agriculture. Yet the few positive sides that were mentioned did not outweigh the negative side.



7 RECOMMENDATIONS/ PERSPECTIVES

This thesis has primarily explored the potential of adjusting farming practices in order to foster sustainable development within the agricultural sector. Thus it needs to be underlined that change needs to take place on all levels and throughout the society in order to be most effective. This also includes the consumers, the government, the EU and other involved parties. It is illusionary to think that a conversion of farmland to organic will solely take place on the grounds of conviction and belief that organic farming is the right solution, without an economic fundament to support conversion and a continuous existence. Consequently different economic players have to change their behavior in order to push organic farming further.

For further investigation the following research areas are recommended in order to obtain a more holistic picture on how farming practices on Samsø can be motivated towards a more long-term perspective:

There is a need for customer awareness and active buying and consumption habits. For example not only methods to reduce runoffs need to be fostered but also a change in diet towards a less meat based diet helps significantly. Approximately 40% of global grain production is used for the feed of animals. Consequently a reduction in meat consumption also takes the pressure off agricultural land that can then be used for different purposes. Furthermore a change in feeding practices is essential to reduce pollutants. Instead of a corn-based diet, livestock should be fed grass again, the most natural feed existing. (Lawrence 2009; Hill 2004, p 235) Christian Castenskiold sees a huge gap in the desires of consumers for organic food and the following purchasing behavior. (Castenskiold 2010)

Another issue in regards to organic farming is the bureaucratic certification process, where the question

arises why a labeling is not established for conventional agriculture and their respective products stating environmental information on the products. Farmers who are already practicing farming in the more sustainable area are then loaded with paperwork and annual inspections, whilst conventional farmers do not face anything like this.

In regards to governments and the European Union, subsidies and other financial support systems need to be revised and reviewed. Farmers are already naturally calculating with the subsidies, when calculating their budget, and yet the financial support for conversion of land into organic farming land is subsidized to an extent that farmers are almost not able to survive the first years, when yield loss is the highest. From a budget as high as 133.8 bn. Euros, the European Union spends approximately 42% on agricultural subsidies. (European Union 2010) But subsidies not only reduce global market prices and thus make it more difficult for unsubsidized farmers to enter the market place, but it also results the dilemma of farmers already calculating the subsidies in and hence lowering the prices on the local market. Considering the current level of prices for food partly caused through the financial crisis but also by a constant price battle with supermarkets, farmers would be unlikely to survive without European agricultural subsidies. (Hermansen 2010) Søren Hermansen further states that European Union subsidies change according to the crop of interest within the next planning period. Therefore subsidies are highly unpredictable and planning is made difficult. The EU, so Hermansen, wants to control the agricultural market and thus invests in different crops according to current interest. This causes the market to be flooded with crops which are subsidized at the time, as more subsidies can be calculated into the farmers' budgets. This constitutes one of the central problems of European agricultural subsidies: an anticipation of overproduction of one



specific good. (Hermansen, Søren 2010) This shows that the problem is still present despite the decision in 2003 to decouple the subsidies given to farmers from their production which was further extended in 2008. Up until now the European Commission is supporting the olive oil market in the EU. (European Commission 2010; Folketinget - EU-Oplysningen 2008; European Commission 1998)

There also needs to be public investment in agricultural research and granting of loans for farmers who want to engage in more sustainable farming practices needs to be facilitated. Planning principles of governments, if they exist, regulating what type of crop shall be produced as well as the management of the entire food chain, need to be based on long term ecological principles, not short-term profits. Only if the focus is long term a country can secure its continuous food production. This of course needs to be in line with short term basic needs. Subsidies, although known to have caused significant problems in the world, can also give incentives towards a positive change, if they are adjusted significantly towards local needs instead of protection of national markets/ EU markets. Markets in the EU are protected via trade barriers that only allow specific goods to enter the European food market. Furthermore the EU has introduced subsidies back in 1990 that support farmers, especially large farms as the subsidies are determined by output, which causes an overproduction of goods and at the same time permits to keep the prices at a low level. But in order to give incentives for change, subsidies can be utilized to encourage more sustainable farming practices, thus e.g. a certain crop/ fruit type in specific geographic areas. For example, in more hilly areas, in order to avoid soil erosion and water runoff subsidies can be directed at e.g. the growing of different fruit trees. Furthermore water conservation and the minimization of chemicals and fertilizers in favor of more natural ways to fight pests, such as a natural crop cycle as well as biodiversity on the field. (WCED 1987, p 133-134) Denmark alongside with Norway and Sweden has started to introduce environmental taxes such as taxes on pesticides that aim at giving incentives to switch

to more environmentally friendly pesticides as well as more environmentally sound practices. (IAASTD 2009, p 462)

Last but not least a system connection needs to be established, just as shown by Søren Hermansen's current project to build a biogas plant, where systems are interlinked and support each other as well as creating part of an industrial ecology, where systems feed into each other and lead to waste reduction. The biogas plant would take care of e.g. 1000 tons of onion waste that is annually produced on Samsø.

There are numerous aspects that can and shall be further investigated when researching to motivate sustainable agriculture. This thesis displayed the supply side motivation through communication and remains one in many papers that are trying to contribute positively to a change in agricultural practices for the sake of environmental improvements as well as the improvement of human health.

Work lies ahead in order to make this statement become the reality:

"Agriculture is perhaps the most inherently sustainable of all human activities, using natural fertility of the land, sunlight, water and human labour to produce the basic necessities for survival" - Mark Overton (1999) (Our Southwest n.d.)





APPENDICES

Appendix A: Development of Agricultural Area in Regards to Land Area in Denmark (in 1000 ha)

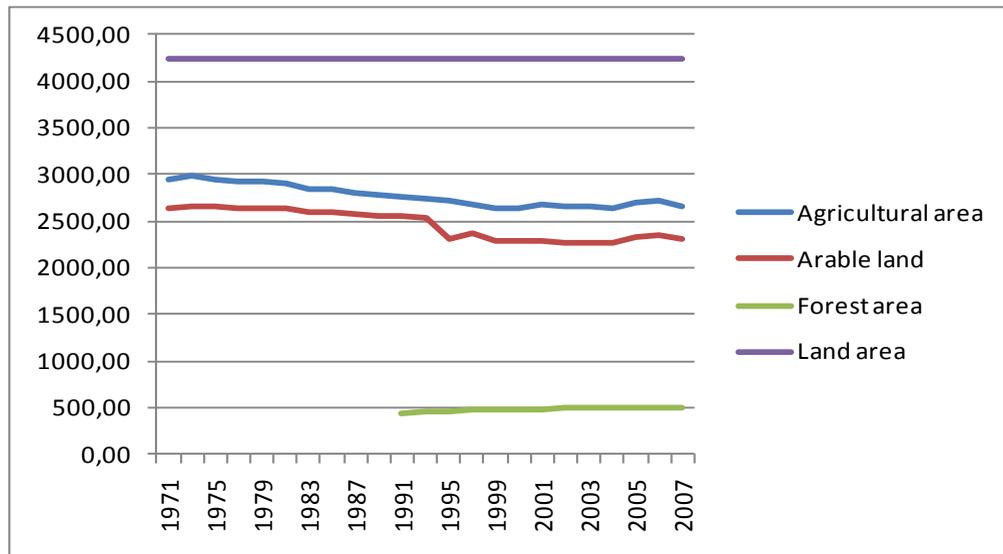


Figure A.1: Land changes according to type of land in Denmark (in 1000 ha)

(Source: FAO 2010)

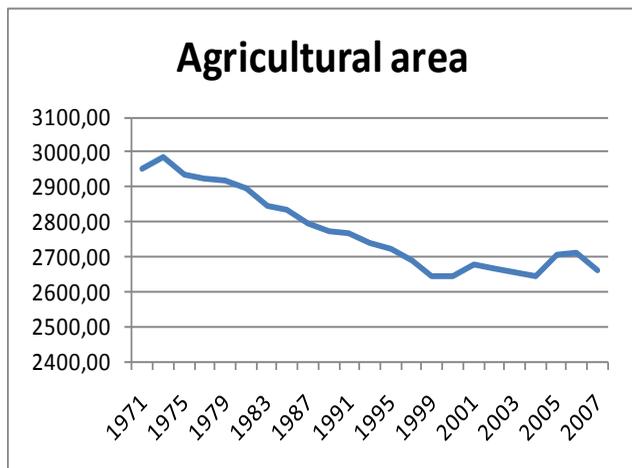


Figure A.2: Changes of agricultural land in Denmark (in 1000 ha)

(Source: FAO 2010)

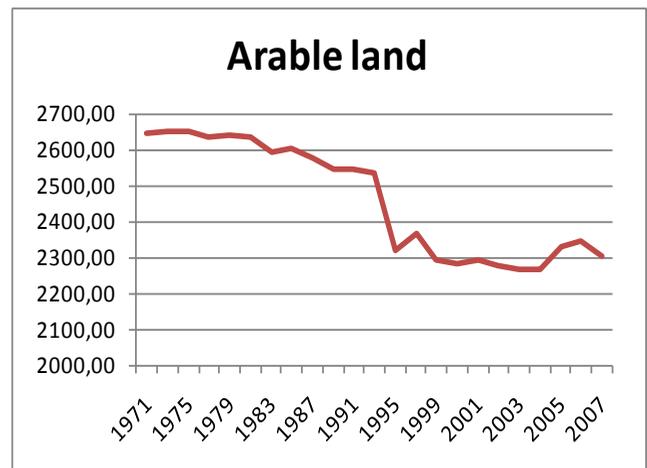


Figure A.3: Changes of arable land in Denmark (in 1000 ha)

(Source: FAO 2010)



Appendix B: Oil Price Predictions

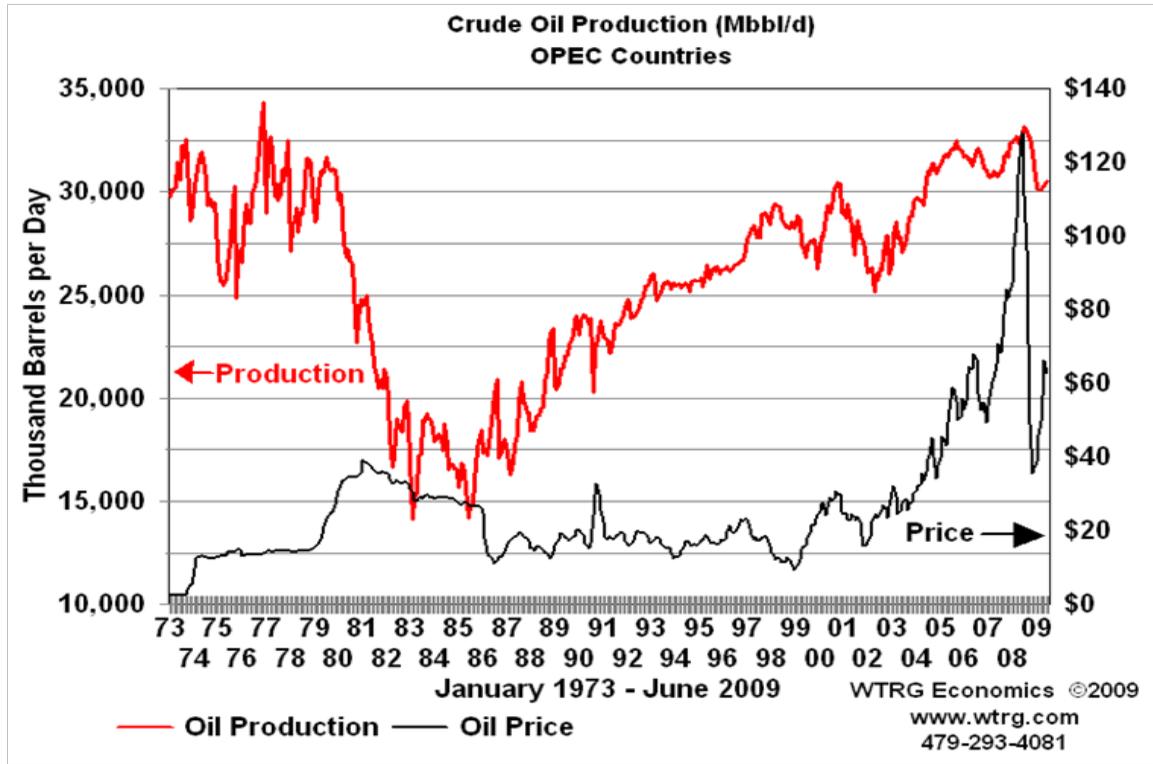


Figure B.1: Crude oil production
(Source: WTRG Economics. 2010)

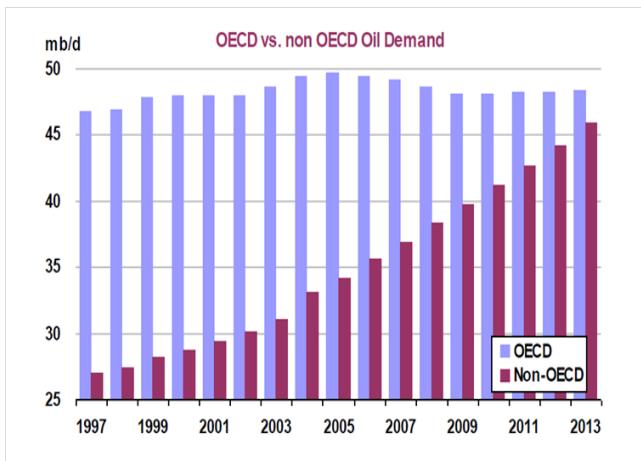


Figure B.2: Oil demand
Source: (IEA 2008, p 20)

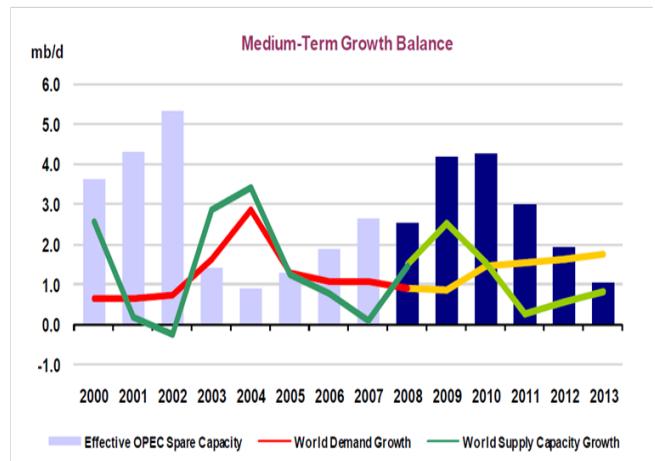


Figure B.3: Medium-term growth balance
Source: (IEA 2008, p 20)



Appendix C: Organic Area as Percentage of Total Agricultural Area in Denmark

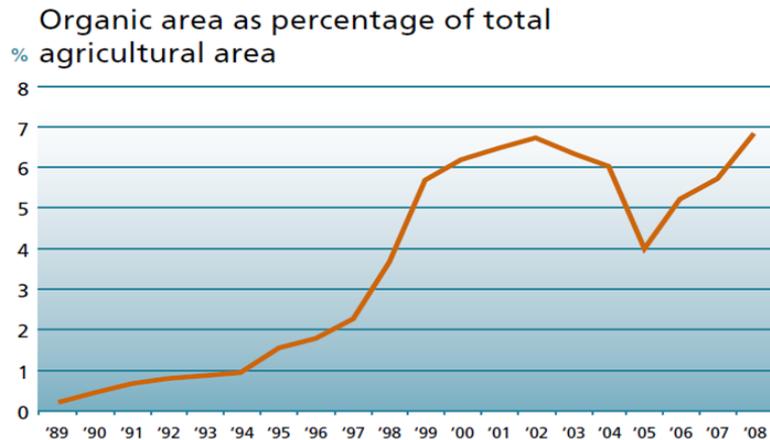


Figure C.1: Organic area in Denmark
(Source: Danish Ministry for Food, Agriculture and Fisheries 2009)

Appendix D: Reduction in Nitrogen Output through the Green Growth Agreement

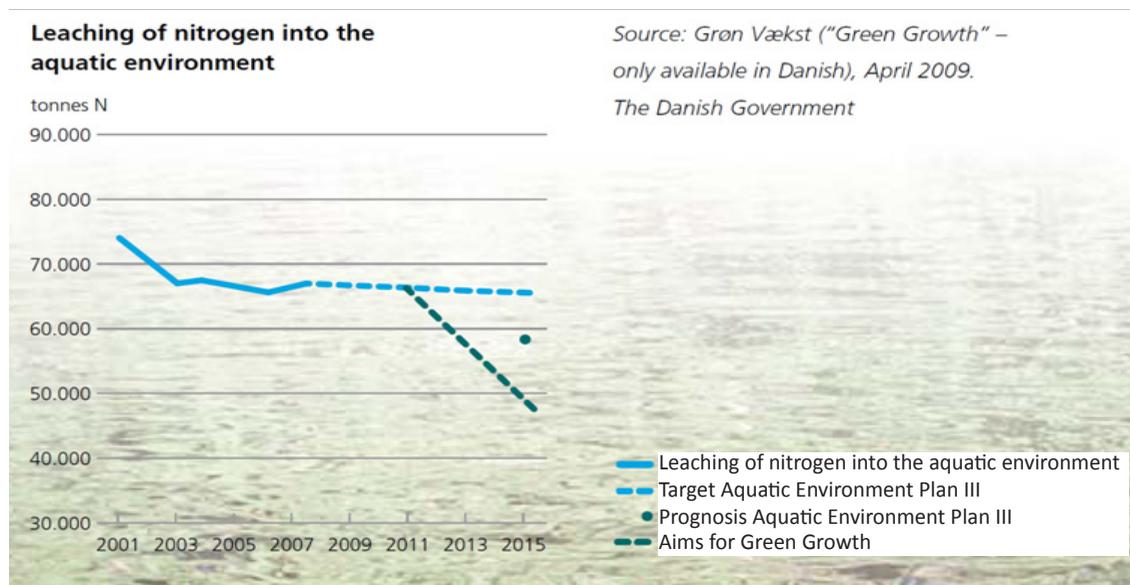


Figure D.1: Leaching of nitrogen into the aquatic environment 2001 – 2008, from 2009 estimation and an indication of the aims of Green Growth till 2015

(Source: Danish Ministry of the Environment 2009, pp 1-36)



Appendices E-P: Transcription of Interviews

Appendix E: Carmen Calverley

Ministry of Food Agriculture and Fisheries
Department of organic farming
Responsible for Inspections of the farms
Telephone interview on the 5/5/2010

What is the essence of Danish subsidies for organic farming?

Denmark has established a support system for organic farming that goes beyond the subsidies of the European Union that are given out to all farmers depending on the size of the farm, thus hectares.

Organic subsidies are approximately 1000 DKK/ ha for the first 2 years and then the support drops.

Does the certification process cost anything?

The certification process for organic farms is free and supported through the CO2 tax that farmers need to pay. Thus this tax income is used to support organic farmers. This is different for the food industry where the certification process involves costs.

How do you explain the drop in numbers of organic farmers in Denmark since 2003?

This is mainly due to the drop in prices from double to 2/3rds above the price for conventional produce down to almost equal prices. This caused a lot of farmers to get back to conventional farming to avoid bureaucratic processes to keep the certificate, inspections as well as to return to more output.

This price drop is partly because of price pressures from supermarkets, as the price for the food item itself mostly didn't fall but the prices farmers get for their produce, thus increasing the profit margin for the supermarkets/ retailers. Furthermore a lot of food is being imported from Eastern European countries as well as Russia, significantly impacting the prices for Danish farmers.

Is there any policy that aims at supporting organic farmers?

There is a new policy in place called the "Green Policy" which aims at helping the organic farmers through such things as free counseling.

There is also a new department that was founded to further market organic farming through innovation, called GUDP.

Is there any possibility to find out who is an organic farmer on Samsø?

Name	Place	Recertified
Allan Staunstrup	Samsø	14-07-2009
Gdr Annette Mørch	Samsø	14-07-2009
Fotograf Jens Jørgen Øster-Mortensen	Samsø	15-07-2009
Erik K Andersen Inger Lise Andersen	Samsø	14-07-2009
Morten Øster Kristensen	Samsø	14-07-2009
Samsø Økogrønt v/Niels Birkmand	Samsø	13-05-2009
Vestergaard økologiske gårdbutik	Samsø	14-07-2009
Bent Degn	Samsø	14-07-2009
Synkefri v/Tom Nagel Rasmussen	Samsø	*
Helene Kjærsgård Jensen	Samsø	15-07-2009
Else Lysgaard	Samsø	15-07-2009
Økologisk Landbrug I/S	Samsø	28-01-2010



Appendix F: Jesper Kaae

Ministry of Food Agriculture and Fisheries
Department of Organic Farming
Head of Department (Kontorchef)

Telephone interview on the 5/17/2010

How has organic farming developed in the past few years?

There has been a steady increase ever since, though since 2003 the numbers in certified has decreased. So far, from what we can see, not a lot of farmers are convinced of organic farming in regards to economic reasons. The certification process, aligned with the EU regulations requires a lot of documentation and is based on precise and thorough criteria to ensure a continuous trust in the organic certification scheme. This has ever since caused debates in politics over whether it is the right approach to have organic farmers document all their actions and conventional farmers, who are using significant amounts of pesticides and synthetic fertilizers, are in less responsibility to do so themselves.

How has purchase behavior driven the development of organic farming? Has there been a steady rise in demand for organic produce?

Demand for organic produce has been on a steady rise, yet the production within Denmark remained on a rather steady level, increasing the amount of produce imported from other countries, as Denmark is unable to supply enough organic products to satisfy the market.

Does the Danish state encourage changing farming practices towards organic farming and if so, how?

The Ministry aims at doubling the land area of organic farming by 2020 and wants to primarily rely on market driven forces through an increase in demand. This has closed any hope for additional funding in regards to helping farmers financially. So far though, demand has exceeded supply and due to financial difficulties on the world market. There are funds available

for conversion, embedded in the Green Growth/Expansion Plan by the government, in summer 2009. There is no recognizable lack of knowledge what organic farming does and how it helps to improve the environmental status within the farming community. Thus the economic incentives are discouraging; despite the fact that there has been a steady increase in sales of organic produce. In regards to that a farmer who actively decides on converting his conventionally farmed land into an organic farming area has made a clear choice in favor of organic farming, knowingly engaging in more paperwork, bureaucracy and tighter regulations.



Appendix G: Erik Grenaa

Samsø Landboforening (Samsø Farmers Association)
Consultant: economy, real estate, family law
(Konsulent: Økonomi, ejendomshandel, familiejura)

Telephone interview on the 5/17/2010

A general question concerning your organization: Are you only giving legal advice or are you also giving advice to farmers or are you giving any other advice as well?

We are a very little organization here. We only have economic advice but also in regards to crops advice and so on.

Have you had any experience with conventional farmers switching to organic farming?

No, no in the last years

So most of the organic farmers have been established for a while?

I do think we only have 2 or 3 organic farmers on our island

Do you know how many farmers in total there are on the island?

Between 80-100, I don't know the exact number.

Are most of the farms small farms or rather large farms?

Oh we have mostly small farms with a few big farms.

What would you say is the main produce that Samsø has on the island?

Potatoes, onions (on a large scale), we have also a big production in strawberries, black current

We have also a factory on the island conserve fabric.

Appendix H: Knud Ravn Nielsen

Samsø Landboforening (Samsø Farmers Association)
Department for Plant Cultivation
Consultant (Konsulent Planteavlsafdelingen)

Telephone interview on the 5/20/2010

How many farmers do you consult at the moment?

we consult about 100 farmers totally and they are all on Samsø, and very few of them are organic farmers. The only advice I can give them is on the subject of EU subsidies in regards to all the paperwork that is necessary.

Do you see more money flowing to the organic farmers than to the conventional farmers in form of subsidies?

Yes, they have some additional money. In Europe everybody gets something. 2300 kr/ ha and then 500 kr/ ha for living on an island. And then the organic farmers get more money on top of that. Is that a lot more money that the organic farmers get. It is about 750 kr in environmental subsidies, 500 kr in the years that they are changing to organic farming

Is that sufficient to support the organic farmers?

You can look at the statistics and you find out that not a lot of farmers have changed to organic, and this could be caused by too little funding. But the main thing in all this is how the organic products are paid in the supermarkets. There has been a tendency to high prices for 5 years and now they are falling for the organic farming products. In Denmark we have a big cooperation, called Brugsen and they have a shop called Irma which is the most selling shop for organic farming products, situated in big cities. They have had a lot of progress in selling organic farming products. But when the financial crisis came in 2008 they suffered on the organic farming products. But I think that when the crisis is over then the price is going to go up again.



When you look at the statistics there have also been a lot of reconversions.

You know the reason why farmers reconvert is because of some weed that we have in Denmark. There are some weeds that are tough to manage in an organic system. And when farmers have fully grown the wheat, they reconvert and then go organic again. This is a technical problem. There are some things that organic farming cannot manage.

What are the reasons for that?

The problem is that, if you have to manage this wheat you have to use a lot of manpower and there are not a lot of people in the country anymore, it is lacking. For that you can also ask Morten Øster Kristensen

Have there been any environmental problems on Samsø?

Well, we sample the groundwater and the water in the lakes each year and then they are analyzed for pesticides, fertilizers. And there are no big problems. The environmental landscape in Samsø is very short of nature, there are fields everywhere. We have a lot of tourists here on Samsø and they think that it is very lovely. But a lot of farmers are hunters, so they are planting trees and biotopes, so the farmers are interested in nature. I don't think there is so much impact on the nature in Samsø. But everything can be better. But I don't think that is the big problem

Where do you see potential for farmers to help the island?

We could produce where the money is and produce more high end products. That is something we could do.

What would that include?

It would include organic farming. But you know the manpower situation. We would need more people here. We have a lot of people from Eastern Europe and they could be the answer to our problems, but maybe we'll face some restrictions on these people in Denmark due to unemployment. There is one problem of getting people there and then there is another problem to have organic farming of changing

the mindsets of farmers and show them that it can be a success. We had a big problem 15 years ago, where a big farmer went bankrupt with a big organic farm, so the farmers don't think a lot about it. A more secure system needs to be in place, they have to be confident that the wheat works and that they get their money's worth.

Does the Danish state pay for the farmers?

Indirectly via the EU subsidies.

Does the municipality have any possibility help farmers financially, training in case they want to convert land to organic?

Well we have some consultants, specialists, so farmers can have the possibility; so that wouldn't be a problem. When they really want to be an organic farmer, they can get all the help that they need. They have to calculate if they earn some enough money and if they don't then it is not possible.

Søren Hermansen was mentioning that over the last years farmers were asked if they had patches of land where different farming could be tried out. What techniques/ crops were tried out?

Well yes, we have a lot of experiments with early potatoes, because that is the main crop, you know, we harvest the potatoes the 1st of July, instead of normally in Denmark we harvest on the 15th of October. We are part of a bigger organization and in the west of Denmark there is a field experiment going on about everything that is going on. We have yearly reports on the field experiments that I can provide you with.

Do you think that there would be a possibility to show the farmers within the experimental fields different techniques and less pesticides, less fertilizers?

That is a well known way of doing it. That is why we make the experiments, to show the people how they can do it. About 20 years ago there was a man from Switzerland who was up here in Samsø and he worked on organic farming and a new way of cultivating the soil to avoid the big problem of soil compression. This system was used by two farmers. One of them was



a big organic farmer and the other one was a small farmer who used the same system for twenty years. And the traditional farmers saw that and just two or three years later a big farmer adopted the system.

But in regards to how to persuade farmers to be organic/ be more aware and use less pesticides and fertilizers?

Just this afternoon I have been working with IPM, we have a species of insects which harm root beets. We can catch the female with some capsules and the pheromones and then we can catch the males and count them and when there is a lot of catching in these traps we spray. Before we started to spray when they could have come and then just sprayed until the last day where you normally could find them. But now we only spray when we see them. But in Denmark we have a national plan for starting up with IPM. I think that is more or less general all over Europe.

And you also see that it works?

In Denmark in Zealand we have a region called Lammefjord and where there are a lot of carrots produced, that is a well known area for carrots. And they used this type of catching of females via pheromones for over 20 years and they have reduced their pesticide use by 75%. So it is really important. But about experiments in real organic farming it would need to be done on special farms that are allowed to have organic farming. You know you need to be registered as an organic farmer and you have to be approved. Every year every 6 months they have a visit of there are controllers to see if you do the right thing. You have to show your plans that is a very controlled area of production. If you want to have more organic farming you have to have a high price for organic produce for the farmers and you have to have more labor, and we have a lot of people from eastern Europe and southern Europe coming to Samsø every year, but so there is enough labor. So you can say, why don't we start up with it? This is because the farmers are not convinced that they can manage every problem. You can for example see the wheat and fungi. There are difficulties but they can maybe be overcome. In Samsø

we have some organic growers and they try to do the best and they have approximately 30% higher price but they say it is too little because the yields are about half.

When you say that farmers are skeptical about organic farming and alternative, so using less pesticides. What was the reaction to the Green Growth Agreement, was it negative or positive?

The responses were very negative and I was the one telling them about it. The problem of the initiative was that the farmers have a lot of disadvantages, they had to do a lot of things, but they had nothing out of it. You know, if we introduced Grøn væksts (GV) if you have a river through your land you have to be 20 m away from the river and there is no compensation for it. The disadvantages lie by the farmers and the advantages by the tourist industry and the hunters and the fishers. So that is what is being discussed now, to see how we can give the farmers some advantages.

As we see it in Denmark with GV, all these initiatives, like the meeting in Copenhagen on CO2, the whole world is trying to do the same thing, Germany also, they want to create a lot of new jobs by introducing new techniques and to new restrictions on the old techniques. So it could be a very small move for a small country, to generate new employment. And we have examples in Denmark of the windmill industry. So the Danish can see that there could be an advantage for them when they introduce GV, but they are afraid that we all the world can see the same and do the same. But maybe we are just faster than the others and we just it. Right now the farmers are negative to it because they don't have enough advantages from it and it costs them more. That is why there is no development there, because the farmers only have the disadvantages.

Are they openly communicating that to the government or are they only discussing it with you?

There is a very big discussion going on, the unions have been discussing this with the government the last year or so. But the negotiations are not public. But as we see it GV was published 2 months ago and all the farmers went into shock. Especially in Jutland, what we call Limfjorden. All the farmers at Limfjorden



were told to stop producing pigs and that is a very big production in this area, and they went into shock. For some time we thought that GV was stopped, but we can see that they are working on with it. It seems that it is something that comes from the EU. As it looks now, we will have GV but we will have extra money from the EU, as Denmark has a disadvantage because we are located so close to the sea and the ocean. So if we shouldn't pollute the ocean so we should at least have some money. So that is how it looks right now.

What is important to understand why people don't just love GV and organic farming is that they consider it as sth. that it breaks their development. The farmers want to have big farms very quick, they want development and unrestricted production. If you look at Denmark all farmers are in Canada and Australia they have seen big farming. Right now it is Ukraine and Bulgaria, there is very big farming and big fields down there. That is what we dream about, big fields, we don't dream about little fields and a lot of things we cannot do. This is the difference. If you are an organic farmer you like small things and you like local production. But in general farmers in Denmark look, but they look globally, they want to be as big as just everybody else. You have to work with the people in this way with this mindset if you want to change them. Most of the farmers are married and it is typically that the wives are more organic.

But there are a lot of problems when you use pesticides.

But the Danish farmers use way less pesticides. The Danish production is based on low use of pesticides. When you use 1 liter of pesticides in Germany you use a quarter in Denmark. We have had a very big development in Denmark in reducing our dosis. In Holland, Germany and France they ask why do you do it, because they tried the same. The reason why they use more in France and Germany is the climate. It is hotter down there. So we can do it. But maybe they don't want to or they can't do it.

Who initiated that in the first place? How long ago was that that the pesticides were tried to be reduced?

The government did that. We had some plans for pesticides and the first plan is sth. like 15 years old. The farmers were shown some test results that show that they could use less and they were given the opportunity to have one consultant and 5 farmers and they go together and they walk together over the field and look at the problems and then you have to use their programs. They have made some programmes where you see how much you should use. But you have that in Germany and in Holland too. Through that we reduced.

And that convinced the farmers a lot? Was it primarily financially?

Well the farmers don't want to use more pesticides than it is necessary and they are hunters too and they like nature in some way too in some way but they don't want to go out and have to remove the weeds manually.

In Denmark we have had some plans from the government to the farmers. First we had it concerning Nitrogen because we had fish deaths in the ocean in the Kattegat. Fish died and also some of marine life died. It happens every year in October. It becomes less and less but it still happens. It is because there is too much nitrogen in the ocean. And that is why we had a plan 20 years ago that reduced how much we pour out into the ocean. But this plan on nitrogen has also lead to a plan in pesticides. So we have been working on this for 20 years.

Do you still see small things like that still happening on Samsø?

It has been discussed, how much. There have always been things like this. We still see it but it is very dependent on the weather on how much storm we have. Some years you have the wind from the right direction and then you have a lot of clean water from the Atlantic into the Kattegat, so there is no problem but in other years when the wind is different you see a lot of fish deaths. There are some indications that there has always been something, but we are reducing it and we are all interested in reducing it as much as possible.



Appendix I: Marlene Linderoth

Danish Ministry of the Environment
Special consultant (Specialkonsulent)

Telephone Interview on 5/19/2010

What is the difference between the two different laws that were recently passed (Landbrugstøtteleven Dec. 2009, Langbrugsloven March 2010)?

The laws that you are mentioning are part of the Ministry for Food, Agriculture and Fisheries. The law from March is looking at the size of the farm in Denmark in regards to area and how many animals are kept on the farm. The law in March has liberated this, so there is no limit to how big the farms can be. In the Danish regulation there is a fixed limit though on how much nitrogen can be applied per hectares. For Fertilizers there is a national goal concerning the amount. This has not been changed. And it has been translated on how many animals you can have on the farm as you need to get rid of the manure. Now there is another possibility for the farmers to use the manure through selling it or utilizing it for energy generation. So there is no environmental problem in the liberation. But there is a limit of how much smell they can leave out in the open, and this limit can lead to investments in cleaner technology if the farmer wants more pigs. And the regulation concerning smell is not changed

Do you think there are any other disadvantages of the liberation?

We have agreed on it, and the government has seen it as a way to giving the farmers a possibility to invest in greener technologies. When they can get a bit bigger they are more likely then to invest into cleaner technology [ex farming technically reducing smell and noise] and renewable energy and be more efficient in that respect.

In general, when you look at the Green Growth Agreement, is there anything where you say it doesn't go far enough, aspects where there is still room for improvement?

No, we are quite satisfied with the Green Growth Agreement. It is a really big improvement in regards to the environment, especially water and nature. There are a lot of good new regulations. One of the good things about the agreement is also that the financial aspects are taken into account, so there is a connection between the law and the financial possibilities. Sometimes you can make a political agreement with a lot of plans but where the financial aspects are postponed. But this agreement has already integrated the financial side.

Do you think that the reductions are sufficient in regards to nitrogen and pesticides? (reduction in Nitrogen by 19000 t in phosphorus, 210 t reduction in nitrogen stated in the agreement)

About the pesticides and the fertilizers, the ministry is still working on the precise way on how it can be done, as it is a new way of measuring. We still haven't put the new act proposal forward that will be done this autumn. There are still a few technical problems left that need to be solved and which needs to be approved by the commission but we hope that it will bring down the amount that will be used. It is always hard to predict, as you need to see how it works but of course we hope that it is actually high enough and that it works. For specific details on the tax please refer to Anita Fjeldsted.

The Goal is the one by the EU commission about the ecological standards that water should have. We have a certain level of knowledge about in which condition the water is and about the sources of pollution and how it can be prevented. We have a lot of knowledge in Denmark, but there are still a few areas left where we don't have enough knowledge about it. So maybe 19000 t are not enough but we still don't know if it is enough or if more is required. And there has been a lot of discussion when we sent out these water plans in January, where we found out that we need to also look at the economical aspects, as in some areas farmers have to make a very big reduction. There will be a new committee where it will be discussed how this can be done, with the financial ministry leading the discussion



to find out how to make a reduction of the last 10000 t. We know that we have to reach 19000 t and so far we know how to reach a 9000 t reduction (included in the water plan) but we need to find out how to reach the last 10000 t which should also be done before 2015 and so far we don't know how to exactly do that. Maybe we need to give the farmers more time to adjust for some parts in some areas of the country. We still need to do some calculations on that.

In regards to all those changes that clearly affect the conventional farmers. Have you heard of any negative response from them, that they are concerned?

Yes, there has been quite a lot, especially in March and April. A lot elements found in the Green Growth Agreement have been transferred from the water plans. That was when some farmers and some specific areas have noticed that they have to make a big reduction in respect to e.g. nitrogen. So that is why they reacted and there has been a lot of debate also between the politicians. That is why we made a new Green Growth Agreement from April 9th 2010 where it says that when we have to find out about the 10000 t then we also have to look into the economical aspects for the farmers to see if they can manage to survive. Because if it is too hard for them to adjust, we should maybe give them a little bit more time than until 2015. But still we don't know, we don't have that conclusion yet.

You mentioned that in a lot of areas farmers did experience problems when it comes to contamination and pollution. What do you know about environmental problem over the last years that are still present today?

Just as an example, back in the 80s the Kattegat had a problem with algae bloom due to fertilizers runoffs. Well there are still problems, I mean every summer there are some fjords that have problems with oxygen because of this. We need to meet the requirements of the EU concerning a certain condition of the water, called the Water Framework Directive. They say, all water should have a certain level of a good ecological standard. That is what we try to find out, how to reach

this condition. In some parts of Denmark it is easier and in some areas it is more difficult to reach that level. There is still a problem in summer, with higher temperatures and connected to these problems [fertilizer runoffs]. But the conditions have improved a lot, since the 80s we have reduced a lot, we have done a lot. We still need to do things.

What was the reason why the Danish government came up with the Green Growth Agreement?

We had a few political agreements that ran out or were half way through. It was a part of the political agreement that in 2009 the political parties should gather and see how it is going with the plan and see if we need to do some more. There was a need for political discussion. That was an agreement about fertilizers that ran out in 2009 and it was also another water plan with two steps (2004-2009 and 2009-2015). So in 2009 we had to see how the plan is going, if we need to do more and how it should be done. In 2009, the EU required also required that all member states had to send out their water plans.

So you can see that it is all connected very closely; what is the problem and how you can solve the problem. So there is a synergy between all that. So it was smart to just put it all together. And also the agricultural ministry they had for their part a wish of making a plan how it would go with the farmers in the long term. And then there was also a discussion about the energy plan and how more sustainable energy can be achieved, like windmills. So the farmers contribution to sustainable energy also became part of it, but sustainable energy in general is not a part of this plan.

Because you also said that the plan needs to be adjusted according to the farmers needs. Are there any teaching and educational plans to support the farmers in that respect?

Yes, before this agreement there was some money involved for it though only concerning fertilizers and within the Green Growth Agreement there is also money for that, but can't specify if it is more or less money. But please refer to Anita Fjeldsted for further details.



Appendix J: Anita Fjedsted

Danish Ministry of the Environment
Danish Environmental Protection Agency Function
Manager, Agronomist (Funktionsleder, Agronom)

Telephone Interview on 5/19/2010

What are the specifics concerning the pesticide tax which comes alongside with the Green Growth Agreement by the Danish Government, which is, if I am informed correctly is not based anymore on frequency of when you apply the pesticides, but rather on the area and how much you apply?

Well, we're going to make a new pesticide tax system that is going to be a new law, a suggestion for a law during this autumn and it depends on whether or not there will be a majority, but we expect so. And the idea behind it, behind the tax is that each and every authorization of every pesticide in order to authorize it you have made a risk assessment. And it is the risk assessment that includes many different subjects; human health, environment, birds, fish, water, effects on organisms living in water and so on. So for each of these areas, human health and the environment, I think it is 16 different subjects, for each pesticide we put/ calculate a number whether it is in the green end of the line or in the red end; if it is problematic or non-problematic. And we summarize all the information for each and every pesticide and then in the end decide which pesticides possess the biggest potential risk to the environment and human health. And the one that have the highest risk you could say, even though they are still authorized, they get the highest tax.

What is the tax based on/ what are you planning to base the tax on, like is it a specific amount?

Yes it will be an amount per kg per active substance. The tax is only based on pesticides that are authorized. And first you need a very thorough risk assessment, which is a very thorough process here in Denmark, which ensures that the ones that are authorized should not possess to big of a risk. However even within the products on the Danish market, there is a big span

you could say. You have products that are based on pheromones and you have products based on garlic extracts and these are products in one end of the scale you could say and then on the other end of the scale you have substances that you are only allowed to use under certain circumstances, so you need to use a lot of different gloves and a mask in order to protect yourself. And it needs to be used 30 m from water sources. Those are the ones that get the highest tax. So they'll still be authorized. But this is the knowledge we have from all the risk assessment in order to decide if we want the farmers to reduce the use of pesticides and switch to other products at lower risk.

In regards to the tax, is there anything alongside to it like educational systems or trainings for the farmers?

Together with the tax, there will be, we haven't anything developed yet, but there will be some kind of colour tag on each product. So that you have green products in one end and red products in the other end, so that farmers can partly see it on the price, because the tax will get higher, and they can also see if they only use green products or orange or red. We haven't decided yet but some kind of a system that helps farmers to decide.

I am just asking because when you move towards more sustainable agriculture there are certain techniques like crop rotation, really studying the land, to know what are the dangers which pests do affect my crop and how can I prevent that through strip cropping, like altering the way of farming a bit. Is anything like that existing?

We have also been trying to implement, according to the Framework Directive of Integrated Pest EU, sustainable use of plant protecting products. There is a very important new directive on how farmers should use their pesticides in a sustainable manner, and that includes what is called Integrated Pest management, and in order to obtain IPM we're going to support the consultants that do consultancy for the farmers to help them to spray in the most optimal way and to help them to cultivate according to the principles of IPM. So the government supports this financially, so a number

of farmers who get this guidance from consultants to live up to this guidelines.

Do you know if the service is frequently used?

Yes they do, but it of course it depends on the price of the crops they grow. At the moment the price is very low, so right now they don't use that many pesticides as they did a couple of years ago and it is more difficult for them to afford to buy a consultancy service to help them to optimise their yields due to pesticide use. By changing the tax system, we believe that there is then a larger need for them to ask the consultancies to help them to chose which pesticides to use, because then you really have a big price difference and they will help the farmers to put together the right pesticide products for their farm in the future, more than they do today, but it is a very well developed consultancy system we have in Denmark for the farmers

That is not organized by the government?

no, it is private by the farmers organizations.

Is this a significant price that farmers need to pay?

Yes it is a significant price

And there is no programme from the governmental side to help the farmers?

There is the IPM programme, where we support a number of, 1000-2000, farmers where we support nearly the full price for the consultancy to obtain IPM.

Appendix K: Morten Øster Kristensen

Organic farmer on Samsø

Telephone Interview on 5/21/2010

Since when does your farm exist? And what do you grow on it?

The farm is built in 1869, and I got the farm from my parents in 1998.

Has it always been organic or have you turned it into organic?

I turned it into organic in 2001

Which type of crop do you plant?

Mostly grain, like wheat, barley and rime, and oats, and we have also grass seeds and pumpkins

I talked to Søren Hermansen and he said that a few years ago you bought another farm that couldn't stay alive any longer. And that was a dairy farm?

Well the farmers who had the farm, he sold the cows 3 years ago, so it is only plant production. After he sold his cows he turned it into pig farming in the fields, and he also stopped that and then I bought it

What made your farm turn it into organic?

First, I bought another farm in 2001 which was organic. So I had two farms. One was organic and one was not organic and I thought that does not work, I need to do either way, one or the other. And I thought that the prices and how we were working in the conventional farming was not very interesting and I couldn't see any way out in some years, and I thought that it would be more interesting in organic farming. And I have a brother who works with organic farming and I knew a lot about it and I made some calculations and I thought for myself, well if I turn it into organic farming it is not worse than what I am doing now. But it could be a lot better if I was good. But I couldn't see it to be worse than now, so that is what motivated me.



Do you have any problems at the moment, as prices for organic food have dropped a lot in the last few years?

I have a lot of problems with that, yes. We're working hard here to stay alive, to keep the farm. But still, if the farm was not organic, the prices are also low so again either way it is very bad at the moment. You pay a lot of interest to the bank and so on. So we desperately need the prices to go up. Unfortunately it doesn't look like it would go up a lot this year. You just have to hang in there.

Is the government supporting you in any way as it is so difficult for you to stay alive?

No. Next year they will lower the taxes that we pay for the land a little bit. But it is not really something that helps. It is just a popular talk, it won't help us a lot. So we don't get any help from the government.

Is this reduction part of the green Growth /grøn vækst agreement?

No, it is because of the crisis, they thought that that is something they could do.

When you look at organic farming and conventional farming; where do you see advantages in organic farming due to your experience and where do you think there are still problems with organic farming?

The problem in organic farming, in the way of farming, is definitely the weeds that we have to deal with. But about the other things of organic farming that is very different here in Denmark from traditional farming is the way that people around you look at you as a farmer. In Denmark, if you are a traditional farmer if it is pigs or cows or just traditional crops, we have a bad reputation in the media, unfortunately. If you go to other countries, people have respect for farmers of the work they do. Here in Denmark we talk a lot about the environment and pollution of the environment and the water below. And that is the farmers fault. And that is one thing that is very different when you are an organic farmer. Then the government supports the idea of organic farming and would like to keep it going. The people who buy organic and even the people who

don't buy organic products they have a different view on the way of living and work we do, so that is positive. I like that and I like the way of working with the fields in the organic way. Definitely.

How do you get rid of the weed, as you said that it is very difficult?

Sometimes you have some machinery and some other part you have to do by hand. Sometimes you can't do anything about it. It is a lot more work. In that part we need the chemicals that we don't have of course.

When you look at what the farm was before, did you have a significant drop in yield when you turned it into organic?

Yes, you go from a high level to harvest only half of what you used to.

Is it getting better over the years?

No that is the same. Well of course there are years that are better than other years are very bad. If you have the big crops like grain, the yield will only be half, but you usually get a higher price. And you have a lot lower input compared to traditional farming because you don't have to pay for fertilizers and you don't have to pay for chemicals.

When you were still a conventional farmer, where fertilizers and pesticides very expensive?

Yes, it is very expensive. And when the prices of products go up, like one or two years ago we had high world prices on wheat, when the prices go up for grain, the companies who make the fertilizers and the companies who make the chemicals they raise the prices because they will increased the need for fertilizer all over the world so they can raise the prices. So sometimes when you have very high prices, maybe in the end it doesn't get any better because the input you have to put in will be a lot more expensive.

Are you talking a lot to all the other farmers on the island? Communicating what your concerns are and what problems you have?

Yes



So do you feel that they have similar problems, like you mentioned that there is a lot of concern for the environment? Do some of the farmers experience similar things?

When I talk to the others it is all pretty much the same. It is a problem all around: Low prices and high interest rates from the banks. And the crisis now makes it very difficult for us to find another bank, if we don't like the one we have now, it is very difficult to find another one who will support us. And that is one of the biggest problems we have right now, the banks they know that you can't just find another one, so they do whatever they like and they do.

So the interest rate has gone up the last years?

Yes, in the bank. But the interest and that is a big problem, because the interest rate is very low right now, but we can't advantage from that, because the banks just want to make more money. So we will hope for better years.

So when you look at Samsø there are still more conventional farmers on the island. As I think that you are one of the few organic farmers on the island, is that right?

Yes, there are only a few, and I am the largest one. And, I am not sure, but I think I am one of the only ones, or the only one that makes a living of it. All the others have their work beside. I think, I am not sure, but most of them have.

When you look at organic farming and you said that the yield drops a lot and it is a lot more work. What are other barriers for other farmers to switch to organic or switch to more sustainable farming, like there'd be IPM and things like that? Is there a barrier that they say, I am too afraid of it or I can't do it?

I think they are definitely afraid of it. If they look at me they can see, that I make a living of it. And I am doing as good as the other ones. But there is a big risk of course. Last year I got a disease in 2/3 of my crops and if I was a traditional farmer I could just spray the crops and I could have a harvest. So last year of 2/3 of the crops I had no yield at all, so that was very tough. And

of course if you were a traditional farmer you would have a normal yield, because you just take the spray and go out. So last year that is the worst ever; the risk. And I think many people are afraid of this. For that particular disease there was nothing more natural that could have helped. You just had to wait and see how bad it was and it was bad.

How would you say you could help farmers to convert to organic? What would you say that they accept on the island? Would they be convinced by, people that teach them how to properly do it or would they be convinced by more consulting?

Maybe more consulting. You have to change the farmers view on organic farming. And a lot of farmers they do vegetables and they use a lot of chemicals on the vegetables. And I think that they think it is the only way to make it, if you have to make a good quality. I think that they think that it is definitely too risky. They do their calculation and they say in the traditional way, I know what I can do. In the organic way I am not sure and maybe I lose it all.

When you look around to the other farmers, don't they experience problems with the soil quality and problems with contamination of water sources and also health problems for themselves when they apply the pesticides? Do they experience anything like that?

I think at many places they experience, it is not the right way to say that the soil is dying, but if you take a shovel and dig in the soil you find almost nothing down there. When you dig in the soil on my farm you can find a lot of worms and stuff like that. And that is a problem and they know that, they just don't know what to do about it.

But do you have meetings on the island where you can discuss all that? Where you can tell them that, yeah you have problems with your soil, but when you look at my soil, it is so much more alive and there is so much more organic matter in it and it is so much healthier?

Well yeah, I could, but we don't have meetings.



Would you think that would be helpful, if you can together every half a year to discuss problems and solutions? Because a lot of farmers do experience the same problems and then it is just a matter of finding a solution together.

Yeah, it could be, definitely it could be, because there are things that I know if I turned back to traditional farming, and I don't know yet if I will do or not, but if I do then there will definitely be a lot of things that I do now in the organic way that I will take with me over to the traditional farming. That is one thing I know for sure; the way of treating the soil and the straw that you put down into the soil. Most of the other farmers they sell the straw, so there is nothing left on the field. Every farmer knows that it is a good thing to put it back into the ground, but nobody does. I don't know why because everybody knows that it is a good thing. But now they look and they can see that they can sell it and they get some money, because they desperately need the money. I look the other way around. The things that go back to the ground it is good for the crops for next year.

Are you selling the produce to the supermarkets?

Very few of my products go to the supermarket. I have some pumpkins called Hokaido that go to the supermarket. But that will only be 10 ha. All the other stuff goes to grain companies. And another small part goes to a local factory. You know they put it into glasses, the pumpkins and the beets, red beets. That would be about 5 ha. But all the rest goes to the grain companies. My farm is about 200 ha at the moment.

Appendix L: Åge Madsen

Conventional farmer on Samsø

Telephone Interview on 5/21/2010

Since when does your farm exist and what do you grow on it?

My bought the farm in 1970. We have strawberries, black current, onions and potatoes and wheat and barley.

How big is your farm?

I own 65 ha and then my farm is together with my brother in a company. And it that company we are farming 200 ha.

Are you using IPM?

I do that with strawberries. But I don't do it more. It was going down here in Denmark, but now there is a new system coming in Europe. We think about doing it. But it is a big work. We have to write everything down. It is not easy to do it.

Do you experience any problems with the farm, such as reduced soil quality and soil erosion?

We sometimes use too big machinery, so soil compression, when it is too wet. So we try to go when the weather is good and go deeper in the ground and try to loosen it up. But now it is very good, because it is hot and dry.

Is there anything else that you are concerned about?
No, no big problems.

Do you talk a lot with the other farmers on the island?

Yes

But do you have regular meetings?

Ah, only where we sell our products or in farmers cooperatives.

Have you ever thought about changing to organic, because on Samsø there are 2 or 3 organic farmers?

Yes, but I haven't done it because maybe I am too old and it is so too big work and you have to put something



in the ground and if you don't have animals then you have nothing to bring back to the soil.

When would you consider changing?

I consider myself too old for it, because it takes 3 years before you can be organic. And maybe there is also some ground that is not good for that. Maybe our soil is too hard.

Why do you think conventional farming is better?

That is a good question. It is what I have been learning. But I had a neighbor who was organic farmer and he was very good with it. But I don't know what is better. Maybe it is the same. But there are so many things about organic farming that you don't know, such as what to give the ground to live off. And if you don't have any animals, that will be one of the problems.

What do you say about the Green Growth Agreement?

I haven't heard much about it, as the government is just discussing it at the moment. But there is a big difference depending on where you live in Denmark, so not every farmer needs to reduce/ do the same.

Do you have difficulties with the prices at the moments? And to whom are you selling?

We are selling to supermarkets and there are only 3 or 4 supermarkets in Denmark. And they are very hard. Every supermarket wants to be the cheapest. But we are satisfied.

Appendix M: Søren Hermansen

EnergiAkademi
Director of the Academy

Telephone interviews on 5/20/2010; 5/5/25/2020;
Inaugural Presentation at Aalborg University
5/27/2010

Telephone interviews on 5/20/2010

You as you have been a farmer yourself back in the days also have a lot of contact with the farmers still, is that right?

Yes, it is a good thing because I know what they are talking about what they are thinking how they react and how they respond to different things. That is the major advantage in my context with the farmers.

Knud Ravn from the farmers Association on Samsø told me that there is currently no movement in regards to conversion of land to organic farming, as prices have been so low and unless the prices go up again he doesn't see any changes in that respect.

That is one thing and the other thing is that Samsø is a little remote according to the markets. A lot of organic farmers have a nearby market, like in Copenhagen, Aarhus or Aalborg, where they can go out on a Saturday and sell their products directly. Otherwise you are dependent on a buyer from the bigger shops and then you have to send your products to a central market where all the shops are buying their stuff and there the competitive situation is really, really strong and they don't get a good price for their products and they also have to pay a lot of costs for the distribution of their products. So it kind of takes away the possibility for the organic farmers. So from this island the conversion to organic farming is a little bit more difficult than in many other places because we have the ferry and we have other transportation and you can say that we are already specialists in vegetables, as we have a high, high percentage of vegetable farmers on the island. And not a lot of animals; livestock is not the business on this island. But the number of



specialised vegetable producers is a high percentage of them. So that also indicates that they have an ability of adjustment, I mean they will adjust to the market quite rapidly. And they can change, because they haven't invested a lot in livestock, facilities and dairies, milk powder or any other of these things. But they can produce the vegetables that are most popular on the market and change from year to year or season. So they are very adjustable.

When you talk to the farmers is there anything that you see that they are really concerned about, problems with the environment such as the soil quality?

They talk about soil erosion and they talk about charcoal is lacking in the soil because we take away most of the carbon in the products and the fertilizer that is given to the land/ that is spread onto the land is not containing any carbon, so this is a problem. And today it takes a very big tractor to plough the land, while 20/30 years ago you could do the same job with a small tractor. And this indicates that the soil is much more clayish and hard and it is not as lively and structured as it was years ago and the farmers know about that. But as long as they can buy a bigger tractor that can do the job, they tend to kind of not do anything about it.

Is this a problem of communication from the side of the municipalities and the farmer consulting companies that there are other possibilities? As when they buy bigger and bigger tractors, once the fuel costs go up...

Yes but the fuel cost is not a significant cost for the farming; it is more labour and the price it costs to handle things. So a bigger tractor can also outnumber hands and the lesser hands the higher the efficiency in some ways. This is what is happening in many places that the farming gets more and more industrialized and because it is more industrialized it is also more business oriented. So if it doesn't pay you don't move. And this is a very depressing development and I think most of the very conscious and intelligent farmers they know about this. If you talk to them in private they say that this is the downside, this is a negative development

and we have to do something about it, but whoever moves first will lose market shares. Because they are competing so hard on the prices and how much they can produce per acres, so the transition of where you are on unknown turf is a little dangerous for the farmers and of course they know that. Couple of years ago we had a big farm that actually transformed itself into organic farming, but it was about 150 ha, and this is a big farm to convert. And he broke his neck this guy, he couldn't do it, because his production dropped to more than half the amount of potatoes per ha per unit. And he couldn't finance that. So this was it. But you see this one time on the island and the farmers will be very reluctant to try again. And maybe you should have it more bottom up and have more patches of land being transformed. And I think that is what we see today. I know that one of the organic farmers has just bought or hired another farm and he has more than doubled his area – Morten Øster Kristensen. He is a young guy and he is also a business guy and he is a little different. Erik Anderson he is an idealist, I mean he is a happy old hippy. He is a good guy but he will not expand. He is almost retired but he is still on and he will be on in the business for years ahead of us, but he will not expand and develop things. Morten hired a farm that was already organic but was about to close down; a dairy farm and the guy who had it kind of gave it up, but that was not because of organic farming but that was because of his own ability to run a farm. So luckily Morten was there to keep on the organic side of the farm, which is good.

How is that then perceived on the island that somebody like this actively goes for it? Are they skeptical or do they not trust it yet?

Well if Morten is doing good and his business is alive and he makes something out of it then they don't have any problems with it, they respect it and he is also a special guy Morten, because he is producing a lot of seeds from grass and from herbs and stuff like that. He is a seed producer. Apart from that he is also producing other things, so he is specialized in a certain direction and he can make money out of it which is good for him. And the other farmers the conventional



farmers say, ok, if he makes it feasible then it is ok, they don't really discuss the organic side of it. They are much more pragmatic and practical in this dimension so I think if you had a private tête-a-tête conversation with them they'd say ok, if I can find a way to make it feasible financially I might just consider changing. They just can't see that.

So it breaks down to, if it is financially possible, yes we would do that otherwise we don't bother.

Exactly, and the problem you can see today is that there is a limited market for organic products. And I think we have reached that limit, because the prices are not going up anymore. They are pretty steady, they are ok the prices. But not good enough for conversion and if you see that the market has kind of absorbed what was necessary then you see that the conventional farmers have a strong pressure from the eastern part of Europe, from Poland, from Ukraine and from other countries, where they can produce the same product with the same quality but at a much cheaper price. Then they can see themselves outnumbered in a few years. Pig farms have a terrible time for the moment, because they cannot compete with the price. So we can say to them, well you should convert to organic farming. So they say yes, that is right, but....

So when it comes to more sustainable farming, such as different farming techniques, trying out strip farming to avoid soil erosion and all that, are those practices that are being experiments with by the farmers?

Yes, we do have a lot of second crops on the farmland. We see potato farmers especially, because they have a very early yield of potatoes on their land and that will be away from the land already by the 1st of July or something when they harvest. They can't have two yields of potatoes but then they plant a nitrogen absorbing plant, this can be an oil plant or clover or something like that and they plant that right after to absorb all the remaining fertilizer in the soil and what they do is that they just plough it down. They till it and then they plough it down. And this is kind of very good for the soil.

Yes, to add organic matter

Exactly, and a lot of carbon and a lot of energy will be kept there for composting during the next year and also the next yield. Then you have a much more structured soil and it is also in a better condition according to fertilizing.

Is that something that the farmers themselves thought of or was that initiated by somebody else?

It has been developed for a long time. When I was a farmer we also did the same thing and we had maybe ryegrass as a second yield after potatoes, but we found out that ryegrass was a little too wet, when we ploughed it down the top soil would then be all muddy and wet because it contained a lot of water and it just kept the water in there, so the soil was wet for a long time. So some of the oil producing products are better, so it developed over time and they are getting better and better in doing this. So they can handle it and also handle it mechanically.

Concerning how to help the farmers to actively go for other techniques or to try on one patch of land, maybe not certified organic but to try it out if that works for them. Is there anything like this?

Knud Ravn, when I was a farmer 10 years ago, he tested and asked all the farmers every year who will offer some land for testing of different techniques, compost from household waste tilled into the ground. All sorts of different try outs, test of new methods of handling things, less mechanical work on the soil and all sorts of things. So there will be piles of reports sitting in the farmers association with a lot of test results. And of course it is also in cooperation with the Danish farmers test laboratories all around Denmark. They have also in line with what they are testing and try outs on Samsø that was according to what we were doing here collectively, compared different methods from different parts of Denmark.

I was just wondering on how open they are, how fast they jump on a train when they see that yes there might be a loss in output during the first few years because the land needs to adjust to not getting



any synthetic fertilizers anymore and to not getting pesticides anymore...?

Maybe you should talk to my brother. He is an organic consultant in the farmers association. And he is working for Økologiens hus in Aarhus (www.okologi.dk)

- Sven Hermansen, Konsulent, Økologisk Landsforening, sh@okologi.dk, Århus, T 8732 2700

There are a lot of people that work there and they are working for farmers who are trying to convert from conventional to organic farming and he also has clients here on Samsø. He is over here 2-3 times a year and he is doing a lot of the planning and the fertilizer planning and all these sorts of things that are obligatory in the EU system where you have to register everything you do. So he is helping them doing that and also for future planning.

Because I just imagine that unless the farmer really sees that it actually is working he might be too afraid and too skeptical to go for it. You rather need to show them than talk about it. I mean they know their land, they have been on the land for a while. So they know that there are problems but they might be just too scared of all the stories that they have heard about organic farming or alternative farming that it does not yield as much ...

That is correct for 80% of the farmers and but there is, these are my figures, 20% left that has a very pragmatic attitude to that. They say that if there is a market if there is a product, and I can produce it for that market at a certain price, I can make a calculation and then I can go for it. It is not a problem. And these are the new types of organic farmers who are not very idealistic according to the philosophy behind it but they are much more pragmatic saying that if it is a better deal/ bargain for me not to use as much fertilizer and chemicals and then have a product maybe only 70% or 60% of what I used to produce but I then save all the costs of the other things and I might turn out to have a better turnover per ha then they do it. They just go for it. And my brother might just be able to give you names of people who are doing that also on Samsø. That is a fact and the rest of them, my impression of the rest of them, the 80%, are stuck within their own situation.

They can't move anymore. They are so up to their neck in debt because of the situation on the markets, they don't get any payment for the products anymore and the cost of running farms is going up and up and up all the time and the prices for the products is going down all the time. And I know that the farmers have a reputation of complaining all the time, but I think, seen from my perspective this is true, and I see a lot of them going bankrupt, old family farms are closed down and this is a very sad situation. Because that leaves me and other people in the situation where we can say that we understand the situation and putting pressure on them now would be kind of suicide. It won't work and it will just create another frustration.

The development is visible all over Europe. Exactly

But the EU is giving subsidies to the farmers and also to the organic farmers, and that is not even enough to help them?

No it is not, because it has become a natural part of the economy the EU subsidies. So it is already calculated in the yearly turnover. So when they make their budget it is including the ha subsidy of whatever yield they have, where some of them are very creative in what they are producing on crops because from year to year it changes a little bit from the EU. They want to control the production, so some years it is canola oil that is subsidized and another year it is another crop and the farmers will shift immediately which means that the market will be flooded by the product that is given the subsidy. It is a very unsteady development where you cannot make a 5 year plan with a rotation system on your farm because you have to expect that within 3 years the market will change again. So that is another complication.

We are working now on a biogas plant to establish this. And this biogas plant is going to have two lines. One for conventional manure and one for bio manure. Because what we want to achieve from this is to produce energy out of the gas and then from the digested products we will produce fertilizer. And this is a very good organic fertilizer. It is a mix of many different things. We will take all the surplus production from the vegetables. I mean on Samsø alone we have more than 1000 t of



waste material from onions per year. And this is just onions. And then we have cabbage and potatoes and all sort of other products. And this is interesting because we can then maybe replace the imported fertilizers with local produced fertilizer from organic matter. And this can be an interesting thing, because everybody knows that when the oil price goes up fertilizer price goes up. And this leads to that we can maybe improve the financial structure through this. The farms are very interested in that. That is a new optimistic area.

The organization that my bother works for they are a very progressive organization they have a very strict target and they fight the government also to make them set up rules and regulations for organic farming

Telephone interview on 5/25/2010

What comes to your mind when you think about sustainable farming? As a lot of people say that organic farming is not the perfect farming type yet, as there are still some problems such as with weeds and things like that.

I don't think that is the major problem is the price of goods and products. There are certain costs when you buy land then you have to pay interest for the loans and you cannot produce enough on the farm in order to pay for your mortgages; because the price of land has been up scaled quite a lot because of pig farms need of land to get rid of the manure from the pig farming and because they had a big business in the stables producing pigs they didn't care so much about the cost per hectare. And so that has left them with, well today it's a mess and a lot of them are actually close to bankruptcy or with very, very bad budgets. But this in general leads to higher prices on land which gives the organic farmers quite a challenge to be able to make business out of organic farming. So that's where the problem is, not so much in the problem of handling it or producing or weed, because a good organic farmer can handle all these things. And rotation yield will take care of this and after a couple

of years when the farmer is in balance again, after several years of conventional farming and chemicals then he'll be able to run his farm and do quite a good job. A lot of good organic farmers are doing very good in that area.

Is there anything provided from the government that helps with the loans, provides cheaper loans for the farmers, as the banks are charging the farmers a high interest rate and despite the fact that the interest rates dropped due to the crisis, a lot of farmers haven't enjoyed the benefits of that drop, as their loans were set at the higher rates before the financial crisis.

Well, if you are a newly established farmer and you buy your first farm, there is a special green loan for new established your farmers, but that is not a big loan. It is a help but it is not solving everything. As long as we have liberal market conditions and the banks are behaving as they are doing I don't think we can see any solutions for this. I mean, those are the conditions farmers are facing. Many of the conventional farmers have a very tough time now, because many of them have made bank loans in foreign countries like Swiss Francs or Japanese Yen, have been very popular currency and also in Euro, but problem is that the Swiss Franc has been very xxx (4:48) with the financial crisis and the only currency that has been more expensive now has been the Swiss Franc, which means that the farmers who have made their bank loans in the very secure Swiss Franc is now paying more because everything else has dropped in price. So this is not so good, so there is a lot of speculation in that end and how to handle it and also because that is the way how to make a little profit or to get it cheaper if you are a good business man, but not a lot of farmers are good business men, so they rely very much on advice from consultants and banks.

When you talk about consultancies, I have talked to municipalities and they said that there are consulting companies, private companies that give advice to farmers, but that is always payable, so there is always a price attached to it. I am not sure if the farmers



association is charging anything or if that is for free.

Well you have to be a member, so they charge a membership fee anyways, and I think it costs something per hour if you have something apart from traditional and just normal advisors then if you want special arrangement then you have to pay for it.

Is there any possibility, supplied by the municipality, some kind of consultancy or training, as just by talking to the farmers, I have the feeling that there is still a lack of knowledge in regards to organic farming or farming that is different from the “conventional” farming?

I don't think you can expect the municipality to make this kind of effort then they could also make this for sustainable tourism, or anything else that is like this, that supports that kind of balance in organic or sustainable development. What I think would be more interesting if as a public entity, the municipality could invest in products, let's say that all the municipal shopping should be sustainable, all the buildings will be gradually transformed into energy conserving or energy saving units and things like that, this is already happening actually. And for farming this is still a liberal branch. And we cannot control what they are doing and what they are not doing. There is nothing in the law saying: you have to do it. The municipality and the state is controlling that you are actually following the regulations according to environmental protection schemes. That is as far as they get from consulting. And I don't think that is looked upon with very friendly eyes, seen from the farms perspective. My brother is working for an organic farming association but he is also charging, I mean they live from consultancy, doing that. I think that is reasonably respected also in organic farming. So I think it is quite a normal situation.

I am just wondering if a lot of farmers restrain from asking for advice just because there is a price attached to it.

It is an hourly price. You pay per hour, so I don't think there is anything in particular that will prevent them from doing that. If they need it they do it. I mean farmers they know that they need expertise so I don't

think they hesitate to call a consultant if they think they need them.

When I look at how much work you have put into transforming the island to a 100% self sufficient island in regards to energy would this, now that the mind sets have also opened up for new things, be an opportunity to kind of introduce the sustainable agriculture idea?

The trick with energy was that we converted everything that was fueled by oil and gas, well not everything but as much as possible because we could prove that it would be cheaper to use sustainable energy than to keep using oil. And we were helped a lot by rising oil prices, I mean, when we started 10 years ago the oil price was at \$US 30-40 per barrel and 10 years later it was a 130 dollars per barrel. Today the price is a little bit lower but there has been a significant price rise in the last 10 years. And this of course has helped us a lot in convincing people, because they could actually save money by investing, which is very unusual. We cannot promise the same thing to farmers when they convert from conventional to organic farming, because we don't know the market. We cannot even predict the market, we had a raise in consumption in organic products but at the same time we had a falling price per unit in organic farming. Of course this is predictable because the more they grow the more competitive they have to be on the market, because the supermarkets are also having an organic product line now. Even some of the discounters (Rema 1000, Netto) they buy organic products. But according to the people I know, the shoppers from the market to the shops they are acting very aggressive, when it comes to prices. And they force the farmers to give a low price if they want to be in one of the supermarkets. And I mean you have to come up with a quite significant production. The trick for the shop is that you pay for the area that you cover with your products. And the producer has to pay for that himself. If you want to be on the lower shelves then you pay a low price and when you want to be right at eye height, where it is catchy and where everybody can see it then it costs a lot more. So you get a price for your product but you



have to pay to be present in the shop. I mean, this is very, very aggressive actually. And what happens is that the shops make a competitive arena for all the farmers. So they outplay the farmers, so they cannot really cooperate. If somebody wants to be there he has to pay for it. So they have to have a very strong organizational structure to fight that. And that is not very usual in the organic farming because they are very individual and very idealistic. The conventional farmers have a very strong organization. For example for dairy, Arla, a big big multinational company and they have their own negotiators when it comes to pricing on the market.

And the organic farming association is not stepping in there?

No, they don't have a tradition for that they are too small. They are up against some really big players, so it is a very tough game, when it comes to marketing.

Do you see any possibility to get that forward, unless the market regulates itself and the prices go up again? Because when you look at the numbers, the demand for organic food has gone up but the production hasn't gone anywhere. Not a lot of farmers have converted to organic and a lot of farmers actually reconverted to conventional farming. And Morten even said that he is surviving now, but if it stays like this he doesn't know if he then just converts back.

It is all about two things. One is the support per ha from the EU. There is an extra subsidy if you convert to organic and a lot of people have that and then realize that the income of the converted land was not good enough, so they converted back again. They only have to stay organic for 3 years (I am not certain about the number of years) and then they are free convert back again. And the other reason is that we have stagnation in the market, I mean the financial crisis is not good for the market, so we had a growing market when the financial structure was up and everybody was consuming a lot but then we had the financial crisis which started a couple of years ago and this means that people are not buying as much as they used to do.

Do you see any possibility of municipalities organizing meetings for the farmers to get together to discuss certain problems?

I don't think we can expect the municipality to be directly responsible for the training or seminar, but I think that the municipality would be positive about us making something similar in cooperation with the farmers association. We are right now working on a biogas plant and this has been supported by the municipalities and the farmers association and the organic farmers where Morten is involved. He is actually in the Steering committee for the biogas plant because he wants us to produce organic fertilizer, which is good. So there you see a support from the municipality. In this dimension; which is good. I think in the future you can also see the municipality be active in the establishment of more jobs, the localized production of different food products and all these sort of things, but this is kind of external. It is not a direct activity towards the farmers it is but more to the middle men who are refining the products or maybe conserving it or something like that. But there can be support from the trade organization on Samsø because they think this is good for business.

Presentation at University of Aalborg (Inaugural Lecture) on the 27th of May 2010:

Start communication by provocation but also based on what we have in common.

Sharing, economy of the commons, responsible layers of the citizens not only regard them as customers

Common thinking: not being concerned, as it doesn't touch us as citizens.

- Communication is essential – listen & learn
- Commitment by ownership – create leadership
- Engagement by involvement – invite stakeholders
- Sharing & exchanging ideas – no copyright
- Invest social capital – improve life quality



- Believe in the economy of the commons – shared by the community
- Keep it simple and relevant

Sometimes there are then disadvantages, but that is acceptable because you have been part of the process
 Historical perspective: How in the early days, How it helped us back then...

Local working groups

How could you be interested in that? Interesting for farmers ... What's in it for me?
 Having a say in development makes you much more aware

Community sustainability

Most radical farmer is now turning green, well not really green, but the mindset is changed.

Training course for municipalities

Open meetings, include all groups (invite not exclude), use local know how and local resources
 To make decision makers able to plan for the future we need:

Reliable policy, LT decisions through brave politicians

Local individual action plans, long-term framework and targets, more local heroes

Reasonable budgets – bankable projects, science, research, testing – innovation

You take care of the energy and leave the farming to us. (Samsø farmers association, meeting where Søren Hermansen accidentally said “and then we could turn everything into organic farming”)

Appendix N: Sven Hermansen

Økologisk Forening (Organic Farmers Association)

Advice Manager Technical Team
 (Rådgivningschef Fagligt Team)

Telephone Interview on 5/21/2010

When you look at convincing conventional farmers to convert to organic farmers, how do you go about it? What advantages do you name?

When talking to farmers who want to convert it is a talk about improvement. We call organic farmers the more clever farmers, which is a bit more provocative but it also triggers response. Organic farmers know a lot more about their land and know what to do in case problems occur. A lot of people still have issues with organic farming but it is not understandable as we are dealing with farming that has been around for so long which is not something new. A lot of it can be regarded as lack of knowledge. Organic farmers are actually more efficient, because they use less input and know exactly what to do when problems occur and don't need to treat that with pesticides or fertilizers. When we go out to consult people, we first let them talk about all the prejudices that they have against organic agriculture and then we analyze every single argument to prove them wrong. We explain how a farm would look like once it is converted to organic. We look at maps and walk around the farm to make it visible. Then we have to go into a basic economic calculation to see what the financial gains are in organic farming if the farmer converts. Because in the end only if people can earn money with it and make a living of it, only when they can see the potential they will decide for the conversion. And then we need to show them how to sell the products properly, as only if you know to whom you can sell your product you will be able to make money out of it. Personally I am fine with people converting to organic for the financial outcomes rather than the philosophy behind it. 9 out of 10 farmers, when they are asked if they would reconvert after farming for 10-15 years will say no. When you compare organic farmers with



conventional farmers, you see a lot of conventional farmers complaining about prices, the weather, politics etc. And it has been like this for years. Personally I don't understand that, farmers always used to be so proud, proud of their work and of their land and today they are not been taken seriously anymore because they always complain. I don't understand why they haven't learned from the past. We are looking into an open discussion with media, so that in case a problem come up, we are openly talking about the problem we have encountered and then media is not picking on it. But if conventional farming has caused problems, then they try to hide it. Organic farmers are proud farmers who talk to their customers, who talk to their family and their neighbors about their farming. And that is also as what they are seen in the public. They are very proactive.

Are you consulting only people that are coming to you and ask you for help or are you also engaging in talking to conventional farmers?

As organic farming association we do need to be careful what we are saying and doing. We don't knock on doors and ask the farmers if they would like to convert to organic. We do offer them the possibility to talk to us and then when they call us up they do and we are happy about it and if they don't then they don't. We are still very small. Only 7% of the farmers in Denmark are organic the vast majority still conventional. Therefore we need to be aware of the fact that there is still a lot of skepticism and if we go from door to door there might actually be more harm than good.

When you talk to the farmers about where they can sell and how to deal with supermarkets, what is your recommendation? Supermarkets are pretty aggressive at the moment where prices are tried to be pushed down even further. Does the organic farmers association help negotiate for prices?

But most farmers don't really sell their products directly to the supermarkets, and even then, we have supermarkets like REMA 1000 where an organic farmer's name was used to name a whole organic

product range, and the gets good money for that. But other farmers are selling their products either to the processing industry or to the wholesale. It is true that supermarkets are currently very aggressive and that one farmer has little ground for negotiations.

In regards to the challenges that organic agriculture is currently still facing; I have been talking to farmers and associations, and everybody mentioned the difficulties that organic farmers still have when it comes to fighting weeds. What is your evaluation of the situation?

We in organic farming have still difficulties with weeds, but it is primarily a problem when farmers haven't done anything before hand. There is annual weed that is spread through seeds and then there is weed that grows through roots. But through crop rotation and different cropping systems these weeds can be reduced to a bare minimum. It is just a matter of actively working with it to then have less hassle with the weed in the future. To fight weed it also really depends on if the price on the crop. When you have a high priced crop you are trying to get rid of the weed in a way that won't damage the crop plant because it is of so much value to you. Therefore weeding practices and tryouts cannot really be undertaken when the prices are high. Rather in a time when the price for a certain crop is low, you can afford to lose more of that crop through weeding practices.

I have been reading a pretty aggressive article against organic agriculture, which named a few common arguments against organic agriculture, such as that even organic farmers are using pesticides to fight pests. He mentions that farmers are still using copper sulphate which might be not harmful to humans but does have implications on nature. I was wondering if that is really the case, that organic agriculture uses organic pest control?

Talking about pesticides is the wrong mindset in this matter, as organic farmer has methods to prevent pests from intruding the field in the first place. Crop rotation and intercropping are all methods that can be used to prevent insects from coming onto the field.



Furthermore different plants can be cultivated that are able to prevent diseases.

Furthermore what we do is to go back to older plant species that still have a resistance to certain diseases instead of cultivating plants that have been solely bred to increase yield over the year, but totally forgetting about the natural resistance of plants against diseases and pests.

With Copper sulphate it is an issue, it is still used in Denmark, because once it has been allowed by the European Union it is hard to get rid of it again though it is primarily used for orchards, so apples, cherries etc. and solely for cosmetic reasons. There is no issue in regards to health implications for humans just through the way that it is applied, but there is no doubt that it is harmful for the environment, as it is a heavy metal. But organic pest control is used in organic farming, but as I said before there is no necessity for it, when different techniques are applied which can prevent pests.

When you look at the fact that farmers, when they decide to convert can't name their produce organic for about 3 years after the conversion. Is there any kind of support during conversion time? As farmers can then not sell their produce yet as organic food despite the fact that they already are applying organic farming methods etc.

The conversion to organic land is financed partly by the EU and partly by the Danish government (50/50), there is an allowance for growing in an environmentally safe way which every farmer can get and then there is also a conversion subsidy which is approximately 1050 kr/ha, which might though not be enough. Today most of the farmers are using the European subsidies to cover part of their loans to the bank. 50-60% of farm land is owned by the farmers themselves, all the rest is owned by the banks thus rented out. Farmers in Denmark are in a huge debt at the moment and thus will not be able to survive without subsidies from the European Union. This is partly their own fault. But the price for farmland has gone up by 8 times in the last year. This is unique in Denmark, that farmers borrow so much land and thus have difficulties with paying back the loans.

When considering the demand for the abolishment of

EU agrarian subsidies, how do you think the farmers could handle this in Denmark?

As I just said, the ownership structure in the Danish farming system is based on huge debt, so I doubt that unless the prices for land go down again, that Danish farmers could survive without the subsidies provided by the European Union.

In regards to yield in organic agriculture, a lot of people talk about the loss in yield after conversion. But there are long-time (20 years) studies which show a difference but depending on the crop the difference is little, so between 10 and 15% and then for some crops it is up to 40% different than conventional farming. Nonetheless there is loss in output. When you look at the yield of organic farmers which are dropping within the first years, how do you convince the farmers that this is not a problem?

Well first of all, the drop in yield depends entirely on what type of crop you are farming. There is an average of 30% yield loss in the first years, for grass it is only 10-15 % less and for other crops like wheat it can be 40%. Nonetheless long-term farming allows you that you recover the yield over the years. Once you've been farming for 20 years there is still less yield but the difference is getting smaller and smaller. In the first years during the conversion you have a huge difference in yield, which is primarily due to the necessary recovery of the land, where fertilizers are replaced by cropping techniques such as crop rotation. A larger diversity of crops is cultivated and different plants/ necessary weeds are grown to prevent pests from endangering the field.

When you talk about yield the main argument always comes up that organic farming is not able to secure the food supply. How would you personally counter that?

Well first of all I would say that if you redirect less food to the pigs and more to the people you have a lot higher energy output than if you put it all into meat. Therefore eating less meat is a solution in this matter. But also there is already an overproduction of food in the world. It is not a problem of quantity. To



solve that we need to have African farmers do small scale farming, secure their own food supply. We need to make them less dependent on corporations like Monsanto, make them use their own local seeds and plants. As in the end if a land is dry it is dry, even with a lot of fertilizer and pesticides you won't be able to grow food there. And then there is a lot of potential also in Asia, where there is a lot of fertile land that can be used for agriculture, if it is done in an organic way which will ensure that the land is going to be able to support agriculture.

What do you say about the Green Growth Agreement, as agricultural area should be doubled by 2020?

Well we are pretty happy about a liberal government talking these steps and we have been heavily involved in lobbywork during the last weeks to promote the goal of the government to double the organically cultivated area by 2020. This is a very ambitious goal as we are currently at 7%, so organic farming is still small. But it will certainly be possible to achieve it; more so through the doubling of hectares and the doubling of consumption as the doubling of input into it. We don't want to double the input. Negative response is there, as the government is regarded a more consumer oriented government and thus more so interested in getting rid of farming in Denmark. But on the other hand it is pretty progressive with the plans to involve more farmers into Biogas so farmers take the responsibility for their CO2 emissions. Thus this is lifting the farmers back into the drivers' seat.

Blog: the Good case and Profits <http://www.okobloggen.dk/post/c398kologi-med-mere.aspx>

Appendix O: Lærke Thorling

GEUS (National Survey of Geography in Denmark and Greenland)

Department: Ground water and quarterly archeological mapping

(Afdeling: Grundvandsog Kvartærgeologisk Kortlægning)

Ground water monitoring

Grundvandsovervågning

Telephone interview on 5/19/2019; 5/27/2010

Telephone interview on 5/19/2010

I don't know if I am able to answer all of your questions, The project ton Samsø has not been active for the last 2-3 years, as there was a rearrangement in Denmark in administrative matters, so a lot of data was lost.

What I do primarily look into is: are there any problems with agriculture at the moment. Is there any contamination of water sources, is there a problem with pesticide runoffs and nitrogen, because I do know that back in the 80s the Kattegat was pretty much polluted to such an extent that there was an algae bloom.

I am actually looking for your expertise and what you have found in regards to conventional agriculture and where you see the need to adjust agriculture, improving farming techniques. I must say also, that the specific auf Samsø is that the area where I know most about and this is also the case about the northern part. Cereals, Cabbage, beets, and onions. So it is very little conventional farming with cows and grain. Because of the climate it is the garden of most of Denmark for vegetables. Therefore using data from usual agriculture is very difficult. It is expensive to transport to and from an island. Therefore it is most valuable for the work if you have high value crops. There is more value in a kilogram of cabbage than in a kilogram of grain. Therefore that is one of the preconditions when working with Samsø that you have this special type of agriculture sustained.



Telephone interview on 5/27/2010

What were issues on the northern part of the island, as you were primarily investigating the northern part?

There were both water quality and water scarcity. Because the annual precipitation is not that high and there is only one major aquifer in the north and in the South there are a lot of only very small aquifers. And irrigation is very important for the crops they have, which is mostly vegetables and therefore the water prices is very high on Samsø but accepted because of these vegetables. With the ocean around there is a great risk of sea water intrusion. And this is controlled in one of the wells on the northern island with some installations with productivity measurements in the well where you can follow the salt water table. So the control of amount of water used for irrigation is a very important issue.

So is there a problem with water scarcity?

well yes, because the farmers would like to use more, so that is a problem for the farmers, as they would earn more when they irrigate more.

When it comes to the aquifers?

In the south island there are a lot of small aquifers with very little surface water contact and old water, and they are only very slowly renewed. Therefore it is also an issue for water scarcity because it is very difficult to renew the water resources. So there are two different problems in the northern island and the southern for geological reasons.

And when you look at the water quality of the aquifers has there been any problem with contamination?

If you take the southern island the main problem is salt water and the natural bad quality with a high content of organic matter and things like that. On the northern part of the island nitrate is the major problem with above 100 mg. More than 100 mg of nitrate per liter of ground water is normal on the northern island. This is very high. So the natural conditions are different for the ground water.

Only minor pesticides findings on the northern part of

the island, this may have several reasons:

1st reason is that some of the pesticides they used to use were very easily degraded

2nd reason is that some of the persistent pesticides are not used because if they are persistent they will stay in the soil and will be bad for the vegetables. Some pesticides that you may use on barley and cereal they are a problem if you then later on want to use cabbage or onions and therefore they cannot use them. Therefore they might use pesticides which we might not measure because they are not in the analytical package. So there might be pesticides that we don't know because we don't measure for them. Special pesticides defined for vegetables. So there is both con and pro for the pesticide situation on the northern island. But we don't find the normal pesticides very often.

And that investigation was done 3 years ago?

No, the investigation is still going on and started in 1990, so there are 20 years of pesticide analytical resources. So it is not just a onetime investigation.

Have your investigations in regards to water usage and the problem with nitrate in the northern part lead to any consequences in Århus commune?

There has been a very strict regulation in irrigation. There are also a lot of regulations and restriction on nitrate.

Have there been any investigations in regards to soil quality?

There are no soil measurements in regards to soil quality to my best of knowledge.

But farmers have experienced problems with pesticides, not so much with synthetic fertilizers because they are very professional, they know what to do. And they can't live without crop rotation otherwise their vegetables will get sick. Because they are very intensive with potatoes and onions and otherwise the potatoes go bad.



Has pesticide use increased?

We haven't done any investigations on pesticide application only on ground water quality, nobody did that. There is no data on the use of pesticides, only go to the farmers association.

Has the nitrate content in the water then been increasing over the years?

It has been increasing since the 1950s but I think at the moment it is starting to drop again but from an extremely high level. Max 200 mg per liter so there is quite a way to go.

Is that water even drinkable?

You can easily drink it, I don't know if it is healthy. But it is not good for drinking water. We discussed that, but they wouldn't accept that and let us calculate the input of nitrogen impact into the nitrate balance on the fields. But in the deeper layers of the ground water on the northern island there is no nitrate.

And that is then used for drinking water.

Yes or a mixture of the polluted and the unpolluted.

Appendix P: Christian Castenskiold

Landsforeningen for Bæredygtigt Landbrug
(Sustainable Farmers Association)
Chairman of the association

Telephone Interview on 5/28/2010

Are you considered as an NGO?

It is an organization of farmers, to not really an alternative but a supplement to the L&F, Landbrug & Fødevarer. We started in February as we couldn't really find out what was being done with the law that is called Green Growth agreement. We were unsure that enough was done to try and work on GG and try to reduce the impact of farming in Denmark. That was the background for our organization. It is mainly farmers being in it. We take the interest of the Danish farmers to try and make a wider solution on all this.

Are you collaborating with the økologisk forening?

We don't work together with them; we are not organized in that way of working together with them. We try to work in any direction that would help our purpose. We are not mainly organic growers; it is probably mainly non-organic growers in the organization.

When you say that you don't consist of mainly organic farmers. How do you personally or as an organization define sustainable agriculture?

We call it sustainable farming as we would work and think there is a way of having a sustainable farming, in both an ecological way and climate and also economically sustainable. We think it is very, very important to have an economical sustainable farming to try and gain some of the purposes that we would work for in regards to the environment and those things. And that is where we see the green growth; that definitely works to reduce the outlet of nitrogen but it is also a very hard economical impact on farming. And it is going to put a lot of farmers out of business



and we think that it is very important for both farming but also the economical situation of the whole society that we try to do this in a way that serves both farming and also the economy of the whole society. That is why we think that there are other ways of doing it, that we could go for some of the goals but we can make it wiser and cheaper which would serve all the best. One of the very hard things about the Green growth is that is that a lot of it is EU purposes or goals, but the other EU countries, they will implement all these things at the latest term which is 2027 and in Denmark we have chosen to implement it all in 2015. And that means that we have 12 years with all the impacts and that is going to affect the competition, the internal competition with the EU very hard. And it is going to be very hard to serve all the environmental purposes if none of the others are going to do the same. And of course as a society you can chose to go for that and then just stop farming whatever that takes and at whatever cost it is. I just find it very important that you have a discussion what is this actually going to affect farming and the whole society and economy and exports and all these things. And out of that you can have a discussion whether we are ready as a society to take the costs of all that and are we actually ready to import all out foods with whatever that takes. That means all the outlet of nitrogen all the climate and the environmental effects of farming you just move that south of the border and it might even be a harder impact than if it was produced in Denmark. I feel that that discussion is not in anyone's mind and of course that is very comfortable for the rest of the society and the consumers that is very comfortable that you don't have to bother your mind about what to do. I think we need to have a discussion about the costs of climate and the costs of environmental impacts or things you want to do. And then you have an informed discussion about all this and then we just go for that. I think it is important to find out what are the economical consequences of all this and what it will cost each and every Danish families. Those are some of the things that we'd like to work for.

It is a problem for us that it is implemented so early in Denmark. We see that Denmark implements always

the EU laws very, very quickly and spot on, which is principally of course correct, but we just have to grasp the fact that it hurts our competition when the other countries do not implement it as quickly or in full scale and that is a bit hard when you are producing and that is affecting your economy on a big scale. And of course the environmental organizations agree on the Green Growth and as quickly as possible as mostly possible. Of course that is what they live off, but it is also very important to for us to be able to run our business on a long-term scale. And also I think that is important to society that there is a Danish farming because in general I think that people would actually prefer Danish products if you inform them about what they contain.

So you don't think it could be a first-mover advantage?

I think it is going to be very hard at the moment, as prices are very low. Maybe it would have been possible a couple of years ago with prices twice as high as today, but we are all battling already to try to get through the crisis and some people are probably not going to get through the crisis. I mean it is hard for everyone even outside farming. Maybe the right question would be: is it the correct time to do this? Because we're not going to make it; maybe if the main economy was much better and prices much higher, then there would be a chance to contain all this within the farming economy, but at the moment everyone is sort of just trying to get through. We have a figure. We think that it is going to affect farming by DKK 2.5 billion, the Green Growth Agreement, which is quite a lot. I think maybe it would be wise to be not quite as drastic as it is set out to be and the problem is I guess, that is only what I think and what I say, that the politicians made some choices, made some decisions without really calculating the costs. And to some extent they have had some quite unrealistic looks on the consequences. Now they have made the decision and now they find out what this all means. Of course it is hard to go back. But that's why Green Growth 2.0 is introducing a discussion and an analysis on the 10,000 tons; I don't know how much you are into the Green Growth Agreement. We are supposed to reduce with 19,000 tons in all and the



first pit of it is going to be 9,000 tons which is going to be implemented in 2015 but then they have decided to make some analysis and discussion about how to and when to implement the remaining 10,000 tons. And I think that comes from them suddenly realizing the costs of Denmark doing all this in 2015 and all the other countries are waiting another 12 years. It is just words at the moment. We hope it is a way of reducing the impact of all this. I would have just hoped that you could discuss of wiser ways of reducing the 9,000 tons, and maybe that is coming but at the moment that is set and that is all decided on how it should be done, and I think you could do that less costly than it is being implemented at the moment.

Have you been heard by the government? Has there been a response to your criticism?

Not directly, but we want to take the contact to the government and some of the politicians about how we look at this and some of the plans seem not to comply with some of the EU laws, so we are going to put a question mark on some of these things. But we are still organizing ourselves and trying to get some publicity and get out and get working. We have actually been in a meeting with some politicians and have been well met, so we just hope that we will be able to affect things even more.

I have been talking to the ministry about negative and positive sides of the green growth agreement and my contact person said that there are a lot of positive things about the agreement but at the same time they have heard criticism about the economic side, things that they haven't considered before, so they will start working on that from now on.

She [Karen Ellemann - the head of the ministry of the environment] is very hard to find out; she is saying one thing to people and then changing her expression according to the situation. She is very new to the ministry so maybe she just needs to find her feet. But of course we as farmers in the situation we are very few people so there are not many votes in farming in general. And I have to say that the Danish farmers as an organization I feel have been very poor

at informing the rest of the population about what we do and what we actually have done. So I think what people other than farmers, think about farming is not always correct, to a lot of extend that is our own fault. We have a huge job to inform a lot about Danish farming, because a lot of people do not know that the pork meat Danish farmers produce seems to be much better, less medicine remains or whatever you call that, than in a lot of other meat, you know imported meat. So we do actually make quality food stuff. And I think a lot of people have had the picture that it is actually really lousy meat that we do and we haven't done anything to gain some environmental goals. So I think a lot of things have been done, I am not saying that we shouldn't do more but a lot of things have been done. And very few people know about it. So we have to be much, much better at communicating with the rest of the society and that is one of our really big troubles that we've tried to get in campaigns organized to have a way of telling some of the stories about Danish Farming and have a discussion out of that but it hasn't been possible to have the organization have the desire to have this and I think that is one of our big problems that the way that people see Danish farming is not quite correct.

Maybe more PR because we to give them some information we have to tell them that you have to work with us, that when you put your hand down in the fridge in the supermarket you are actually a part of the decision of how Danish farming is supposed to be done. If you chose the Polish meat, we're out of business and that's it. But we need to give the people information that they are actually partly responsible for what is happening in the country side.

How would you modify the green growth agreement?

For one thing I would do a very proper research work to find out where we would gain and how we would reduce the outlet of nitrogen and how we would reduce the outlet most efficiently at the least cost. And one problem of all this is to have these catch crops [A catch crop is, you know, after harvest, we put in a crop that will send its roots down to try and get the remaining nitrogen out of the soil. And try to sort



of lift that up instead of it running out in the water] that is one thing; they have decided to have the catch crops as a general thing all over Denmark. And in some places it would help a lot and in some places there is nothing to go for, and I think it is absolutely crazy to have the costs all over Denmark if you could actually find out where do we sort of have the highest efficiency of a catch crop and then go for that. And of course that it might be one farmer and not the other farmer, but I think a lot of farmers could agree to make this a joint effort. And then let's put some money in. and if we have to, for heaven's sake, let's put these catch crops in where they have an effect. I would rather spend money on having a catch crop at my neighbors place or somewhere else if that is what's going to help or gain on the water environment instead of planting it somewhere where it will not do a difference.

Is planting a catch crop a requirement that every farmer has to do?

Yes, in my area we are going to have catch crops on about 37% of our area and when you have a catch crop you are forced to grow a spring crop which means that you would plant in spring instead of the autumn. So that would actually restrict my possibilities to choosing my crops according to where I can make the best profit. And as we are in an area where it can be very summer dry and that hurts the spring crops mostly, so it is going to cost us a lot of money because we can't grow the best crops and we would have to grow crops that are affected most be slightly dry periods in summer time. So it is going to have a big effect economically and if it doesn't work or if it doesn't serve the purpose that it is there for, I find it absolutely hopeless. So in the green growth agreement you have split Denmark into three areas, three different categories. According to your area and your category, that decides the amount of catch crops that you have to grow. The areas depend on what waters would receive the drainage water from your area. So it depends on where your drain water goes, in what fjord or seas that might go to. There is a map where you have some green parts, some orange parts, and some pink parts of Denmark. That map that shows the categories of catch crops.

What are you growing and are you a conventional farmer? How big is your farm?

I am a conventional farmer. I am growing mainly rape seed oil, wheat and spring barley. At the moment, this year, because of the spring barley being at a very low price we are trying to grow spring wheat and we some maize for corn and we have some grass seed as well. But our main crops in a normal year would be rape seed oil, wheat and spring barley. I am growing 450 ha and then I put the whole lot together with a colleague of mine and we are growing 900 ha together in one big lot.

In regards to more sustainable – how would you say sustainable agriculture is possible to have sustainable agriculture?

I think it is a very interesting discussion all this because some of the plans here are that we should supply bio-fuels meaning that a lot of straw and material would be taken away from the farms. Now I am working my farm with reduced tillage which means that we don't plough and we try to put as much straw back into the field. This is also a way of catching carbon or loading carbon into the soil. And this is a discussion that is not really on at the moment. Of course you can say if you burn it and it goes out, that is CO₂ neutral in that way, but you don't discuss in any way that you can actually catch CO₂ and load it into the ground. It is going to be a very wide spread discussion if you are going to discuss the environmental impacts or gains that are possible. It is going to take the full way in it and discuss all the matters that are in that discussion. But I think as a conventional farmer we could produce bio-fuels as a way to gain sustainable improvements, as a way of reducing oil and coal use. And then you can take a discussion whether you should have grains for fuels or not. There is a lot of carbon that can be supplied in a cleaner way and you don't have to transport coal on a very large way. And the discussion is that if you want to produce your food without fertilizers and without chemicals. And that is another subject where I would like to have the informed discussion with our consumers. You hear a lot of people, you know there are a lot of test in front of the supermarket. The number



of people that they say they'll buy organic products as they go in, does not sum up with the products in the supermarket. So it takes some honesty from the consumer as well to say: if I ask for organic products than I really have to buy them and if I don't buy them than I have to comply with the fact that some products are made in a conventional way. Because we're not going to survive if everybody demands but organic products and society forces a lot of the farmers to go organic and it is not being sold. That doesn't make sense. Because that means that we're going bankrupt anyways and we then have to actually import conventional food; because that's after all that is what is being sold. So the whole thing takes a lot of honesty on both sides and to have a discussion, what is it that you want us to do? If you demand some things then you also have to comply with it.

Have you ever considered moving to organic?

I have discussed it with friends. I actually had some friends that went organic and they had to go back. And that was because when they started about 10 years ago, they started out when the prices for organic food just collapsed. They were only arable farmers, so that was grain and the price of grain has collapsed in compared to the former price. So I have discussed it and thought about it but I haven't been wanting to do it unless I see that it is a safe way to go. I guess that when you talk organic, the conventional market is completely international and would be set price wise by an international market, and I guess an organic market is a more local market. So I depend a lot more on my own society and what my consumers want. And that is what I fear, due to the lack of correspondence of knowledge about farming which is our own fault, but still that comes to a lot of demands being put forward and maybe not quite in a rational way and maybe not in a way where people also spend the money on buying the demand they put forward. That held me from converting to organic farming. Another problem is that the consumer has been informed/told that organic farming is the only correct way of doing it. Of course it is good if you don't like spraying chemicals and fertilizers, of course that is the correct

way, but the outlet of nitrogen of an organic farm is actually higher than some of the conventional farms. And that again is a subject I think we should discuss. If people want to have organic products, that is fine with me they should just need know what is up and down on all this. And if they will say yea, I don't like pesticides so I agree with a higher outlet of nitrogen then that is fine, I just want the informed choice that makes people stay with what they do. What I fear is that some people would swop to organic and then if the market turns because of some kind of information people would get then you're done.

What do you think is the right thing?

We've practiced using clover as fertilizer in our main crop to try and let the clover catch nitrogen as a way to fertilize our crop and catch nitrogen. So we've tried some of the organic ways and tried to mix it in with our conventional system. Even though we're not forced at the moment we use a lot of catch crops in our system both to rise our carbon level in our soil and try to catch, if there is some fertilizer left we try to catch that. Last year we tried to do some direct drilling which is planting without cultivating our soil, which is a way to reduce your carbon outlet even further and we looked into a full scale system in the long run we would maybe reduce the outlet of methane, which is a very bad greenhouse gas. So even though we're conventional we do some thinking to see what can be done, but the problem is that system sometimes is actually a hindrance to going for all these things. Because if the main topic is to maybe save on fertilizer outlet then you're restricted in another way so sometimes it would be very nice if we could discuss the whole scale of thing you could do to do some environmental bettering.

Did the organic methods that you applied then work well?

We did a small scale thing and we didn't have any help to measure the exact amount of fertilizer that was caught and we had a very dry season afterwards, so we had problems with measuring the effects of what we did and we also had some conflicts with controlling



our weeds because when we grew the clover that restricts the use of chemicals afterwards, so we had to try and be careful that we didn't get a lot more weeds than we would have done if we didn't do it. So we tried and we are ready to try more things maybe we should have some help to do it in a more professional way.



BIBLIOGRAPHY

Scientific Sources

A

Andersen, A., H. Kristensen, C. Madsen, U. Bach, M. Jørgensen, J. Stephensen, O. Hougaard, et al. 2003. Læsø, samsø og ærø – udvikling og muligheder. Anvendt KommunalForskning, , <http://www.akf.dk/udgivelser/2003/pdf/oerne.pdf> (accessed 5/26/2010).

Ankjær Rasmussen, I. n.d. Om rodukruddt. in Økologisk landsforening [database online].[cited 5/24/2010 2010]. Available from <http://www.okologi.dk/landmand/landbrugsprojekter-og-artikler/landbrugstemaer/rodukruddt/om-rodukruddt.aspx> (accessed 5/24/2010).

B

Baker, S. 2008. Sustainable development as symbolic commitment: Declaratory politics and the seductive appeal of ecological modernization in the european union. In *The politics of unsustainability - eco-politics in the post-ecologist era.*, eds. I. Blühdorn, I. Welsh, pp 113-133. London/ New York: Routledge - Taylor & Francis Group.

Balzter, S. 2009. Das wunder von samsø. Frankfurter Allgemeine Zeitung, 06/26/2009, 2009, sec Menschen und Wirtschaft.

Barber, D. 2010. How I fell in love with a fish. in TED Conferences, LLC [database online]. Ted.com, [cited 4/5/2010 2010]. Available from http://www.ted.com/talks/lang/eng/dan_barber_how_i_fell_in_love_with_a_fish.html.

Bates, A., and T. Hemenway. 2010. From agriculture to permaculture. In *2010 state of the world: Transforming cultures - from consumerism to sustainability.*, eds. L. Starke, L. Mastny, pp 47-53. New York: W.W. Norton & Company.

Bittman, M. 2008. Rethinking the meat-guzzler. New York Times (01/27/2008).

Botin, L. 2010. "Embodiment of Time and Place (3rd Presentation)" (Presentation, Course: Theory of Science, Aalborg University, 2010), <http://www.lsn.aau.dk/intranet/planogmiljo/em8/BilagTOS/slideslecture32010lb.pdf> (accessed 06/03/2010).

Brennan, S., and J. Withgott. 2005. Environment - the science behind the stories, ed. C. et al Bridges. San Francisco: Pearson Education Inc.

Bryman, A. 2008. Social research methods. 3rd ed. Oxford: Oxford University Press.

Buttel, F. H. 1993. The sociology of agricultural sustainability: Some observations on the future of sustainable agriculture. *Agriculture, Ecosystems & Environment* 46, (1-4): pp 175-186.



Buttel, F. H., A. P. Hawkins, and A. G. Power. 1990. From limits to growth to global change—Constraints and contradictions in the evolution of environmental science and ideology. *Global Environmental Change* 1, (1): pp 57-66.

C

Calverley, C. I. 2010. Telephone interview- personal communication on 05.05.2010. 05/05/2010. Ministry of Food, Agriculture and Fisheries.

Carson, R. 2002. *Silent spring*. Anniversary Edition (first edition: 1962) ed. New York: Mariner Books.

Castenskiold, C. 2010. Telephone interview - personal communication on 28.05.2010. 05/28/2010. Landsforeningen for Bæredygtig Landbrug.

Connell, S. 1997. Empirical-analytical methodological research in environmental education: Response to a negative trend in methodological and ideological discussions. *Environmental Education Research* 3, (2): pp 117-132.

Controlling-Portal. n.d. SWOT-analyse: Funktion für unternehmen. in Controlling-Portal.de [database online]. [cited 6/6/2010 2010]. Available from <http://www.controllingportal.de/Fachinfo/Grundlagen/SWOT-Analyse.html> (accessed 6/6/2010).

Cox, R. 2010. *Environmental communication and the public sphere*. 2nd ed. Los Angeles: Sage Publications.

———. **2007.** Nature's "crisis disciplines": Does environmental communication have an ethical duty? *Environmental Communication: A Journal of Nature and Culture* 1, (1): pp 5-20.

D

Danish Energy Agency. n.d. Samsø - renewable energy island. in Danish Energy Agency [database online]. [cited 5/26/2010 2010]. Available from <http://www.ens.dk/en-US/Info/news/Factsheet/Documents/samsoe170709.pdf> engelsk.pdf (accessed 5/26/2010).

———. **2010** Beregnings-forudsætninger. in Danish Energy Agency [database online]. [cited 6/2/2010 2010]. Available from http://www.ens.dk/Documents/Netboghandel%20-%20publikationer/2010/forudsætninger_for_samfundsoekonomiske_analyser_paa_energiomraade.pdf (accessed 6/2/2010).

Danish Ministry for Food, Agriculture and Fisheries. 2010. Grønt udviklings- og DemonstrationsProgram (green development and demonstration program). in Ministry of Food, Agriculture and Fisheries [database online]. [cited 5/24/2010 2010]. Available from http://www.fvm.dk/Groent_Udviklings-_og_Demonstrationsprogram.aspx?ID=42556 (accessed 5/24/2010).

———. **2009a.** Number of farms (organic). (12/31/2009).



Danish Ministry for Food, Agriculture and Fisheries. 2009b Organic farming - denmark organic country 2009 - fødevareministeriet. in Danish Ministry for Food, Agriculture and Fisheries [database online]. [cited 6/3/2010 2010]. Available from http://www.fvm.dk/PDF'er_engelsk.aspx?ID=36916 (accessed 6/3/2010).

———. **2009c.** Organic production and consumption in denmark. in Danish Ministry for Food, Agriculture and Fisheries [database online]. [cited 6/3/2010 2010]. Available from http://www.fvm.dk/Organic_production_and_consumption.aspx?ID=36896 (accessed 6/3/2010).

Danish Ministry of the Environment. 2009a. Danish agreement on green growth. The Danish Ministry of the Environment, 2010, http://www.mim.dk/NR/rdonlyres/54887891-D450-4CD7-B823-CD5B12C6867A/0/DanishAgreementonGreenGrowth_300909.pdf (accessed 5/17/2010).

———. **2009b.** Ministry of the environment - A historical step forward for nature and the environment. [cited 5/17/2010 2010]. Available from http://www.mim.dk/eng/News/Historical_step_forward_for_nature_and_enviroment.htm (accessed 5/17/2010).

———. **2003.** Kort & matrikelstyrelsen - landet i tal - største øer. in The Danish Ministry of the Environment [database online]. [cited 6/5/2010 2010]. Available from [http://www2.kms.dk/C1256AED004EA666/\(AllDocsByDocId\)/1D7EE8822587E667C1256AEF0030ABF6?open&page=strste&omr=KORT_DK_I_TAL](http://www2.kms.dk/C1256AED004EA666/(AllDocsByDocId)/1D7EE8822587E667C1256AEF0030ABF6?open&page=strste&omr=KORT_DK_I_TAL) (accessed 6/5/2010).

Danish Ministry for Food, Agriculture and Fisheries. n.d. Klimanormaler danmark. in Danmarks Meteorologiske Institut [database online]. [cited 6/2/2010 2010]. Available from <http://www.dmi.dk/dmi/index/danmark/klimanormaler.htm> (accessed 6/2/2010).

Doyle, T., and D. McEachern. 1998. Environment and politics - routledge introductions to environment series. New York: Routledge.

Duncan Brown, A. 2003. Feed or feedback: Agriculture, population dynamics and the state of the planet. Utrecht, Netherlands: International Books (accessed 6/1/2010).

E

European Commission. 2010 Agriculture and rural development - agricultural markets - direct payments- info sheet on single payment scheme. in European Commission [database online]. [cited 5/24/2010 2010]. Available from http://ec.europa.eu/agriculture/capreform/infosheets/pay_en.pdf (accessed 5/24/2010).

———. **1998.** DG VI - fact sheets: Reforming the olive oil sector. in European Commission [database online]. [cited 05/24/2010 2010]. Available from http://ec.europa.eu/agriculture/publi/fact/olive/index_en.htm (accessed 05/24/2010).

European Union. 2010. Tätigkeitsbereiche der europäischen union – haushalt. [cited 4/30/2010 2010]. Available from http://europa.eu/pol/financ/index_de.htm (accessed 4/30/2010).



F

FAO. 2010a. FAOSTAT - world agriculture - data base "agricultural area and arable land". [cited 4/5/2010 2010]. Available from <http://faostat.fao.org/site/377/DesktopDefault.aspx?PageID=377#ancor> (accessed 4/5/2010).

———. **2010b.** FAOSTAT - world agriculture - data base "ResourceSTAT". [cited 4/28/2010 2010]. Available from <http://faostat.fao.org/site/405/default.aspx> (accessed 4/28/2010).

Foley, G., ed. 2004. Dimensions of adult learning: Adult education and training in a global era. Maidenhead, England: Open University Press.

Folketinget - EU-Oplysningen. 2008. What is the CAP? in Folketinget - EU-Oplysningen [database online]. [cited 5/24/2010 2010]. Available from http://www.eu-oplysningen.dk/euo_en/spsv/all/86/ (accessed 5/24/2010).

Freestone, O. M., and P. J. McGoldrick. 2008. Motivations of the ethical consumer. *Journal of Business Ethics*(79): pp 445-467.

G

Grenaa, E. 2010. Telephone interview - personal communication on 18.05.2010. 05/18/2010. Samsø Landboforening (Farmers Association on Samsø, Denmark).

Gribel Vorum, M. 2010. Økologisk forskningsprojekt skydes i gang. in Økologisk landsforening [database online]. [cited 05/24/2010 2010]. Available from <http://www.okologi.dk/baeredygtigt-forbrug/aktuelt-om-oekologi/oeko-nyheder/2010/maj/oekologisk-forskningsprojekt-skydes-i-gang.aspx> (accessed 05/24/2010).

H

Hawken, P. 2005. The ecology of commerce - A declaration of sustainability. First hardcover edition 1993 ed. New York: Collins Business - Imprint of HarperCollins Publishers.

Hayes, J. 2007. The theory and practice of change management. 2nd ed. New York: Palgrave Macmillan.

Hays, S. P. 2000. A history of environmental politics since 1945. Pittsburgh: University of Pittsburgh.

Hermansen, Søren. 2010. Telephone interview - personal communication on the 20.05, the 25.05. and the 27.05.2010 (inaugural presentation at aalborg university). 05/20&25/2010. EnergiAkademiet Samsø.

Hermansen, Sven. 2010. Telephone interview - personal communication on 21.05.2010. 05/21/2010. Økologisk landsforening.

Hill, M. K., ed. 2004. Understanding environmental pollution. 2nd edition ed. Cambridge: Cambridge University Press.



I

IAASTD. 2009. Agriculture at a crossroads - global report. Washington, DC: International Assessment of Agricultural Knowledge, Science and Technology for Development, 2010.

IEA. 2008. Medium-term oil market report. Paris: OECD/ International Energy Agency, .

J

Jamison, A. 2010. "Action and Change-Oriented Research" (Presentation, Course: Theories of Science (8th Presentation), Aalborg University, 2010), <http://www.lsn.aau.dk/intranet/planogmiljo/em8/BilagTOS/slideslecture82010aj.pdf> (accessed 06/05/2010).

K

Kaae, J. 2010. Telephone interview - personal communication on 17.05.2010. 05/17/2010. Ministry of Food, Agriculture and Fisheries.

Kerton, S., and A. J. Sinclair. 2009. Buying local organic food: A pathway to transformative learning. Agriculture and Human Values (08/04/2009), <http://www.springerlink.com.zorac.aub.aau.dk/content/g04187q267t86221/fulltext.pdf>.

Kilbourne, W., and G. Pickett. 2008. How materialism affects environmental beliefs, concern, and environmentally responsible behavior. Journal of Business Research 61, (9): pp 885-893.

Kirby, A. 2009. Climate in peril - A popular guide to the latest IPCC report. Arendal: UNEP/ GRID Arendal,

L

Lappé, A. 2008. Doing the right thing can be delicious. In World changing - A user's guide for the 21st century., ed. Alex Steffen, p 51. New York: Harry n. Abrams, Inc.

Laumer, J. 2010. Poison in the hive: High levels of pesticides & breakdown products found in bees wax & pollen. Treehugger, 03/23/2010, 2010, sec Business & Politics News.

Lawrence, F. 2009. Eat less meat and dairy: Official recipe to help health of consumers – and the planet | environment | the guardian. The Guardian, 12/11/2009, 2009, sec 2010. <http://www.guardian.co.uk/environment/2009/dec/11/eat-less-meat-dairy-diet> (accessed 4/26/2010).

M

Mäder, P., A. Fließbach, D. Dubois, L. Gunst, P. Fried, and U. Niggli. 2002. Soil fertility and biodiversity in organic farming. Science 296, (5573) (31.05.2002): pp 1694-1697.

Madsen, A. 2010. Telephone interview - personal communication on 19.05.2010. 05/19/2010. Private: Conventional Farmer on Samsø.



Marafiotte, T., and E. Plec. 2006. From dualism to dialogism: Hybridity in discourse about the natural world. In *The environmental communication yearbook.*, ed. S. P. Depoe. Vol. 3, pp 49-76. Mahwah: Lawrence Erlbaum Associates.

McWilliams, J. 2010. What's behind the honeybee decline? perhaps not what you've heard. *New York Times*, April 28th, 2010, sec Opintion - Freakonomics. <http://freakonomics.blogs.nytimes.com> (accessed 05/03/2010).

Mezirow, J. 1994. Understanding transformation theory. *Adult Education Quarterly* 44, (4) (Summer 1994): pp 222-232.

Milstein, T. 2009. Environmental communication theories. In *Encyclopaedia of communication theory.*, ed. Littlejohn S. W., Foss K. A. Vol. 1, pp 344-350. Thousand Oaks: Sage Publications.

N

Nadler, D., R. B. Shaw, and A. E. Walton. 1995. *Discontinuous change: Leading organizational transformation.* The Jossey-Bass management series. San Francisco: Jossey-Bass.

Norden. 2006. *Environmental communication with consumers- A nordic manual.* Copenhagen: Nordic Council of Ministers, .

Nyadie, B. K., and J. Kruse. 1999. *Permaculture for a sustainable agricultural development.* Hurup, Thy: Nordvestjysk Folkecenter for Vedvarende Energi - Folkecenter for Renewable Energy, .

Ø/O

Øster Kristensen, M. 2010. Telephone interview - personal communication on 21.05.2010. 05/21/2010. Private: Organic Farmer on the Island of Samsø.

Our Southwest. n.d. Quotes on sustainable development and sustainability - our south west. [cited 6/8/2010 2010]. Available from <http://www.oursouthwest.com/news/quotes1sd.htm> (accessed 6/8/2010).

P

Pearsall, J. and Trumble, B., ed. 1996. *The oxford english reference dictionary.* 2nd ed. Oxford: Oxford University Press.

Perkins, J. H., and R. Jamison. 2008. History, ethics, and intensification in agriculture. In *The ethics of intensification - agricultural development and cultural change; the international library of environmental, agricultural and food ethics.*, ed. P. B. Thompson. Vol. Volume 16, pp 59-83. Dordrecht, Netherlands: Springer Science + Business Media B.V.

Rambøll. 2005. *Nordsamsø – resultat af nye nettonedbørberegninger.* Århus: GEUS - Nationale Geologiske Undersøgelser for Danmark og Grønland, 73678.



R

Rasper, M. 2009. 60 Jahre Bundesrepublik Deutschland: Meilensteine unserer Umweltgeschichte. Natur & Kosmos.

Ravn Nielsen, K. 2010. Telephone interview - personal communication on 20.05.2010. 05/20/2010. Samsø Landboforening (Farmers Association on Samsø, Denmark).

Rich, S. 2008. Sustainable farming 101. In World changing - A user's guide for the 21st century., ed. Alex Steffen, p 52. New York: Harry n. Abrams, Inc.

Robertson, G. P., and R. R. Harwood. 2001. Agriculture, sustainable. In Encyclopedia of biodiversity (volume I), ed. S. A. Levin, pp 99-108. New York: Elsevier.

Rohwetter, M. 2007. Produktionsplanet Erde. Die Zeit (11/29/2007).

S

Sachs, W. 1999. Planet dialectics: Explorations in environment and development. Halifax, Nova Scotia: Fernwood Pub.

Sachs, W., and T. Santarius, eds. 2007. Fair future - resource conflicts, security and global justice. Trans. Patrick Camiller. London/ New York: Zed Books.

Schaller, N. 1993. The concept of agricultural sustainability. Agriculture, Ecosystems & Environment 46, (1-4): pp 89-97.

Scialabba, N., and C. Hattam. 2002. Organic agriculture, environment, and food security. Rome: Food and Agriculture Organization of the United Nations.

Scoullos, M. ("Sustainable Development – Introductory Lecture" 2009), http://moodle.vasa.abo.fi/file.php?file=/2237/M_SCOULLOS_movie-Turku-bilagaCOS.ppt; <http://web.abo.fi/lc/natforelasning/sustainabledevelopment/scoullos.html> (accessed 04/17/2010).

Shiva, V. 2002. Globalization of agriculture, food security and sustainability. In Sustainable agriculture and food security - the impact of globalization., eds. V. Shiva, G. Bedi. 1st ed., pp 11-70. New Delhi: Sage Publications.

Simon, H., and A. von der Gathen. 2002. Das große Handbuch der Strategieinstrumente. Alle Werkzeuge für eine erfolgreiche Unternehmensführung. Frankfurt/ Main: Campus Sachbuch, Campus Verlag GmbH.

StatBank Denmark. Agriculture and fisheries. 2010a.- economic statistics - LBF11: Gross domestic product at factor cost for agriculture by type. in Statistics Denmark [database online].[cited 06/04/2010 2010]. Available from <http://www.statistikbanken.dk/statbank5a/SelectVarVal/Define.asp?Maintable=LBF11&PLanguage=1> (accessed 06/04/2010).



———. . **2010b** National accounts, balance of payments and international investment position – regional accounts - RNAT11: GDP (DKK mio.) and GDP per capita (DKK 1000) by region, type and price unit (1993-2008). in Statistics Denmark [database online].[cited 06/05/2010 2010]. Available from <http://www.statbank.dk/statbank5a/SelectVarVal/Define.asp?Maintable=RNAT11&PLanguage=1> (accessed 06/05/2010).

———. **2010c** Population and elections - BEF4: Population 1st january by islands. in Statistics Denmark [database online].[cited 05/26/2010 2010]. Available from <http://www.statistikbanken.dk/statbank5a/default.asp?w=1280> (accessed 05/26/2010).

Strong, B. 2009. Denmark's wind of change. TIME. 02/25/2009, <http://www.time.com/time/magazine/article/0,9171,1881646,00.html> (accessed 5/26/2010).

Sustainable Cities. n.d. Samsø: A role model in self-sufficiency | sustainable cities. in Sustainable Cities.dk [database online].[cited 5/17/2010 2010]. Available from <http://sustainablecities.dk/en/city-projects/cases/samsø-a-role-model-in-self-sufficiency> (accessed 5/17/2010).

T

TCW. 2004. Theory of planned behavior/ reasoned action. in University of Twente [database online].[cited 05/24/2010 2010]. Available from http://www.cw.utwente.nl/theorieenoverzicht/Theory%20clusters/Health%20Communication/theory_planned_behavior.doc/ (accessed 05/24/2010).

The Economist (Author unknown). 2009. 2020 vision - the peak-oil debate - the IEA puts a date on peak oil production. The Economist 393, (8661) (12/12/2009): p 82, 2/3p.
The Independent. 2009. The little island and its big, green victory - climate change, environment. The Independent, 11/26/2009, 2009, sec 2010.

Thorling, L. 2010. Telephone interview - personal communication on 19.05 & 26.05.2010. 05/19&26/2010. GEUS - Nationale Geologiske Undersøgelser for Danmark og Grønland.

Trumbo, C. W., and G. J. O'Keefe. 2004. Reasoned action in environmental communication research: Demonstration of an augmented model. In The environmental communication yearbook., ed. S. L. Senecah. Vol. 1, pp 201-218. Mahwah: Lawrence Erlbaum Associates.

U

UNECE. 2008. Aarhus parties commit to strengthening environmental democracy in the UNECE region and beyond (riga, latvia; 11-13 june 2008). in United Nations Economic Commission for Europe [database online].[cited 5/21/2010 2010]. Available from http://www.unece.org/press/pr2008/08env_p10e.htm (accessed 5/21/2010).

UNEP. 2008. Agriculture: The need for change - press releases april 2008. in UNEP - United Nations Environmental Programme [database online]. Washington/London/Nairobi/Delhi, 2008 [cited 6/1/2010 2010]. Available from <http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=531&ArticleID=5769&l=en> (accessed 6/1/2010).



UNESCO. 1997. The declaration of thessaloniki - international conference on environment and society. Paper presented at The Declaration of Thessaloniki, Thessaloniki, Greece, http://portal.unesco.org/education/en/ev.php-URL_ID=23929&URL_DO=DO_TOPIC&URL_SECTION=201.html (accessed 4/17/2010).

W

Walker, G. B. 2004. The roadless area initiative as national policy: Is public participation an oxymoron? In *Communication and public participation in environmental decision making.*, eds. S. P. Depoe, J. W. Delicath and M-F A. Elsenbeer, pp 113-135. Albany: State University of New York Press.

Walsh, B. 2008. Soren hermansen - heroes of the environment 2008. TIME. 09/24/2008, http://www.time.com/time/specials/packages/article/0,28804,1841778_1841782_1841789,00.html (accessed 5/26/2010).

WCED. 1987. Our common future. Geneva: World Commission on Environment and Development, Oxford University Press.

Weick, K. E., and R. E. Quinn. 1999. Organizational change and development. *Annual Review of Psychology* 50, (1): pp. 361-386.

Y

Yunlong, C., and B. Smit. 1994. Sustainability in agriculture: A general review. *Agriculture, Ecosystems & Environment* 49, (3): pp 299-307.

Picture Sources

Anzetteln.at. 2009. Unsere Community wächst! Retrieved 6/4/2010, from <http://www.anzetteln.at/static/tenants/default/sites/bl/blog/media/Community1.story.jpg>

Acceso Hispanico. 2009. Science & Environment. Retrieved 6/6/2010, from <http://www.english.accesohispano.org/wp-content/uploads/2008/11/5893121.jpg>

Codeva. 2008. Codeva for a better world. Retrieved 6/6/2010, from www.freewebs.com/codeva/photos/Leaf%20Curl.jpg

CUESA. n.d.. What is Sustainable Agriculture?. The Centre for Urban Education about Sustainable Agriculture. Retrieved 6/6/2010, from http://www.cuesa.org/sustainable_ag/

Danish Ministry for Food, Agriculture and Fisheries. 2009. Organic farming - organic consumption and production in denmark - fødevareministeriet. in Danish Ministry for Food, Agriculture and Fisheries [database online]. [cited 6/3/2010 2010]. Available from http://www.fvm.dk/PDF'er_engelsk.aspx?ID=36916 (accessed 6/3/2010).



EUNIL. n.d. Denmark. European Union National Institutions for Language. Retrieved 6/6/2010, from http://www.eurfedling.org/maps/Satellite_Denmark.jpg

Flickr. 2007. Egyptian Agriculture. Retrieved 6/6/2010, from http://www.flickr.com/photos/libyan_soup/2049326171/

Flickr. 2009. Agriculture pattern. Retrieved 6/6/2010, from <http://www.flickr.com/photos/96614226@N00/4042434056/>

IICA. 2010. Knowledge Centre – Information by thematic. Inter-American Institute for Cooperation on Agriculture. Retrieved 6/6/2010, from <http://www.iica.int/Eng/conocimiento/infoTema/PublishingImages/agriculture.jpg>

Kort & matrikelstyrelsen. 1995. Danmark 1:100 000, topografisk atlas. Kort & matrikelstyrelsen. Copenhagen

Natural buy.com. 2009. Spices as Pesticides? Sounds Healthy and Tastes good, too. Retrieved 6/7/2010, from http://www.naturalbuy.com/wp-content/uploads/2009/08/pesticide_use.jpg

Permaculture Research Institute of Australia. 2008. Peak Oil, Petrodollars and Climate Change Apathy, by Craig Mackintosh (published 8/25/2010) Retrieved 6/7/2010, from http://www.permaculture.org.au/images/peak_oil3.jpg

Samsø Kommune. 2009. Plan- og Agenda21 strategi. Retrieved 7/6/2010, from http://soap.plansystem.dk/pdfarchive/70_1061998_APPROVED_1219932710217.pdf

Steen, V. 1987. Danmark – Østjylland. Gzldendalske Boghandel. Copenhagen

Wenzel Communication. n.d. Retrieved 6/6/2010, from http://www.wenzel-communication.de/Wenzel-Communication.de/Kontakt_files/photo_2008_ic_interpersonal_communication.gif

Wilhelm Business Training. n.d. Change Management und Strategieentwicklung. Retrieved 6/6/2010, from <http://www.wilhelm-training.de/bilder/changemanagement.jpg>

World Changing. 2009. Community (published 2009) Retrieved 6/6/2010, from <http://www.worldchanging.com/com-munity>

WTRG Economics. 2010. Crude Oil Production. http://www.wtrg.com/oil_graphs/PAPRPOP.gif

YogiZenDude. 2009. Permaculture – Creating a Sustainable Now. Retrieved 6/7/2010, from <http://yogizendude.com/wp-content/uploads/2009/09/permaculture-quansut-hut-meadow.jpg>







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