PAPER PRESENTED AT THE 2004 BERLIN CONFERENCE THE HUMAN DIMENSIONS OF GLOBAL ENVIRONMENTAL CHANGE "GREENING OF POLICIES – INTERLINKAGES AND POLICY INTEGRATION"
3-4 DECEMBER 2004

Policy integration in the shaping of organic food as strategy in the Danish food sector – what happened to the environmental concern as driving force?

Associate Professor Michael Søgaard Jørgensen, Department of Manufacturing Engineering and Management, *Technical University of Denmark, DK-2800 Kgs. Lyngby, DENMARK*
Tel: +45 45 25 60 24. Fax: +45 45 93 66 20. E-mail: ***msj@ipl.dtu.dk*** *Website:* ***www.ipl.dtu.dk***

Summary
The paper discusses the mechanisms in the shaping of organic food as strategy in the Danish food sector based on an analysis of the development since the 1980'ies as a contribution to the discussion of strategies for sustainable transition. The background of the paper is the major achievements since the 1980'ies, but also the recent reduction in the increase of land being converted to organic farming.
The analysis is based on Karnøe's and Garud's approach for analyses of the creation of new technological fields, which sees this as a combination of path creation and path dependency combined with analysis of typology for governance. Focus is on the shaping of new institutions, structures, new knowledge fields and on the re-use and re-shaping of existing institutions, structures etc. These processes involve an ongoing interaction between production, consumption/use, knowledge and regulation, where these systems constantly are co-shaping each other. The focus of the transition is shaped along the transition.
The analysis shows how the organic farming and the retail sector strategy on organic food are co-shaped. The definition of organic agriculture in the national regulation is also part of the shaping of the transition. Focus is on certain values of the organic agriculture as developed by organisation for organic farming by focusing on the principles of biological proximity and not the values of social proximity.
The analysis shows the role of the initial conditions in the shaping of the transition as constraining, as well as enabling factors. Among the important conditions have been the big pork export and the specialised farms, which has implied a limited focus on organic pig production and more focus on the production, which more easily can be converted (dairy cattle). The close links between big dairy companies and a co-operative retail chain has been important, because the retail chain was able to influence the dairies to start buying and processing organic milk.
The regulation of organic food and most of the regulation of environmental aspects of agriculture in general has been based on policy integration, since the governmental regulation has been organised within the ministry regulating food and agriculture. Denmark was the first country to introduce a national support scheme for organic farming and for research and development (1988) based on a law on organic farming (1987). The idea was to generate consumer confidence in organic food in order to develop a market for organic food. It was also agreed that there was a need for developing the supply and demand of organic food further. Therefore the scope of the

support scheme for organic far ming was extended, so it also covered support for the development of new organic food products. Activities for the development of the demand for organic food was also supported, e.g. campaigns for organic food by retail chains and public procurement by support to the development of strategies for the usage of organic food in public institutions, hospitals etc.

The shaping of the limited role of organic farming and food as elements a strategy for sustainable agriculture is very important. Organic food is seen as a strategic product niche and as a threat to the conventional agriculture and not as a possible environmental strategy for the conventional agriculture, although organic farming is given some preference in the granting of applications for environmentally related subsides to the agriculture in general. The market-based approach has caused several problems in the regulation of demand and supply because of the strong price competition in the Danish retail sector.

Policy integration is also practised in the environmental regulation of the conventional agriculture through limits to the number of pesticide sprayings, taxes on pesticides and the request for fertiliser accounts, so that two competing development paradigms today are regulating via policy regulation.

Some considerations for organic farming as an environmental strategy in the future are presented.

Introduction

A more sustainable development demands a substantial change in the production and consumption patterns in the Western world. That is, it is not enough that a company here and there is developing a more green strategy. There is a need for sustainable transition within product and service areas towards reduced resource consumption and reduced use of hazardous chemicals. Transition is not happening from one day to the other. It might start with one company developing a greener strategy, which then might trigger a competitor to do the same thing etc. However, analyses of experience with sustainable transition like the development of the Danish wind energy sector and the increase in the Danish use of wind power shows that such changes might be some very long processes with a complex and ongoing interaction between production, consumption, knowledge development and governmental regulation (see for example Karnøe and Garud, 1998).

The paper discusses the mechanisms in the shaping of organic food as strategy in the Danish food sector based on an analysis of the development since the 1980'ies as a contribution to the discussion of strategies for sustainable transition and the role of different policy strategies, including policy integration, herein. The background of the paper is the major achievements within organic agriculture and organic food production and consumption in Denmark since the 1980'ies, but also the recent reduction in the agricultural area and the number of organic farms.

The analysis is based on Karnøe's and Garud's approach for analyses of the creation of new technological fields, which sees such creation as a combination of path creation and path dependency. The focus is on the shaping of new institutions, structures, new knowledge fields and on the re-use and re-shaping of existing institutions, structures etc. The focus is on the ongoing interaction between production, consumption/use, knowledge and regulation, where these systems constantly are co-shaping each other.
Policy-making has played and still plays a major role in the development of organic food in Denmark. This includes regulation via different policy networks, national governmental regulation and international regulation, especially within the European Community (EU). Also the regulation of the conventional farming has played and plays a role in the shaping of organic food as strategy. The paper analyses the different forms of policy-making, including the role of policy integration vertically (within different levels of the food sector) and horizontally (within the different fields of regulation in relation to food, agriculture etc.).
For short, organic farming is here shortly defined as agriculture, where it is not allowed to use artificial fertiliser and chemical pesticides and where the husbandry is based on organic fodder and some stricter ethical demands. As the paper will show the definition of the organic farming and the processing of the organic food itself is part of the social shaping taking place.

Theoretical considerations for the analysis of sustainable transition

Whether one is a pessimist or an optimist, one can either phrase the development of organic farming and organic food in Denmark as "only 6% of the agricultural area has been converted and only 25% of the milk bought by consumers is organic" or as "as much as 6% of the agricultural area has been converted and even 25% of the milk bought by consumers is organic". The point of this paper is that one has to use both views, not only in an analysis of the development of organic farming and organic food in Denmark, but in analyses of sustainable transition in general. One should recognise that on the one hand a new product niche and maybe

even a new development path has developed and on the other hand the conventional agriculture is still dominating with more than 90% of the agricultural area. The approach of Karnøe and Garud in their analyses of the development of path creation and path dependence in the Danish wind turbine field offers a way of combining focus on creation of new development paths and on the dependence of existing paths (Karnøe and Garud, 1998). The approach of Karnøe and Garud is presented in the following and is taken a step further as the basis for the analysis of organic farming and organic food in Denmark (hereafter called "organic food production" or "organic food", when reference is made to the field in general).

The point of Karnøe and Garud is that the concept of "path dependence" implies that paths are created and that new paths therefore also can be created. What we need to understand is on the one hand what stabilises development paths or trajectories and on the other hand how new paths are created and stabilised. Path dependence is created through the building of institutions in terms of standards and rules, investments in facilities and technology in general and by the competence developing in the governmental institutions, companies etc. A mindset characterising a technology can for example be described in terms of the four elements in the concept of "local theory" developed by Sørensen and Sætnan for health and safety management and later on transferred to the environmental field by Forman and Jørgensen: a) what is seen as problems, b) what is seen as the causes of the problems, c) what is seen as legitimate demands and d) what is seen as strategies for change (Sørensen and Sætnan, 1983) and (Forman and Jørgensen, 2001).

New paths can be created by changing existing institutions by changing their role, competence etc., developing new institutions, developing standards, developing funding schemes, developing governmental plans or regulation stating certain demands, time schedule for changes etc.

Karnøe and Garud emphasise, based on the analyses of the Danish wind turbine experience how markets, competencies, institutions etc. all should be seen as the results of transition processes shaped by (Karnøe and Garud, 1998)

- The initial conditions
- The interaction between four systems of production, consumption/use, knowledge and regulation
- A mixture of use or reproduction of existing technology, knowledge, institutions etc. and the shaping of new technology, new institutions, new regulation etc.
- Random events

The interaction between the systems of production, consumption/use, knowledge and regulation is in some literature described as a co-shaping or a co-evolution of production and consumption. Karnøe and Garud emphasise that the creation of new paths involves a complex process where each of the systems sometimes set frames for the further development of one or more of the other systems and sometimes adopt to conditions set by one or more of the other systems. In the case of the Danish wind turbine field, for example, it meant a tremendous step forward, when the electricity companies were asked to install a rather big capacity of wind power within a number of years. This was the result of pressure from among others NGO's within the field. When the electricity companies gradually realised they had to fulfil this demand they set new demands for the production of the windmills, because they wanted to install bigger windmills. These complex mechanisms also implies that most probably transition processes will not evolve as simple market

driven development or as simple compliance processes, where a government sets the rules and the industry complies (Karnøe and Garud, 1998).

The mixture of system interaction, reproduction and shaping of new institutions etc. and the role of random events seem to imply that transition processes are not straight forward, but a mixture of amplifying and dampening mechanisms. For the Danish wind turbine field:

- Amplifying mechanisms: subsidies only given by fulfilling quality criteria (as opposite to the US subsidy schemes); active and critical consumers organised in NGO's, systematic knowledge development and exchange; new users (the electricity companies); the development of a wind turbine market in the California based on tax exemptions.
- Dampening mechanisms: critique of the aesthetics of the increasing and size of the wind turbines in the landscape; limitations to how much wind turbine capacity private persons can own; the collapse of the Californian markets when the tax exemption scheme suddenly was cancelled (Karnøe and Garud, 1998).

Finally, Karnøe and Garud also points to the need for a social construction approach in this kind of analyses, since technological systems not only is a question about technologies, but also about the people (the actors) involved in the shaping of the technological systems, why this type of changes often is called "socio-technical changes". Each actor has a frame of beliefs (for example what wind power is good for), standards of evaluation, and behaviour (practice). Three frames that typically play a role in the development of technologies are frames about production, frames about use, and frames about regulation. Beliefs about production may include beliefs about the future potential of a technological system. These beliefs are integrally connected with the design parameters that designers, technicians and researchers employ (Karnøe and Garud, 1998). The beliefs might also be the background for users to emerge or regulation schemes to be designed and agreed upon. In a Danish context wind power has had at least four roles in the past 30 years. Right after the so-called oil crisis in the 1970'es wind power was seen as a possible strategy for secure supply of electricity. After the nuclear power accident at the Three Mile Island and nuclear power still was part of the Danish energy policy wind power was seen as a safe alternative to nuclear power. During a period with very high unemployment in the 1980'es the production of wind turbines was seen as a way of increasing the employment in the industry (Karnøe and Garud, 1998). Since the discussion about greenhouse effect emerged in the 1990'es, wind energy is also seen by some actors as a strategy for reduction of CO2 emissions.

What is important about the social construction approach is that the social-technical changes are not seen as an explanation in itself. That is, these changes have to be explained: why and how certain understandings of a problem and a solution become the dominating one(s). A starting point for discussing power in relation to technological development could be Giddens' definition of power as *"the transformative capacity to harness the agency of others to comply with one's ends"* (Bijker, 1995, p. 262). In this definition, power is a relational concept; it is exercised in specific circumstances, and cannot be possessed. Power is located between actors – it is dynamic and has to be reproduced all the time.

Technologies can exert power through their function as an *exemplary artefact*, where the relevant social groups have invested so much in the artefact, through building up institutions etc. around it, that its meaning has become quite fixed, or obdurate. It can no longer be changed easily,

because it is part of a fixed network of practices, theories, and social institutions. Hansen points out that a technological system does not form a power structure by only fixing the meaning of a technology, but also by fixing relations between relevant social groups (Hansen, 1997).

The technological system represents a (more or less accepted) socio-technical contract that delegates identity and roles, responsibility and competence, opportunities and resources, etc. to a number of social groups in the technological system. However, the social groups will never fully accept their place in the network, and potentially they will reject their position herein. Social construction studies should therefore study both the exercise of power in the form of fixing of the meaning of artefacts as well as the reasons for the actors accepting or being forced to accept a given technology (Hansen, 1997). Hansen recommends to look at construction processes as "the simultaneous construction of artefacts, relevant social groups, negotiation rules and discourses" (Hansen, 1995).

The focus on the four systems of production, consumption, knowledge and regulation does not imply that these systems are homogenous units. It is important to be aware of the mechanisms of change within each of the systems. Local initiatives might disrupt existing structures and contribute to the emergence of a new system or they might become incorporated into the existing system and thereby contribute to the continuity of the existing system. There might be a shift in relations over time in the relations from competitive to symbiotic and maybe back again (Schot et al, 2001).

All in all, technological change must be understood as a constant process of interaction between actors with different frames of reference. This leads to a constant process of path dependence and path creation as actors reproduce, enact and negotiate with each other.

The complexity of this kind of sustainable transition processes also imply that it probably is not possible to make plans that once and for always can describe the way to sustainable transition within an area. Arie Rip talks about the need for reflexive, adaptive planning, where the implementation and impact of strategies are assessed and new strategies and plans developed (Rip, 2002). This implies that it is important to make assessments of the past experience, the present potentials and barriers and try to develop proposals for further action. This paper aims at this in relation to the Danish organic food production and consumption. For each of the four systems of production, consumption, knowledge and regulation a status is made. This includes analyses of some of the interactions among the systems, the meaning attached to organic food by different actors and some of the amplifying and dampening mechanisms, which seem to have been important in the development of organic food production and consumption in Denmark.

The following paragraphs analyse the changes in the Danish food sector during the last 10-15 years with respect to organic food. The focus is on changes in the systems of production, consumption, knowledge and regulation and how these systems have interacted in terms of coherence and dissonance among the systems, including the impact of different initiatives aiming at developing the organic food production.

The overall transition towards organic food production and consumption in Denmark
This paragraph gives an overall picture of the development within organic food in Denmark. A first question to be raised could be, whether there has been a sustainable transition in the Danish food sector. As indicated in the beginning of the paper the answer is a combined "yes" and "no". "Yes" because organic products within especially the dairy sector and the vegetable sector play a major role and have reached, for some products, domestic market shares of 20-25 %. "No" because the amount of organic products in other areas are to be counted in parts of percentages. This is for example the case for pig meat, which is one of the dominating sectors in the Danish food sector (together with the dairy sector). This paper is triggered by these achievements, these barriers and the recent decrease in the Danish organic agricultural area, which seem to show limits to the market-based strategy, which has been the main strategy of the governments.

The domestic market shares for some products are shown in table 1. The table shows big differences in market shares for different products. The market shares have not changed dramatically the recent years for most of the products. In some cases the share seems to fluctuating, since the shares go up one year and down the following year. The increase for milk is one of the bigger increases and the reduction for wheat flour is one of the biggest reduction rates.

Product	**Share 1999 (%)**	**Share 2000 (%)**	**Share 2001 (%)**	**Share 2002 (%)**
Oatflakes	24.9	24.4	22.9	27.2
Milk	21.1	22.2	26.0	23.5
Egg	18.2	18.7	16.9	16.8
Carrots	14.6	12.9	15.4	12.8
Wheat flour	10.7	9.5	6.9	8.2
Rye bread	7.8	6.8	6.2	5.0
Yoghurt etc.	7.9	6.8	5.5	5.4
Coffee	3.4	4.2	3.8	3.5
Potatoes	4.3	3.3	3.8	3.2
Beef	1.3	0.5	1.8	0.9
Pork	0.5	0.3	0.3	0.4

Table 1: Market shares for some organic food product in Denmark, 1999-2002 (Økologisk Landsforening, 2002) and data from GfK ConsumerScan

Table 2 shows the development in area and the number of farms as indices since 1989, almost since the present transition towards organic farming took off in the 1980'ies, in combination with the percentage of the total number of farms and of the total agricultural area. At the end of 2003 6.3% of the Danish agricultural area was grown as organic farming or was under transition into organically grown area, compared to less than 0.5% of the area in the end of the 1980'ies. It is, however a decrease of around 6% since 2002. A little more than 7% of the farms (around 3500 out of around 48500) are organic farms, indicating that the average organic farm is a little smaller than the average farm (conventional and organic together) (47.9 hectares for organic farms compared to 54.7 hectare). The percentage of farms has decreased with a little more than 5%

since 2002. It is the first time since the beginning of the 1990'ies that the area and the number of farms have decreased. Compared with the development in the total number of farms the (relative) increase in the number of farms since the end of the 1980'ies is bigger, since the total number of farms in the period has decreased. During 1995-2003 the total number of farms decreased with 30%, while the number of organic farms increased with more than three times. The total agricultural area has been almost constant in the period so that the development in the percentage of organic area has been equal to the absolute increase in the organic area (a little more than four times during 1995-2003).

	1989	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Pct. of total farms							1.5	1.7	2.5	3.5	5.2	6.4	6.5	7.3	7.2
Index farms	100	130	168	168	150	169	262	291	403	556	773	864	879	926	875
Pct. of total area							1.5	1.7	2.4	3.7	5.5	6.2	6.5	6.7	6.3
Index area	100	121	188	195	210	221	428	483	673	1037	1535	1730	1816	1867	1759

Table 2: Index for the development of number of organic farms and organic agricultural area in Denmark 1989-2003 and the percentage of the total number of farms and the total agricultural area 1995-2003. The figures include farms and agricultural land under conversion (Own calculations based on (Plantedirektoratet, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004)

The table shows a nine times increase in the number of farms and an almost nineteen times increase in the agricultural area. This covers an over average number of small farms and an over average number of bigger farms. The over average number of bigger farms can be explained by the fact that among animal husbandry with dairy cattle an over average number of bigger farms have been converted into organic farms. The relation between the average area of the organic farm and the average farm has changed several times during the period depending on the type of farms converting and the decrease in the total number of farms. In 1995 the average size was the same, in 1998 the average organic farm was bigger, while since 2000 the average farm has been increasingly bigger than the average organic farm. The change 2000-2003 can be explained by a strong concentration among especially the conventional farms (11% decrease in the total number of farms with a constant total area) compared to an almost constant average size of the organic farms 2000-2003.

The transition has by some research teams been divided into phases with different characteristics. One suggestion is a division into a) an informal phase; b) an initial growth period with governmental regulation; c) an industrialisation phase with a stronger market position (Kristensen and Nielsen, 1996). A more elaborated proposal adopted from (Kristensen and Nielsen, 1996) and (Ingemann (ed.), 2000) is given in table 3.

Year	Milestone	Characteristics	Description
1970'ies	Small increase in organic farms	Pioneer phase	A lot of idealism among pioneers and no integration with the conventional agriculture. Different value concepts in the organic movement with focus on new forms of ownership and everyday life, and the environmental impact of the agriculture
1981/82-	Start of a national organisation for organic farming	Forming national organic farming organisation and school Expansion	Organisation and school dominated by agricultural expertise and less by people with a broader societal perspective on organic farming. Some expansion of the organic farming. Sales primarily through health food stores and local buying clubs.
1987-	National label for organic food	Integration Governmental accept Expansion	Organic sales companies established. Some integration with the conventional food sector in relation to companies and organisations. National law on organic farming with focus on the closing of nutrient cycles, avoidance of hazardous chemicals and animal welfare. Governmental subsidy scheme for conversion to organic farming. First information campaign on organic food from the co-operative retail chain.
1992-	Two retail chains make organic food a strategic area	Organic food as a strategic niche Consolidation of the industrial processing of organic food	After some market saturation organic food gets a more strategic role in the competition in the retail sector. Consolidation of the industrial processing of organic food. More professional organic organisations within agricultural politics and sales and marketing .
1998-	New forms of production and supply	Direct supply to consumers Small, independent dairies re-emerge	A number of box schemes for direct supply to the consumers of vegetables and some other types of fresh food is started. New small, independent dairies are started.

Table 3: Proposal for division of the period since the 1970'es into phases in the development of organic food production in Denmark. Elaborated from (Kristensen and Nielsen, 1996) and (Ingemann (ed.), 2002)

Table 3 shows that the organic food production in a Danish context since the 1970'ies has changed from a social and environmental vision among a few environmentalists and people interested in new ways of ownership into a strategic market niche at a highly competitive food market without societal environmental targets and based on a market-driven approach. The integration into the conventional food sector has changed the principles of organic food production. There are among some actors still visions for the societal role of organic food

production as a way of transforming the whole food sector, but this is not the dominant values driving the development today (Ingemann (ed), 2002).

The following paragraphs discuss the mechanisms in the overall transition described in this paragraph. The paragraphs are structured into paragraphs about mechanisms in the interaction among the systems agriculture, processing, distribution, private and professional consumption, knowledge (advice, research etc.) and regulation (national, international, private). This serves as a basis for a discussion at the end of the paper of the role of policy making and policy integration and of potentials and barriers to further transition in the future.

The role of transition within agriculture and food industry

The relation between the agricultural supply of organic food and the demand for organic food (from retailers, consumers, catering etc.) has almost all the time since the 1980'ies been a topic for discussion between the organic farmers' organisation, the food industry, and the retailers and the ministry regulating agriculture and food, because the approach to the development of the organic food production has been an approach based on developing supply and demand on a market basis. Although there has been a lot of discussion about the environmental impact of conventional farming and the poor animal welfare in conventional farming, organic food production has not served as a joint vision for a transition of the food production into a sustainable food production. An explanation to this seem to be that the initial conditions in the food production with highly specialised farms and an ongoing centralisation in as well agriculture as food industry are so far from the principles underlying organic farming among some farmers, consumers and NGO's about closed nutrient cycles, the precautionary principle and proximity in the relations between farmer and consumer.

The importance of the initial conditions is for example seen in the difference of conversion to organic farming within dairy cattle and pig production. The conversion rate has been much bigger within dairy cattle than within pig production. Both types of farms are important in Denmark, but it is much easier to convert a dairy cattle farm than a pig farm. A number of dairy cattle farms already have their cattle outside a part of the year, so a conversion to organic farming can be done without big investments in new stables. The opposite is the case for pig production, where the demand for access for the pigs to go outside a part of the year demands a big change in the way of managing the husbandry. Hereto comes that it seems to be much more difficult to manage the quality of the organic pig meat than the quality of the pig meat. The difference is seen from the number of farms having dairy cattle and/or pig production. For organic farms the percentage of dairy cattle farms are 19.3 % compared to 17.6% for the conventional farms. For pig production the percentage of pig producing organic farms is much lower than for the conventional farms (9.8 % compared to 23.2 %) (Plantedirektoratet, 2004).

Co-operation and competition between the organic farmers and the food industry

The relations between the Danish farmer-owned food industry co-operatives and the organic farmers have during the last 15 years shifted between competition and co-operation and the transition towards more organic food shows elements of as well creation of new companies as "reconstruction" of existing companies with new roles within organic food. The following paragraph analyses this process of co-operation and competition with special focus on milk, since this area has been one of the drivers in the organic transition. As background information it is

important to be aware of the following conditions for the transition: Farmers have since 1988 been able to get a governmental grant during the conversion period, which has encouraged some farmers to convert their farms. For some farmers, however, the concern for nature and/or for animal welfare has also been very important (Aktionsplan, 1995). The major dairies and pig slaughter companies have traditionally been farmer co-operatives, where the farmers sign as partners for a number of years and on the other hand are guaranteed that the company will buy all the milk or the pigs the farmer supplies.

In the mid 1980'ies some organic farmers started a few small organic milk dairies and were able to start selling organic milk to the co-operative supermarket chain. There is no doubt that the co-operative retail chain has played a big role in the way the organic food production has developed in Denmark. On the one hand the chain has acted as an important market for the organic farmers, but the conditions which the co-operative chain has demanded in terms of the ability to supply all shops via a centralised national distribution system has also implied a shaping of the organic food production. Maybe the first step towards integration between the organic food production and the conventional food industry was taken, when the co-operative chain in the mid 1980'ies as a big customer asked the two major conventional dairies to start buying organic milk from farmers, which implied that the chain did not want to base the supply of the organic milk on the small organic dairies. The co-operative chain and the two big dairy companies were at that time closely related and had for example jointly developed a centralised system for fresh food supply of the retail sector. The two dairies guaranteed the farmers a premium price of 40% compared to the conventional milk. The increase in the end of the 1980'ies of organic farms was probably encouraged by this decision of the two big conventional dairy companies (Aktionsplan, 1995). Later on, the conventional dairies decided to offer organic farmers contracts for 3-5 years, because the dairies feared that they would not be able to get enough organic milk due to some problems in relation to the organic dairy farmers' organisation.

The strategy of the conventional dairies could, however, also look more as an attempt of controlling the development of the organic milk than a wish for a shift in the agricultural strategy. For example, the cardboard packaging used for the organic milk in the beginning was not allowed to look differently from the conventional packaging seen from the top of the packaging, which was the way the consumers would see the packaging in the shops. It should be difficult for the consumers to find the organic milk. The conventional dairies also made some kind of exclusion strategy so that shops, which wanted to buy organic milk products from other dairies, would not be able to get conventional milk from the two major conventional dairies. Furthermore, one of the dairies had big influence on the major distribution company for supplying retailers with fresh food, so the organic dairies had from the beginning to develop their own distribution channels. This shows the impact of a rather centralised dairy sector on the transition. After a few years the organic dairies realised that they would not be able to raise sufficient money for developing their own advertisement, distribution channels and product development. Therefore most of the organic dairies started to co-operate with the conventional dairies. Firstly, they co-operated around distribution, but later on some of the organic dairies merged with the conventional dairies and most of the farmers became partners in one of the two major co-operative dairy companies (these two co-operative companies later merged into one company responsible for around 95% of the milk processing in Denmark).

During the first half of the 1990'ies the conventional dairy companies were from time to accused of not really being interested in the organic milk and not doing enough for the promotion of the organic milk, although money actually was set aside for promotion. It could look like it more was a question of controlling the organic milk development, because the organic milk products are competing with the conventional milk products.

One of the critics was the size of the premium price the consumers had to pay for the organic food, which for the drinking milk at that time was around 50%. This premium price was caused by a combination of the profit the dairies and the supermarkets wanted to have, because of the higher price paid to the farmers, the special handling of the organic milk and the limited sale in the supermarkets. At a time the conventional dairy companies had to sell 30-40% of the organic milk as conventional milk, which implied that they did not get back the premium price paid to the farmers for the organic milk, which the organic milk sold as organic milk was supposed to "pay".

However, as earlier mentioned in relation to Table 2 a major increase in the number of organic farmers and the organic agricultural area took place during the mid-1990'ies. This was mainly caused by two circumstances, which show the role of random events and the role of system brokers and builders in sustainable transition in the food sector. One circumstance was measurements showing pesticide residues in groundwater, which suddenly showed the organic products as a way of reducing the usage of pesticides and thereby a way of reducing ones own intake of pesticides through the drinking water, but also through the food itself. Another circumstance was the pressure put on the co-operative retail chain for developing a more offensive strategy on organic food, including reducing the prices of the products. This pressure came from the organic agricultural organisations and from a big agriculture collective also active in the distribution of organic vegetables to the retailers. This changed rather fast the conditions for the organic food. The supermarket chains began competing on having organic food on the shelves and there was suddenly a lack of organic milk.

This change also shows how the regulation in terms of the rules for conversion of conventional farms into organic farms shape the speed, whereby an increase in the organic food can take place. Since there was a lack of organic fodder to feed more dairy cattle it was not possible very fast to increase the production of organic milk, although a number of farmers were interested in converting their farms. The rules for organic food, which will be discussed in the paragraph about regulation, allow milk to be sold as organic, when the dairy cow has lived under organic conditions for 3 months. The rules include that most of the fodder must be organic, the use of medicine is more restricted and there must be access to outdoor area 150 days a year). However, since there was lack of organic fodder for cows and the transition period for organic plant cultivation is so that only the third harvest after conversion can be sold as organic, the transition period for an increase in the organic *production* of milk was 2-3 years. This implied that the increase in the sales of the organic milk could not be much more than selling the previous surplus of organic milk as organic milk in stead of mixing it with the conventional milk. Table 2 shows that the area was doubled within 2 years and increased with a factor 3 in 3 years from the mid-1990'ies.

The strategic role of organic food and the dissatisfaction with a too low commitment of the big conventional dairy company towards organic milk made some farmers again start small organic

dairies. The big dairy company tried to hinder this by not allowing old dairy facilities, which they had closed down as part of their ongoing centralisation of the milk processing, start up again as dairies. One of the new, small organic dairies were able to get agreements with a supermarket chain, where the milk was sold in the supermarkets less than 24 hours after the milking. This shows how organic food has become a product area, which parts of the retail sector wants to position itself around. It has, however, been difficult for some of these small dairies to survive due to strong price competition on the organic milk. This has caused one of the small organic dairies to close down after some years and another of them was recently bought by the big conventional dairy company.

Recently a new discourse on organic milk has emerged. The conventional dairy company is again not able to sell all the organic milk as organic and the company has again started talking about "a surplus of organic milk" of about 30-40% of the organic milk. This development show the difficulties of making supply and demand match in a market based transition in the food sector. The following paragraph discuss the impact of the role of organic milk as only a niche in the big conventional dairy company, which shapes the way the company try to shape the discourse around the relation between supply and demand.
The smaller organic companies are often characterised as more innovative than the conventional dairy company that have some organic production. In the discussion of what the conventional dairy company called "the surplus of organic milk" the conventional company has often been accused for being too little innovative and having too little ambitions for the organic food. Compared to the small organic dairies it is very little innovative, when it comes to product development. For example is its number of organic cheeses very limited. Success with a low-fat organic milk product, which it more or less copied from one of the small organic dairies, was able to reduce the surplus of organic milk considerably. However, after some time the company started producing a similar conventional product. It is not clear whether the dairy company did not want to give a organic product a special position, because of critique from the conventional dairy farmers, or it is the supermarket chains, whom has pushed for a conventional variant of a successful product. Therefore the surplus of organic milk could also be called "the result of a passive market strategy". It could also be seen as "a contribution to the reduction of the environmental impact of agriculture", if focus was not on the market, but on the reduction of environmental impact from the agriculture. However, the governments have not pushed the food industry to have a supply oriented or environmental oriented strategy on organic food. The governmental strategy for organic food has for several years been a market-oriented strategy, where the ministers of food have said that the willingness of the consumers to buy the organic food products should be the main driving force. The topic of governmental regulation is discussed in details later in the paper.

Competition from other "green" concepts
The relative success of the organic food has also caused competition from other "green" concepts in the conventional food sector. The vegetable producers' association's tried in the mid-1990'ies to get the retailers to recognise their concept for so-called "integrated production" as a green label and pay a premium price for the products, like for the organic products. The co-operative retail chain refused to recognise the label, because it did not necessarily imply an environmental advantage and because the chain thought that another "green" label besides the organic label

would confuse the consumers. The label is still there, but it is not being marketed as a kind of eco-labelling.

The relative high share of organic dairy products and the low share of organic meat products is, as earlier mentioned, a consequence of the ease whereby dairy farms can be converted and the difficulties of converting pig farms. Furthermore, it is also a consequence of the difficulties of obtaining premium prices on organic pork and pork products, which is a highly price competitive area in the Danish retail sector. The increased focus on animal ethics during the end of the 1990'ies could have implied a bigger market share for organic meat, but a number of private label conventional fresh meat with some focus on quality and animal ethics has made the market opportunities for organic meat in this part of the market more difficult. An investigation among consumers show that some of them think they actually buy organic meat, when they buy some of these alternative, conventional products (Økologisk Landsforening, 2002).

The role of distribution and consumption

The role of the Danish co-operative retail chain in the development of the Danish market for organic food shows the importance of existing actors in this transition process. It was the first retail chain to start selling organic food encouraged by some organic farmers and it was this retail chain, which asked the conventional dairy companies to start selling organic milk. It was also this retail chain, which some key stakeholders in the organic sector approached in the beginning of the 1990'ies and encouraged them to develop a more offensive strategy on organic food by reducing the retail prices and by expanding the assortment. When this strategy was implemented in 1993 it more or less immediately made organic food a strategic product area in the competition in the retail sector and caused the earlier mentioned deficit of organic milk. As earlier mentioned a small organic dairy was able to obtain agreements with another supermarket chain about special products, because the chain wanted to have a special profile on organic food.

The role of the co-operative retail chain

The role of the co-operative chain has, however, also implied that the organic food suppliers have had to fit to the way the co-operative chain is organising distribution and sale.

When the chain started purchasing organic vegetables it was possible for a farmer to deliver to the nearest shop. Later the products had be delivered in certain packaging and delivered either to the regional distribution centre of the chain or to an organic farmer acting as a regional distributor. In this way the retail chain got a more uniform packaging and had to buy from fewer suppliers.

Some initiatives from the food industry with new products have stalled, because the retail sector did not agree on the conditions, which the food industry would like to have when producing organic food. One example was a new type of organic rye bread developed by one of the big bread industrial companies in co-operation with three NGO's (a trade union, a consumer organisation and an environmental organisation) and a university (Technical University of Denmark) with the aim of creating a tradition of organic bread in the industry. Because the industrial bread company was uncertain about the actual sale of the product they wanted the supermarkets to order the breads two days in advance in stead of the normal one day in advance. The co-operative retail chain within organic food wanted, however, to be able to order the

organic bread on a day-to-day basis as normally and the bread industry would not give the chain those conditions during the negotiations. This meant that the production of this rye bread stopped after some months, because the sale was too small for the bread company maintaining it as a product (Jørgensen, 1992), because the competition between the major bread companies is hard and based on frequent introductions of new products. The example shows on the one hand that new relationships develop during the transition in terms of the co-operation between the NGO's and the bread company, which is an existing actor, whom was willing to try to develop a new strategy. On the other hand it was not possible to get the relation between industry and retailer to adopt to a new condition for ordering products.

The co-operative chain has also contributed to the shaping of organic food as an alternative to genetic modified food as a reaction to the difficulties of getting guarantees from their suppliers of GMO free ingredients for bread. This problem was part of the reason for the co-operative chain later on to convert all their in-house bakeries in a part of the chain into organic bakeries at the end of the 1990'ies. This transition started as part of the above described project with co-operation between a number of NGO's and the bread sector about developing organic bread as an area (Jørgensen, 1992). At that stage the co-operative chain saw organic bread as a way of producing bread on a handicraft basis. The conversion of these bakeries triggered resistance from opponents of organic farming and made them raise the issue at the annual assembly in some of the local co-operative shops in the co-operative chain. Recently the chain dropped the organic bread strategy, apparently due to internal controversies about whether the chain should impose such a choice on the customers.

Since the mid-1990'ies the major part of the organic food has been sold via the supermarkets, while health food stores earlier were the main retail channel. Table 4 shows the preferences of consumers in terms of where they prefer to buy organic food. It is seen from the table that most consumers prefer to buy in the supermarkets.

Retail channel	**Percentage whom mentions this channel as a preferred channel for organic food**
Co-operative supermarket chain	68.1
Private supermarket chain	41.7
Other private supermarkets	23.9
Farm-gate buying	13.6
Greengrocer	8.1
Food market	7.9
Health food store	2.7
Box scheme	0.3
Others	5.1
Don't know	1.8

Table 4: The consumers' preferred retail channel for organic food. NB! the respondents had the opportunity of mentioning more than one retail channel so the numbers don't add up to 100%) (Økologisk Landsforening, 2002)

This integration of the organic food into the basic assortment of major supermarket chains as a strategic area has been followed by a phase, where the organic food has had to comply with the general conditions of competition in the retail sector. These conditions have turned out to be strong price competition, a demand of ongoing renewal of the assortment (like mentioned before in relation to bread) and strong demands to the turnover per meter of shelf in the supermarkets. A sharpening of the price competition has caused the supermarkets to reduce their assortment of organic food. The living conditions of the many busy consumers seem to worsen this situation, because some consumers will then buy the corresponding conventional product since they don't have time to search for the product in another shop (Økologisk Landsforening, 2002).

The recent years a number of options for delivery of organic food (especially organic produce) to households either at the home address or at the work place, as so-called box schemes, have been developed. The service has probably grown, because it is making it easier for the consumer to get access to these products by getting them directly to the door. It is not clear, whether this new retail channel has implied a higher consumption of organic food or it mainly has redistributed some of the shopping from buying in supermarkets into a box scheme system. Another part of the service, which seems to have attracted consumers, is that most of the companies choose the type of produce in the box do on behalf of the consumers. Some consumers find this exciting, because they get to know old types of produce that today are not so well known. Also recipes for how to use these vegetables in the cooking are included. This is an example of adoption to the living conditions of the users as part of sustainable transition. It is, however, also an example of how difficult it might be to change consumer habits. Originally it was part of the strategy of especially one of the companies, calling themselves "The Seasons", only to supply seasonal products and mostly to supply domestic products. However, it looks like the company now has adopted a more traditional all-the-year round supply strategy. It is only a very little part of the consumers in table 4, who mention box schemes as their preferred way of purchase. This might be because these companies primarily have grown since 2001 or it might show that there might not be a connection between the media attention of this new strategy and the actual role.

The role of consumer concern

Investigations of which consumers buy organic food and why they do so have been an issue in the public debate about organic food. It looks like some advisers and researchers want the consumers to state whether they buy organic food because of care for their own health OR whether they do it in order to protect the environment, which some researchers see as a more altruistic concern. A recent investigation, however, shows that consumers do not distinguish between health and environment, as some researchers might want the consumers to do. According to one survey improved animal welfare and environmental protection are the two most important features of organic food production. Health attributes are ranked lower, and most consumers, whom perceive organic food as healthier, do so because of the absence of pesticide and medicine residues (Wier and Andersen, 2003). The role of premium prices has also been a major issue in the discussion about the possible role of organic food. It could look like the food industry and (some) retailers think the consumers must be willing to pay more for the organic product, while the environmental organisations tend to think that it should not be the organic products as the less polluting products, whom should be most expensive, but the more polluting products. According to (Wier and Andersen, 2003) between one fifth and one third of the consumers are willing to pay more for organic products. It depends, however, on the product

type. Most consumers are willing to pay extra for organic milk and bread, fewest for potatoes and beef. In average the consumers are willing to pay a premium of between 25% and 38%, depending on the product type. Consumer research shows that the consumption of organic food is more price sensitive than the consumption of conventional food (Økologisk Landsforening, 2002). The premium price for organic food has for most product groups been reduced or remain unchanged, since organic food became a more strategic niche from the mid-1990'ies. For common products like milk and bread the premium price has reduced from 42% and 95% respectively to 12% and 43% respectively (Økologisk Landsforening, 2002).

Danish consumers, in general, seem to be positive towards organic food. 93% of Danish households had bought organic food at least once and 87% at least twice during the later year (Økologisk Landsforening, 2002). There is, however, a big difference among the amount of organic food consumers buy. It is probably less than 1% of the households, which only buy organic food. An investigation based on the actual practice of the consumers divide them into heavy-users (more than 10% of the food budget is spent on organic food), medium-users (2.5 – 9.9% spent), light-users (up-till 2.49% spent) and non-users (Økologisk Landsforening, 2003) (table 5). According to the investigation the 13% heavy-users bought in 2001 58% of the organic food (in relation to value) and in 2002 61% (Økologisk Landsforening, 2003).

Consumer type	**Share of consumers (%) 1999**	**Share of consumers (%) 2000**	**Share of consumers (%) 2001**	**Share of consumers (%) 2002**
Heavy-users	15	13	13	13
Medium-users	26	27	28	27
Light-users	52	54	52	55
Non-users	7	6	7	5

Table 5: Division of Danish households according to their consumption of organic food (Økologisk Landsforening 2003)(accessed at www.alt-om-okologi.dk 28 Nov 2004)

The analysis shows that a relative big part of the heavy-users lives around the capital (39% of the heavy-users compared to 25% of the population), while the opposite tendency is seen in more country-side areas. However, this is not necessarily only a demand-based tendency, since shops, which focus a lot on organic food in an area, is able to increase the market share of organic products above the average of the country (Økologisk Landsforening, 2002).

Organic food as local and/or global concept
The main part of the organic products is sold on the domestic market, although 60-80% of the conventional meat products and dairy products are sold at foreign markets. This shows that the organic food first of all is a domestic market niche. However there are some export of organic food and especially some of the small organic dairies seem rather successful. The big conventional dairy has had some problems, since the sales at the UK market has declined due to an increased focus on supplying national organic food in UK (Økologisk Landsforening, 2002). This shows how contradicting values of the organic farming as a more local way of producing

and supplying and as a export strategy have impact on the shaping of the role of organic food production in a country.

The role of the knowledge system

The knowledge system, understood as the advice system and the research system, has also played a role in the transition towards more organic food production. New institutions have been developed, but they have gradually developed co-operation with the existing institutions in terms of the conventional agricultural advice system and the "mainstream" food researchers.

Denmark has a long tradition for agricultural advisers organised by the farmers' associations. When organic farming started getting more widespread in the 1980'ies it became clear that there was a need for advice on organic farming. Based on an emerging dialogue between the national organic farming organisation and the farmers' associations, it was agreed that the advice could be organised in affiliation to the farmers' association. However, it became clear that the existing agricultural advising system was so much integrated into the conventional agriculture and its use of artificial fertiliser, pesticides etc. and had co-operation with the suppliers of these products. Therefore it was decided to have dedicated organic agricultural advisers. Later on, co-operation between the two groups of advisers was organised by training some of the conventional advisers in organic farming, because it turned out to be a barrier to the organic advice system that the knowledge of the organic advisers was not "deep" enough compared to the depth of knowledge the more specialised conventional advisers had. By combining advice from the two groups it became possible to offer more specialised advice to the organic farmers. It seems like there also has been some transfer of experience from the organic agriculture to the conventional agriculture, for example in relation to the use of pig fodder, which contains more fibre in order to reduce the risk of infections in the guts of the pigs (Sørensen, 2003)

Research in organic food production in Denmark has be carried out on different topics, including:

- the practice on organic farms in relation to nutrient flow, yield etc.
- experiments with the development of more efficient and less polluting practice etc.
- the practice in organic food processing
- action research in the development of standards for processed food and in starting production of processed organic food
- the implementation and use of organic food in food catering
- the attitudes and practice of consumers towards organic food
- the environmental impact of organic farming
- scenarios for further transition of the agriculture into organic farming

Most of the research has focused on the agriculture and a smaller part on processing and private and professional consumption. Some of the agricultural research has been carried out by researchers, whom previously did research in conventional farming and some by researchers, whom has worked with organic research all the time. The main organisational frame for the organic agricultural research has been the existing national agriculture research institute and the national agricultural and veterinarian university. Some of the research has been done in relation to farms connected to the institute/university and some research has been done in relation to "real" farms. In some cases there has been different focus of the agricultural researchers. For

example some researchers focus on a concept for animal husbandry, which is closely related to the present conventional practice, while other researchers have focused on a concept more based on animal ethics and quite different from the conventional farming, but building upon free range husbandry. A programme on so-called “grass root research” has given farmers, whom has got ideas for new agricultural methods or equipment, the opportunity to get funding for research in order to get practical experience systematised and applied in the further development of the organic farming.

There was already from the 1990’ies some focus on the research in the practice of the organic farmers and also their environmental impact compared to conventional farmers, because the research showed that the average organic farmer caused less emissions of nutrients to air and water than the average conventional farmer. The actual impact of this research and the debate around has not been assessed.

Part of the research on the organic food processing and the use of organic food in food catering has had, as earlier mentioned, an action research approach in order to bring different stakeholders together, develop visions and also start production (see for example (Jørgensen, 1992) and (Kristensen and Nielsen, 1994)). Other parts of the research has focused on collecting and analysing experience and developing strategies for further transition (see for example Kristensen et al, 2002). Some of the research has had impact on the further development within organic food production and has also contributed to the social shaping of what organic food production could be and could not be. Some of the research can be characterised as “science for policy”. For example some of the research on the use of organic food in public catering was initiated by a county, where organic food was seen as a local environmental strategy for groundwater protection.Another research project aimed at showing that the whole conventional Danish agriculture in principle could be converted into organic farming seen from an area and nutrient flow consideration, including the big pig production. Thereby the researcher wanted to change the understanding of organic food production from being a strategic market niche into a vision for the whole agriculture. In relation to two national working groups on strategies for reduction of the use of pesticides social shaping of what organic farming is also took place, since there was big discussions about whether organic farming should be included as a possible strategy and also what extent of conversion which should be assessed as an alternative strategy. One of the working groups calculated a rather big economic loss by a comprehensive conversion of the present agriculture into organic farming, because the present amount of pig production would not be possible to maintain as organic farming and thereby there would be a reduction in export income. It is difficult, however, to say how much impact this research and the two working groups have had on the transition and on the beliefs of different stakeholders. The two working groups should also be seen as regulation through policy networks as discussed in the next paragraph about the role of regulation.

The role of governmental regulation and of policy integration

Regulation has played and still plays a major role in the development of organic food production in Denmark. This includes regulation at different levels regional and national governmental regulation and international regulation, especially within the European Community (EU). Also the regulation of the conventional farming plays a role for the transition. Several types of

governmental regulation have been implemented. (Schot et al, 2001) describes three different governance paradigms. All of them have been seen as part of the direct regulation of organic food production:

- Classical steering paradigm with a central role for government and hierarchical relations: the Danish law on organic farming, the certification scheme with an organic control label
- Market based model based on financial incentives: national support scheme for conversion of farms and companies, national support scheme for research and development, public green procurement with focus on organic food
- Policy networks based on interactions among actors in which information and resources are exchanged: the national council for organic food, development of national Action Plans, working groups on agricultural strategies, demonstration projects etc..

The regulation of organic food and most of the regulation of environmental aspects of agriculture in general has been based on policy integration, since the governmental regulation has been organised within the ministry regulating food and agriculture. This might be seen as a follow up to the development of plans for sustainable development within several ministries in Denmark at the end of the 1980'ies as a follow-up to the Brundtland report, including the ministry regulating food and agriculture. The sustainability plan from this ministry, however, was almost more focused on the economic sustainability than on the environmental sustainability.

Some other regulatory initiatives have been dedicated towards organic food production, while others have been directed towards agriculture in general. Whether these general schemes have been applicable to organic farming has been part of the social shaping of the transition. The regulation of the agriculture in general should therefore also be seen as part of the shaping of the transition towards organic farming. A minority in the parliament has several times proposed a tax related to the use of fertiliser, for example as a tax on loss of nutrients from the farms, but they have not succeeded in getting a majority for the proposal. Such a proposal might have made more farmers to convert to organic farming, if organic farming thereby had been economically more attractive. When the parliament implemented some European Community subsidies for environmental friendly farming, defined as a reduction of the use of pesticides and fertiliser, the national organic farming organisation had to "work hard" to get organic farming accepted as an eligible strategy, although it does not use pesticides.

The regulation of conventional farming

The conventional agriculture is today, besides the voluntary schemes described above, regulated through a number of restricting regulations, which mostly are administered by the ministry regulating agriculture, so it should be regarded as policy integration. The regulation focuses on

- limits to the number of pesticide sprayings for the whole agriculture at national level combined with taxes on pesticides
- the request for nutrient accounts for nitrogen

The number of pesticide sprayings has been reduced from around 2.3 a year to around 2.1 a year. The goal is 1.9 sprayings a year. In 2003 the number of sprayings increased again. The request for nutrient accounts and the control by the ministry aimed at reducing the loss and nutrients and making the farmers recognise and utilised the fertiliser value in the manure. This regulation seem to have been the background for the reduction of use of artificial fertiliser with around 40% since the mid-1990'ies at an almost constant agricultural area. The local environmental authorities are

at the same time practising inspections of the farms in order to see how the daily practise seem to be (Bjerre, 2004).
An emerging focus is a further technical optimisation within this optimising paradigm within the conventional farming track through the development of more advanced equipment for precision farming based on GPS technology and computing technology in order to reduce the amount of pesticides and fertiliser further (Grønt teknologisk fremsyn, 2003). Also the addition of enzymes to pig fodder is considered as a strategy to improve the digestion of the fodder and thereby reduce the amount of phosphate in the manure is considered.

The shaping of organic farming through governmental regulation and integration into the existing organisational structures
Denmark was the first country to introduce a national support scheme for organic farming and for research and development (1988) based on a law on organic farming (1987). Also a governmental inspection and control system and a national label for organic food was introduced. The idea was to generate consumer confidence in organic food (Ingemann (ed.), 2002). A private certification system had been introduced in 1981, and it had triggered the initial growth of organic farming (Michelsen and Søgaard, 2001). In this earlier system confidence was based on the independent control made by other farmers, based on the inspection scheme of the national organisation for organic farming.
Besides acting as the general support for conversion to organic farming, the national support scheme has also been used as a more specific instrument, when the subsidies to pig farmers and plant farmers converting their farm to organic farming were increased. The background for this was the earlier mentioned lack of organic grain in the mid-1990'ies and the much smaller conversion rate within pig husbandry compared to the conversion rate within dairy cattle and vegetables (Michelsen and Søgaard, 2001).

The conversion of organic farming from a pioneer phase into a phase with national governmental regulation started with dialogue between the organisation for organic farming and the conventional family farmers' association and later also the (bigger) farmers' association about setting up the earlier mentioned advice system in affiliation to the two organisations.

The co-operation with the conventional organisations and the shaping of a national law etc. implied a definition of organic farming, which did not address all the values, which the organisation of organic farming had discussed. These values can be characterised as: a) the cyclical principle focusing on the interplay between the farm and the surrounding natural systems in terms of nutrients, energy etc.; b) the precautionary principle aiming at prevention and concern for the environment although there might not be scientific evidence for negative environmental impact; c) the proximity principle focusing on creating geographic proximity by focusing on local co-operation about fodder, manure etc. and social proximity focusing on near and open relations between farmers, food industry, consumers etc. (Ingemann (ed.), 2002).
According to (Ingemann (ed.), 2002) the focus in the development of the organic farming has, since the governmental regulation was implemented and since the co-operation with the conventional agricultural organisations started, primarily been on the cyclical principle of the single farm and farms in the neighbourhood by putting limits to the external input to the farm and not on closed cycles between agriculture, industry and consumers.

The precautionary principle has been practised in relation to for example the ban against the use of GMO (genetically modified organism) in organic farming and the restrictions to the use of medicine for the husbandry and the use of additives to fodder and food.
The proximity principle has focused on putting limits to the distance of transportation of external input to the organic farm, but has not addressed the social proximity among farmer, industry, consumer etc., since this principle is very much is in contradiction to specialisation in the conventional agriculture and to the physical and economic centralisation in the food industry and the retail sector.
Neither the cyclical principle has been fully met. This is due to the fact that it has been impossible from the beginning to get 100% organic fodder for the organic husbandry, if the conversion should not be delayed too much. However, the possibility of using conventional fodder is being reduced gradually these years as part of the EU regulation of organic farming. This shows how the principles of a sustainable transition is negotiated and shaped according to the implementation options, if a fast transition is to be obtained.

When the interest of the food industry in organic food developed, the industry pushed for allowing more food additives in the food processing during one of the revisions of the Danish rules for organic food in order to be able to process the food (for example when making bread) more or less in the same way as normal. However, the number and the types of the permitted food additives are still much smaller than for conventional products. The discussion around this topic showed some disagreement among the organic farming organisation and the consumer organisations on the one side and the food industry on the other side about how "radical" the organic values should be: Should it only concern the agriculture or should it also concern the food processing. The food industry was allowed to use some more additives, but as mentioned still very limited compared to the conventional food and for example is no food colorants allowed in organic food. The EU regulation on the processing of organic food allowed even more additives to be used in the processing, which partly seemed to be a consequence of the merger of different processing traditions in the different countries whereby the list of permitted additives became longer.

The role of environmentally related regulation in relation to organic farming
Most of the regulation of the transition has been based on a market-based approach, where the farmers have been given options and support for conversion in order to increase the supply of organic food, the food industry has been able to get to support to product development and the retailers to training, information campaigns etc. There has not been any command-and-control regulation, which has forced farmers to convert to organic farming. The closest to an integration between environmental regulation of the agriculture and organic farming as a strategy has been the integration of the option of getting support for conversion to organic farming (and other types of environmental initiatives) at particular environmentally sensitive areas as part of the previous Danish Water Protection Action Plan, which aimed at reducing the emissions of nutrients from the agriculture to the air and the water in order to prevent the nutrification of streams, lakes and seas. Part of the scheme was administered by the counties, which should appoint the environmentally sensitive areas. There was, however, not very much interest in this funding option for conversion to organic farming and neither so much interest in general for the scheme (Mathiesen, 2003). Probably because the organic farmers converting during the period were not especially located near this kind of area and the conventional farmers located at such places were

not interested in converting to organic farming. Based on a midterm evaluation of this scheme it was decided to make it easier for the farmers to apply the scheme and make the scheme more visible to the farmers (Amtsrådsforeningen 2000). The possibility for organic farmers to get extra funding, if they are located in a sensitive area, was integrated into a revised scheme for funding of organic farming (Direktoratet for Fødevareerhverv, 2003) in order to make this option more visible for the organic farmers. At the same time the scheme made it possible for organic farmers to skip their approval as organic farmers and still get an environmentally related subsidy. This option was a reaction to the fact that a number of organic farmers wanted not to continue as organic farmers. Applications for the general scheme for environmentally related subsidies gave priority to applications from new organic farmers compared to conventional farmers applying (Direktoratet for Fødevareerhverv, 2004). The interest for the revised scheme for environmentally related subsidies from conventional farmers was huge, but it did not trigger a big number of applications for conversion into organic farming. These schemes can be seen as policy integration, where the administrative part is handled by the Ministry for agriculture, which has experience in this field, while the environmental focus is administered by the regional environmental authorities, which knows which areas that are environmentally sensitive.

Integration between organic farming and public green purchase
The earlier discussed use of organic food in public catering was originally initiated by staff in some kinder gardens, hospitals and other public institutions, whom wanted themselves to contribute to a more sustainable development. It expanded because governmental institutions and municipal institutions also saw the use of organic food as a way of practising public green procurement, which has been a request for governmental institutions and which several municipalities also has developed a strategy on. The conversion has been enabled partly by local funding and partly by funding from the national council for organic food and be seen as an example of policy integration, where the starting point is the environmental strategy for public green purchase, which is integrated into the regulation of food. The case of organic food in public institutions is also an example of interaction between production, consumption, knowledge and regulation as part of the transition. The idea was initiated by the consumption system (the catering staff), whereby they contributed to the shaping of organic farming as strategy. When public support made the use in the institutions more widespread, more catering staff in the consumption system raised a demand to the production system (agriculture and industry) for more uniform quality of the products and for food designed for catering (bigger portions, ready-to-use ingredients etc), as they already could get as conventional food. The knowledge system has also played an important role, since some consultants were financed to support the conversion process and some, as mentioned, collected and analysed the experience from these conversion processes (for example (Kristensen NK, Nielsen T, Mikkelsen BE. 2002.)).

Final discussion and recommendations
The analysis confirms Karnøes and Garud's theory for path creation and path dependency in the development of new paths, which points to the role of production, consumption/use, knowledge and regulation and their interaction in the creation of new paths. The analysis also confirms the combination of creation of new institutions and structures and the re-use and re-shaping of existing institutions and structures. Here it is seen with respect to the processing plants

(especially dairies), the distribution and sales via supermarkets and no longer so much via health food stores, and with respect to the agricultural advice and research.

The analysis shows how the different systems are co-shaping each other. For example how the organic farming is shaping the strategy of the co-operative retail chain and of the retail sector, but also how the organic farming and the food processing is being shaped by demands from the retail sector to packaging, ordering schemes, number of suppliers etc. The analysis has also showed how the *focus* of the transition itself is being shaped along the transition. The definition of organic agriculture in the national regulation focuses on certain values of the organic agriculture as developed by the national organisation for organic farming by focusing on the principles of biological proximity and for example not on the values of social proximity, because the latter seem to be out of the focus which the ministry for agriculture can have, although the ministry is administering the Danish part of the EU programme for the rural districts aiming at strengthening the rural districts. Most important for the future increase in organic farming is probably the shaping of the limited role of organic farming and food in relation to the development of a more sustainable agriculture in general. Today organic food is seen as a strategic product niche and not as an generally applicable environmental strategy for the conventional agriculture, because the two paradigms are quite far from each other. At the same time the market-based approach to organic farming has caused several problems in the regulation of demand and supply, which especially becomes a problem if the organic product is not seen as a contribution to a more sustainable agriculture, but as a surplus of a more expensive niche product.

Organic food has been given different meaning by different actors during the years, which seem to have supported the development of the organic food within the market-based strategy, because it could be referred to as strategic within several discourses. Organic food and farming have for example been seen as

- more healthy and environmental friendly as it reduces the risk for pesticide residues and nitrate in the groundwater,
- a strategy for more biodiversity in the fields
- the only strategy to avoid genetic modified food ingredients,
- more well-tasting products,
- a more ethical way of animal husbandry,
- a possibility for food export,
- an area for public green procurement,
- a regional development strategy with regional interaction along the product chain from field to table.

Several of these aspects relate to environmental aspects, which are in focus in the environmental regulation in general. Organic food is, however, seen by many actors related to the conventional agriculture as a threat, since they have tried to question, whether organic food should be healthier or better than conventional food, if analyses of the two types of food did not show higher amount of vitamins or better taste of organic food. Actors positive to organic food and farming have highlighted if organic food showed to be better, but have also argued that the health related and environmental advantages from not applying pesticides should be enough to shown the advantage of organic farming and food.

The role of random events is mainly seen in the impact of tests showing pesticide residues in ground water on the increase of the sale of organic food in the mid-1990'ies. This might not even be seen as an external random event, but more as an example of how information about an environmental problem creates a discourse about the problem and possible solutions and how certain beliefs of the problem and its solution can gain support.

The analysis confirms also the role of the initial conditions in the shaping of the transition as constraining, as well as enabling factors. Among the important conditions have been the big pork export and the specialised farms, which has implied a limited focus on organic pig production and more focus on the production, which more easily can be converted (dairy cattle). The close links between the big dairy companies and the co-operative retail chain was also important, because the retail chain was able to influence the dairies to start buying and processing organic milk.

Policy regulation has been practised in relation to organic food and farming by having the development and administration of the area organised within the ministry for food and agriculture. However, the recent reduction in the organic farmed area and the lack of increase in market shares for a number of organic food products seems to show the limits of the policy integrated, market-based approach to a transition of Danish agriculture into organic farming. The principles of organic farming is so different from the conventional farming strategy, except for dairy cattle, that it is not possible to apply organic farming to the present domination of specialised farms and the major role of pig farming. At the same time, the market-based product-oriented approach based on special labelling of the organic food is seen as questioning the quality of the conventional food products. The strong price competition in the retail sector makes the competition for the organic food harder, since they in most cases are more expensive than the conventional products.

The conventional farming has to some degree accepted regulation of their environmental impact, which also has been organised through policy integration by being having subsidies and fertiliser accounts administered by the agricultural institutions and authorities. This should be seen as a strategy for not having the conventional farming strategy questioned in general.

Considerations about a further transition towards organic farming
If organic farming should be developed further in the coming years it is necessary to consider, whether it is possible to get organic farming more accepted as an environmental strategy in relation to some of the environmental topics, which are discussed presently in Denmark, like cleaner ground water, reduced eutrofication of streams, lakes and seas and the safeguarding the biodiversity. Also more economic development in the countryside might be a political theme to try to connect to.
As tools contracts between state and the stakeholders of the food sector could be considered. Also a strategy for the so-called "surplus products" has to be developed. As regulatory measures supporting the further conversion could the following be considered higher taxes on pesticides and taxes on artificial fertiliser and more funding for research and development.

Precision farming as technological strategy for reduced environmental impact of conventional farming, which, as mentioned, is getting growing attention, because it is a strategy, which can fit

together with the present specialisation of the farms and because it can develop technology with potentials for export. In a recent Danish governmental green technology foresight the potentials for organic farming of some of the technologies, which are under development for precision farming, were considered. Focus was especially on pattern recognition technology and the use in the development of automated weed management in organic farming (Grøn teknologisk fremsyn, 2003). If this development should support the development of technology for organic farming it is necessary to set demands to the technology development in precision farming about addressing organic farming and involving organic farming stakeholders. Otherwise the development of precision farming might make strengthen the conventional farming paradigm and at the same time weaken the organic farming paradigm.

There is also need for more research on the practice and the problems in organic farming, including fruit growing, the nutrient flow in organic farming, stable systems of organic husbandry, evaporation from manure etc. It is also necessary to consider how the existing agricultural research in conventional can support a transition towards organic farming further. It is, however, important to keep in mind that the focus in conventional farm research often is on optimisation of the single element like the focus on the single plant in genetic modification, which is different from the more system oriented approach in organic farming.
Finally, it is necessary to develop a strategy for the future Danish pig production. It seems impossible to produce the present number of conventional pigs as part of organic farming. However, many workplaces and export income is depending on the pig production so strategic considerations are necessary, if a more substantial transition to organic farming and food production should develop into a possible development path.

References

Aktionsplan for fremme af den økologiske fødevareproduktion i Danmark, 1995 (In Danish) (Action Plan for the Promotion of the Organic Food Production in Denmark), Ministry for Agriculture and Fisheries

Amtsrådsforeningen 2000. Aftale om miljøvenligt jordbrug (In Danish) (Agreement about environmental friendly agriculture)

Bijker WE.1987. The Social Construction of Bakelite: Toward a Theory of Invention. In W.E. Bijker WE, Hughes TP, Pinch T(eds.): 'The Social Construction of Technological Systems'. Cambridge: MIT Press

Bijker WE. 1995. The Social Construction of Bicycles, Bakelite and Bulbs – Towards a Theory of Sociotechnical Change, Cambridge, Massachusetts and London: MIT Press

Bjerre M. 2004. Miljøkompetence i produktkæden – anvendelse af handelsgødning i dansk landbrug (in Danish) (Environmental competence in the product chain – the use of artificial fertiliser in Danish agriculture), Master Thesis at the Postgraduate Environmental Management Programme,Technical University of Denmark

Direktoratet for Fødevareerhverv 2003. Økologisk Jordbrugsproduktion. Vejledning om arealtilskud 2003 (In Danish) (Organic farming. Guidelines for subsidies 2003), Ministry for Food, Agriculture and Fishery

Direktoratet for Fødevareerhverv 2004. Vejledning om miljøbetinget tilskud for 2004 (In Danish) (Guidelines for environmentally related subsidies), Ministry for Food, Agriculture and Fishery

Forman M, Jørgensen, MS. 2001. Virksomheders miljøkompetence – effekten af netværk, læring og forebyggende strategier (In Danish) (Corporate environmental competence: the effects of networking, organisational learning and preventive strategies) Working paper Centre for Human Resource Development, Technological Institute and Department of Manufacturing Engineering and Management, Technical University of Denmark, 21 pp.

Grønt teknologisk fremsyn. 2003. (In Danish) (Green technology foresight), Ministry of Science, Technology and Innovation

Hansen KH. 1995. Repairing SCOT: Introducing Power. Paper for the Annual Meeting of the Society for the Social Studies of Science, October 18-22, 1995. Charlottesville, Virginia, USA.

Ingemann JH (ed). 2002. Økologisk landbrug mellem historie og principper (In Danish) (Organic Agriculture between History and Principles), OASE Working Paper, Aalborg University

Jørgensen MS. 1992 Some experiences with proactive technology assessment in the Danish food sector. Proceedings from the 3rd European Congress on Technology Assessment, Post Congress Workshop, Copenhagen, 4.-7.11.1992: 487-507.

Karnøe P, Garud R. 1998. Path creation and dependence in the Danish wind turbine field. Papers in Organization, No. 26, Institute of Organization and Industrial Sociology, Copenhagen Business School, 32 pp.

Kristensen NK, Nielsen T. 1994. Anvendelsen af økologiske fødevarer i Københavns Amt (In Danish) (The use of organic food in Copenhagen County), Report no. 3, Interdisciplinary Centre, Interdisciplinary Centre, Technical University of Denmark

Kristensen NK, Nielsen T. 1996. From Alternative Agriculture to the Food Industry: The Need for changes in Food Policy In IPTS Report. Issue 20, 6 pp.

Kristensen NK, Nielsen T, Mikkelsen BE. 2002. Anvendelse af økologiske fødevarer i kommuner og amter (In Danish) (The use of organic food in municipalities and counties), National Food Agency, Ministry of Food, Agriculture and Fisheries.

Mathiesen FD. 2003. Personal communication. Ministry of Food, Agriculture and Fisheries

Michelsen J, Søgaard V. 2001. Policy Instruments Promoting Conversion to Organic Farming and their Impact in 18 European Countries 1985-1997, Political Science Publications No. 1/2001, Faculty of Sciences, University of Southern Denmark

Plantedirektoratet: Økologiske jordbrugsbedrifter 2003. Autorisation. Produktion (In Danish) (Organic farms. Authorisation. Production), 2004 (and the similar publications from 1996 to 2003 covering 1995-2002)

Rip A. 2003. Challenges for Technology Foresight/Assessment and Governance In Science & Technology policies in Europe: New Challanges and New Responses. Final Report from the STRATA Consolidating Workshop, Brussels, 22 & 23 April 2002

Schot J et al. 2001 Transition to Sustainability through System Innovations. Keynote paper for an International Expert Meeting, Version September 2001

Sørensen, J.T. (ed.) 2003. Produktionsstyring med fokus på husdyrsundhed og fødevaresikkerhed i økologiske svinebesætninger (In Danish) (Production management weith a focus on husbandry health and food safety in organic pig production) Research Centre in Organic Agriculture, Internal report no. 54

Sørensen KH, Sætnan AR. 1983. Makt og medvirkning, i arbejdsmiljøet (In Norwegian) (Influence and participation in work environment) Norsk Institutt for Sykehusforskning, Trondheim-NHT, NIS report 8/83.

Wier M, Andersen LM. 2003. Consumer demand for organic food – stated attitudes and actual behavour, SØM paper, AKF

Økologisk Landsforening. 2002 Forbrugernotat (In Danish) (Consumer note), Århus, Denmark

Økologisk Landsforening. 2003 Forbrugernotat (In Danish) (Consumer note), Århus, Denmark (acessed via www.alt-om-okologi.dk, 28 Nov 2004)