

# **Public-private partnerships in Denmark**

SAFEACC WP 5

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# **1 Introduction**

Food safety and food quality are issues that are high on the public agenda. To ensure that consumers are able to buy and consume safe and high quality foods is not a trivial matter. It involves numerous actors in the food chain, often from several countries as many food products cross national borders before becoming available to consumers. In the Global Food Network the experiences and knowledge of different stakeholders is exchanged in order to facilitate the dissemination and development of knowledge on cross-border supply chains and networks for safe and high quality food products.

As one element of this project, this report presents an inventory of public-private partnerships in Denmark. More specifically, it provides an inventory of past, present and proposed research projects related to food quality and food safety involving both public and private partners. Furthermore it points to a number of opportunities for developing public-private partnerships.

## **1.1 Global Food Network**

The Global Food Network is a concerted action project with participants from 12 countries. The overall aim of the project is to establish an international research and knowledge network on cross-border food supply chains and networks. The European Union (EU) funds the concerted action, which has three main objectives:

- To build a sustainable platform for the exchange, dissemination and development of knowledge on cross-border supply chains and networks for safe and high quality food.
- To enable the partners of the platform to develop internationally attuned research agendas to support research and development on safe and high quality cross-border food supply chains and networks.
- To construct a sustainable, expandable and easily accessible communication structure and website to enable exchange and further development of knowledge.

## **1.2 Summary of the national workshop**

As part of the concerted action all participating countries have held national workshops to discuss problems in relation to food safety and food quality. In September 2003 participants from business, consumer interest groups, standardisation bodies and research institutions convened for the Danish national workshop. Major topics discussed by participants were the importance of process technology for food safety, the power of retailing and the importance of retail practises for food safety and for making quality food products available to consumers as well as the role consumers play, both in relation to their willingness-to-pay for food safety and their ability to handle food products safely.

## **1.3 Gaps**

The topics discussed by the participants of the Danish national workshop differ markedly from the gaps identified by the project participants at the beginning of the project. Gaps identified by the European participants included the food service sector, translating quality and safety characteristics of products up-stream in the supply chain, institutional processes and consumer behaviour. These are quite abstract issues,

whereas participants at the national workshop focused more on the concrete problems they had experienced.

### **1.4 Public-private partnerships**

In order to bridge the gaps and solve the problems that exist in relation to making safe and high quality food products available to consumers, it is important to build on the knowledge about food safety and food quality that already exists, but also to identify areas where further research is needed. In this connection public and private parties mutually benefit from co-operating.

Public-private partnerships are quite widespread in Danish agri-business, which can boast a long history of interchange between academia and practitioners. Traditionally, technical issues have been dominant, but increasingly we also see partnerships between public and private partners around issues such as consumer demands and co-operation between retailers and suppliers.

## **2 Methodology**

The inventory of public-private partnerships presented in Section 3 has been constructed using a combination of methods. First, the websites of different research institutions were searched for information about collaboration projects involving both public and private and partners. Secondly, research institutions involved in public-private partnerships were contacted and asked to provide information about past, present and prospective partnerships. To the extent that was required, researchers that could be identified as involved in public-private partnerships were finally contacted either via email, phone or in person to provide detailed information about research projects.

Based on the information gathered, short summaries of each public-private partnership were written. These summaries all follow the format shown in Table 1.

**Table 1** Format of public-private partnership summaries

<b>Title:</b>	
<b>Objectives:</b>	
<b>Initiator:</b>	
<b>Participants:</b>	
<b>Size:</b>	
<b>Funding:</b>	
<b>Duration:</b>	
<b>Questions:</b>	

An attempt has been made to make the list of projects as comprehensive as possible. However, it is undoubtedly not exhaustive. In particular, it has been difficult to find information about proposed projects.

### 3 Research projects involving public and private players in the field of food safety and quality

#### 3.1 Research projects concluded in the last 5 years

##### 3.1.1 Research projects concerning Food Safety and Quality in general

<b>Title:</b>	Complementarities between the sales organisation of slaughterhouses and manufacturing companies and the purchasing organisations of retail chains : Seen from a constructivist perspective
<b>Objectives:</b>	<p>The scientific purpose of this project was to identify a sustainable connection between changes in a companies identity, concept construction, structuring and externally oriented actions and their influence on the development of the company. Development is seen in a sector delimited by the company.</p> <p>The practical purpose of this project was to identify how Danish slaughterhouses and manufacturing companies can make sustainable improvements to their competitive abilities and thereby increase sales to European retail chains in four selected countries.</p>
<b>Initiator:</b>	Norma and Frode S. Jacobsen Foundation
<b>Participants:</b>	<p>The MAPP Centre</p> <p>Danish slaughterhouses</p> <p>Manufacturing companies</p> <p>Retail chains in Denmark, Sweden, England and Germany.</p>
<b>Size:</b>	About 1 million DKK
<b>Funding:</b>	Norma and Frode S. Jacobsen Foundation
<b>Duration:</b>	2001-2004
<b>Questions:</b>	

<b>Title:</b>	The use of starter cultures to improve the quality of meat products
<b>Objectives:</b>	The overall target of this project was to improve the flavour of fermented meat products by using starter cultures and enzymes. The use of commercial starter cultures or enzymes produced by starter cultures was investigated. The growth, proteolytic and lipolytic activities were examined at environmental conditions of relevance to meat products (temperature, pH, NaCl). The detailed investigations with known optimal conditions for growth and enzyme activity were used in the development and production of fermentates for meat products. A method and application later patented.
<b>Initiator:</b>	
<b>Participants:</b>	LMC (BioCentrum-DTU og Mejeri- og Levnedsmiddelcenteret) Danish Meat Research Institute Danish companies from the meat industry
<b>Size:</b>	
<b>Funding:</b>	
<b>Duration:</b>	
<b>Questions:</b>	

<b>Title:</b>	New Approach for typing of brewing Yeast (Eureka)
<b>Objectives:</b>	The project deals with molecular biology techniques like PFGE chromosome profile analysis, PCR and RAPD for typing of brewing yeasts. Further the patterns of technological important genes are determined by Southern blotting. Physiologically the yeast strains included are described according to physiological criteria in particular their oxygen demand determined in laboratory scale model fermentations. Gene expression studies are carried out and compared for the yeast strains under aerobic and hypoxic conditions.
<b>Initiator:</b>	
<b>Participants:</b>	The Royal Veterinary and Agricultural University Laboratorium A/S Royal Grolsch N.V
<b>Size:</b>	
<b>Funding:</b>	EU
<b>Duration:</b>	1997-2000
<b>Questions:</b>	

<b>Title:</b>	Strategic frozen peas
<b>Objectives:</b>	The purpose of the project was to map consumer demands for pea quality and subsequently implement the demands in new methods to improve and process peas. The project contained sensory assessment as a mean to characterise the properties and market analysis in order to map consumer conception of pea sorts in relation to their properties. The comparisons provided the basis for an assessment of which properties to consider in pea growing and are described in a publication entitled “The strategic pea”.
<b>Initiator:</b>	
<b>Participants:</b>	LMC (Mejeri- og Levnedsmiddelinstittet) The Royal Veterinary and Agricultural University (Institut for Matematik og Fysik) Danish Institute of Agricultural Science Danisco The MAPP Centre The Danish Fruit, Vegetable and Potato Board
<b>Size:</b>	
<b>Funding:</b>	
<b>Duration:</b>	
<b>Questions:</b>	

<b>Title:</b>	Measuring equipment for prediction of meat quality
<b>Objectives:</b>	The objective of the project was to achieve knowledge of the meat quality of pig carcasses from physico-chemical measurements carried out early on during the slaughter process, i.e. within one hour after sticking. The strategy for meeting the objective was screening of model carcasses with different “engineered” meat qualities by a number of predominantly spectroscopic techniques. This project led to an exhaustive explorative spectroscopic characterisation of early post mortem meat quality, which had not been performed previously. The most important result of the project was the identification of a method based on Fourier transform infrared spectroscopy, which is able to predict the water-holding capacity of early post mortem, meat. For this purpose KVL and their partners at Danish Meat Research Institute submitted a patent application.
<b>Initiator:</b>	
<b>Participants:</b>	LMC (Mejeri- og Levnedsmiddelinstittet) Danish Meat Research Institute
<b>Size:</b>	
<b>Funding:</b>	
<b>Duration:</b>	
<b>Questions:</b>	

<b>Title:</b>	Assessment of CO <sub>2</sub> measurement for determination of microbial activity
<b>Objectives:</b>	In some productions it is desirable to avoid batches of meat with an initially high bacterial level. A rapid method requiring limited manual handling is needed for the identification of such batches. The project included literature studies and testing of CO <sub>2</sub> -measuring equipment in development, based on infrared fibre optics. The pre-prototypes available in the project period may be developed into robust and sensitive equipment. The methods are not suited for online measuring, as they measure the development of microbial metabolites over a certain time. Using fresh pork meat, data indicated that it was possible to separate meat with a high bacterial count within 2.5 hours.
<b>Initiator:</b>	
<b>Participants:</b>	LMC (Mejeri- og Levnedsmiddelinstuttet) The Royal Veterinary and Agricultural University Tulip International Kjærgaard Industri-Automatic A/S Foss Electric A/S DELTA FORCE Danish Meat Research Institute Agri-Contact
<b>Size:</b>	
<b>Funding:</b>	
<b>Duration:</b>	
<b>Questions:</b>	

<b>Title:</b>	Advanced quality monitoring in the food production chain
<b>Objectives:</b>	In the AQM program classical methods were combined with chemo-metric studies of consumer related perceptions of quality into better tools for production monitoring and control. This overall combination was not tackled previously but its solution is essential for improving efficiency in the food industry. Focus was on providing information on the final consumer perceived quality most often described by sensory attributes. The project has shown future approaches for strengthening the necessary efforts within food quality monitoring thus improving the competitiveness of Danish food industry.
<b>Initiator:</b>	
<b>Participants:</b>	LMC (Mejeri- og Levnedsmiddelinstituttet) The Royal Veterinary and Agricultural University Danish Institute of Agricultural Science Danish Institute for Fisheries Research
<b>Size:</b>	
<b>Funding:</b>	
<b>Duration:</b>	
<b>Questions:</b>	

<b>Title:</b>	Hygienic design and cleaning of food processing equipment
<b>Objectives:</b>	The purpose of the project was to model the hydrodynamic cleaning effect from parameters, determinable by Computational Fluid Dynamics (CFD). Phenomena that promote and inhibit cleaning, exemplified by two aspects of fluctuation, namely the displacement force on the surface and the exchange of fluid nearby have been examined.
<b>Initiator:</b>	
<b>Participants:</b>	LMC (BioCentrum-DTU) Alfa Laval LKM Arla Foods Institute of Biotechnology
<b>Size:</b>	
<b>Funding:</b>	
<b>Duration:</b>	
<b>Questions:</b>	

<b>Title:</b>	Food quality and safety
<b>Objectives:</b>	<p>The purpose of the project was to investigate consumer interest in food quality and food safety to obtain data and determination of central behaviour parameters together with the derived consequences in the entire food chain on the enterprise, sector and macro levels. More specific objectives were:</p> <ul style="list-style-type: none"> <li>• To map and quantify consumers' demand and willingness to pay for food products in general and for food products with certain quality and safety aspects in particular</li> <li>• To map and quantify the consequences for changes in consumption patterns for the rest of the food chain</li> <li>• On the basis of the understanding obtained to perform holistic analyses covering the entire food chain in order to estimate market-based and economic scenarios for food products with certain quality and safety aspects</li> </ul>
<b>Initiator:</b>	Danish Research Institute of Food Economics
<b>Participants:</b>	<p>Danish Research Institute of Food Economics  Danish Meat &amp; Bacon Council  Economic Council of the Labour Movement  Danish Crown  The Confederation of Danish Industries  Danish Zoonosis Centre  Danish Poultry Council  COOP Danmark  GfK Denmark  Danish Agricultural Council  The National Committee for Pig Production  The MAPP Centre  Southern Danish University (CAST)</p>
<b>Size:</b>	About 9.4 million DKR
<b>Funding:</b>	The Danish Directorate for Food, Fisheries and Agricultural Business and others
<b>Duration:</b>	2001-2003
<b>Questions:</b>	

<b>Title:</b>	Sustainability in the production of pork with improved nutritional and eating quality using strategic feeding in out-door production (SUSPORQUAL)
<b>Objectives:</b>	To establish the general frames for out-door sustainable pig production resulting in pork with documented high nutritional and eating quality, which meets the increasing demands of European consumers regarding safety, nutritional quality, eating quality, improved shelf-life (convenience) and animal welfare together with a thorough investigation regarding consumer demands and possibilities for such pork products within EU, which can predict the potential market for such pork.
<b>Initiator:</b>	
<b>Participants:</b>	Danish Institute of Agricultural Sciences The Kielanowski Institute of Animal Physiology and Nutrition/The Polish Academy of Sciences Centre de Recherches de Clermont-Ferrand Theix/Institut National de la Recherche Agronomique, France Danish Meat Research Institute Swedish Meats R&D The Royal Veterinary and Agricultural University, Denmark The MAPP Centre Department of Food Science/Swedish University of Agricultural Sciences
<b>Size:</b>	
<b>Funding:</b>	
<b>Duration:</b>	1999-2001
<b>Questions:</b>	

<b>Title:</b>	Validation and standardisation of diagnostic Polymerase Chain Reaction for detection of foodborne pathogens
<b>Objectives:</b>	<ul style="list-style-type: none"> <li>• To validate a simple and reproducible method for purification of DNA from bacterial culture,</li> <li>• To establish a DNA sample bank, consisting of material with defined and certified DNA contents,</li> <li>• To establish a databank for registration of certified DNA samples, food pathogen-specific genes, primers and probes, and an agreed list of strains necessary for the evaluation of specificity of PCR tests,</li> <li>• To develop measurable criteria for validation of thermocyclers,</li> <li>• To develop and validate user-friendly, pre-PCR sample preparation techniques for the four sample types included,</li> <li>• To assess specificity, sensitivity and reproducibility of known PCR analyses through comparative studies and ring-trials,</li> <li>• To adapt a validated Campylobacter PCR to automated amplicon detection techniques,</li> <li>• To develop practical guidelines for first-time implementation of PCR by end-users,</li> <li>• To prepare draft proposals (ENV) for European standardization (CEN) of PCR-testing,</li> <li>• To arrange hands-on workshops for transfer of technology to non-expert, end-user laboratories</li> </ul>
<b>Initiator:</b>	
<b>Participants:</b>	<p>Danish Veterinary Laboratory (DVL), Denmark,  Lund University (LU), Sweden,  Central Science Laboratory (CSL), UK  Institute for Milk Hygiene and Milk Technology (IMM), Austria  Institute for Reference Materials and Measurements (IRMM), Belgium  Federal Institute for Health Protection of Consumers and Veterinary Medicine (BgVV), Germany  Congen Biotechnologie GmbH (CONGEN), Germany  Department of Microbiology at University of Athens (DMUA), Greece  Slovak Academy of Sciences (IAPSK), Slovakia.  Justus-Liebig University (JLU), Giessen, Germany  Agence Française de Sécurité Sanitaire des Aliments (AFSSA), France  Universidad Complutense de Madrid (UCM), Spain and several assistant contractors</p>
<b>Size:</b>	
<b>Funding:</b>	
<b>Duration:</b>	2000-2004
<b>Questions:</b>	

<b>Title:</b>	Biological degradation of aflatoxins in fermented maize and sorghum products
<b>Objectives:</b>	Establishing a collection of culture of reported and new bacteria and yeast able to degrade aflatoxins. The overall goal is to develop methods for reducing aflatoxins in maize and sorghum products.
<b>Initiator:</b>	
<b>Participants:</b>	The Royal Veterinary and Agricultural University and others
<b>Size:</b>	
<b>Funding:</b>	EU DG XII-Science, Research and Development
<b>Duration:</b>	1998-2001
<b>Questions:</b>	

<b>Title:</b>	Capability Building for Research and Development in Traditional Fermented African Dairy Products: (EU-INCO)
<b>Objectives:</b>	The project dealt with feno- and geotyping of the dominant lactic acid bacteria and yeasts in traditional milk fermentations in the African participating countries. The technological properties and probiotic characteristics of isolates of yeasts and lactic acid bacteria were investigated as a basis for selecting starter cultures for controlled fermentations. The HACCP concept was introduced to the African project partners.
<b>Initiator:</b>	
<b>Participants:</b>	The Royal Veterinary and Agricultural University Uganda Industrial Research Institute, Kampala Ethiopian Health and Nutrition Research Institute, Addis Ababa Food Research Centre, Khartoum
<b>Size:</b>	
<b>Funding:</b>	EU-(INCO)
<b>Duration:</b>	1996-1999
<b>Questions:</b>	

<b>Title:</b>	Consumer Attitudes and Decision-Making with Regard to Genetically Engineered Food Products (CADE-GENETECH)
<b>Objectives:</b>	<p>The objectives for each country involved were as follows:</p> <ul style="list-style-type: none"> <li>• To gain an understanding of the concerns and benefits relevant to societal actors in selected EU countries associated with the use of genetic engineering in food products</li> <li>• To gain an understanding of how consumers in selected countries of the EU form attitudes, positive or negative, towards genetic engineering in food products</li> <li>• To gain an understanding of how such attitudes interact with other factors in determining consumers' purchasing decisions</li> <li>• To gain an understanding of how various strategies for informing consumers about benefits and risks associated with genetic engineering affects their attitudes and their purchase decisions</li> <li>• To derive, based on the understanding obtained, conclusions for the development and marketing of food products based on genetic engineering, for the regulation of the use of genetic engineering in food products, and for strategies for informing consumers about use and consequences of the use of genetic engineering in food products</li> </ul>
<b>Initiator:</b>	European Commission
<b>Participants:</b>	<p>The MAPP centre  VTT Technical Research Centre of Finland  PBL  CH  University of Potsdam  ISIDA  IFR</p>
<b>Size:</b>	
<b>Funding:</b>	European Commission
<b>Duration:</b>	1996-1999
<b>Questions:</b>	

<b>Title:</b>	What is pork quality?
<b>Objectives:</b>	The main purpose of this project is to elaborate on existing knowledge about the product specific quality indicators which consumers use when purchasing pork. The existing knowledge is supplemented on the main areas: The first regarding which quality indicators consumers use and secondly how the quality indicators shall look to indicate good quality in the mind of the consumer.
<b>Initiator:</b>	
<b>Participants:</b>	The MAPP Centre Danish Meat Research Institute
<b>Size:</b>	
<b>Funding:</b>	
<b>Duration:</b>	
<b>Questions:</b>	

<b>Title:</b>	Enzymatic production of monoglycerin emulsifier
<b>Objectives:</b>	Monoglycerin are fats, where the molecular structure is characteristic by only having one fatty acid esterificated to glycerol. This structure leads to that monoglycerin is surface active and monoglycerin is therefore widely used as an emulsifier in the food industry. It is well known that some monoglycerin structures have better emulsifier abilities than others and that the emulsifier preparations used today contain mixtures of different emulsifier structures.
<b>Initiator:</b>	LMC (Biocentrum-DTU)
<b>Participants:</b>	LMC (Biocentrum-DTU) Danisco-Cultor A/S
<b>Size:</b>	About 1.8 million DKR
<b>Funding:</b>	Danisco-Cultor A/S
<b>Duration:</b>	2003 - 2006
<b>Questions:</b>	

<b>Title:</b>	Production of butter fat with better nourishment qualities
<b>Objectives:</b>	Butter fat has a certain mixture and positioning of fatty acids in triglycerin. At the same time the molecular structure causes butter fat to be absorbed with high efficiency which has some unwanted consequences in regards to human nourishment. Di-glyceride, where only two fatty acids are esterificated to glycerol and where the “middle” fatty acid is missing which means 1,3 di-glyceride are absorbed with lower efficiency. A lowered fat absorption is assumed to reduce the risk of developing fatness and other related illnesses.
<b>Initiator:</b>	LMC (Biocentrum-DTU)
<b>Participants:</b>	LMC (Biocentrum-DTU) Danish Dairy Board Danish Institute of Agricultural Science Danish Institute for Fisheries Research
<b>Size:</b>	About 3.5 million DKR
<b>Funding:</b>	Danish Dairy Board
<b>Duration:</b>	2003-2005
<b>Questions:</b>	

<b>Title:</b>	Enzymatic extraction of fibres in diet from potato pulp
<b>Objectives:</b>	<p>Certain polysaccharides from potato pulp have earlier shown to have physiologically useful effects as fibres in diet. Fibres in diet has an useful effect on digestion and certain types of fibres lowers the absorption speed of carbohydrate and can thereby obstruct fast glucose response, which can prevent development of type 2 diabetes. The Danes consume insufficient amounts of fibres.</p> <p>The objectives of this research are:</p> <ul style="list-style-type: none"> <li>• to invent a economic profitable processing process of potato pulp more specifically improve the economy, water usage and working environment in the potato flour industry,</li> <li>• to make a foundation for development of a new type of fibre enriched products e.g. fat reducing pate so that fibre consumption in society overall can be increased.</li> </ul>
<b>Initiator:</b>	LMC (Biocentrum-DTU)
<b>Participants:</b>	LMC (Biocentrum-DTU) Danish Institute of Agricultural Science Dansk Procesteknologi Novozymes Palsgaard
<b>Size:</b>	About 2 million DKR
<b>Funding:</b>	DFFE
<b>Duration:</b>	2003- 2004
<b>Questions:</b>	

<b>Title:</b>	New enzyme processes in fruit juice production
<b>Objectives:</b>	Pectin decomposition enzymes demolish pectin in the cell wall matrix. Decomposition of pectin causes pectin to not bind water. Pectin decomposition enzymes are widely used in the fruit juice industry today as pressure help in order to increase output of juice. This applies to production of apple juice, black currant, cherry, cranberry and white wine. These fruits contain large amounts of potential beneficial antioxidants in the shell parts, which are leftovers from pressurising.
<b>Initiator:</b>	LMC (Biocentrum-DTU)
<b>Participants:</b>	LMC (Biocentrum-DTU) KVL (Department of Food Science) The Royal Veterinary and Agricultural University Danish Institute of Agricultural Science Vallø Saft A/S Bioscan FLS Miljø Novozymes
<b>Size:</b>	About 4.3 million DKR
<b>Funding:</b>	DFFE, EU
<b>Duration:</b>	1999 - 2004
<b>Questions:</b>	

<b>Title:</b>	New foodstuff and materials based on starch
<b>Objectives:</b>	<p>The result of a long-term effort on starch in Denmark has resulted in development of many new starches that have potential uses both within and outside the foodstuff industry. It is of great industrial interest to test these starches in regards to functionality in industrial produced confectionery products and thereby to develop new applications with unknown capabilities.</p> <p>The research aims to increase and expand consumption and economic value of both Danish starch and imported raw starch. Newly developed starch with extreme and interesting abilities will be implemented into existing products and tested for their functional capabilities. At the same time products will be developed both inside the material- and the foodstuff segments based upon newly developed starches special abilities. The project will show the connection between the chemical/physical capabilities of starch and the functionality within the projects three segments foodstuff, materials and water like systems.</p>
<b>Initiator:</b>	LMC (Biocentrum-DTU)
<b>Participants:</b>	<p>LMC (Biocentrum-DTU, Bioteknologisk Institut-DTU)  The Royal Veterinary and Agricultural University  Danish Institute of Agricultural Science  AKV Langholt  KMC a.m.b.a  TOMS Gruppen A/S  Swalöf Weibull</p>
<b>Size:</b>	About 4,1 million DKR
<b>Funding:</b>	DFFE, Øresund Food Network
<b>Duration:</b>	2003-2006
<b>Questions:</b>	

<b>Title:</b>	Good food on a large scale
<b>Objectives:</b>	<p>The purpose of this project is to develop tools for a flexible supply chain to optimise the quality of the end product of catering, large kitchens and institutional kitchens. The means will be to use system analyses to focus on high quality in general of the so-called meal elements. Optimising logistics in the supply chain to ensure shortest possible time between raw material producer and end user. Optimising the time consumption here will decrease loses and quality reduction in connection with storing plus demands for packing technology.</p> <p>The reason for this project is that the number of hot meals that are consumed within homes are increasing and are therefore becoming an everyday good for many consumers. It is expected that consumers will be even more critical towards the accessible quality while catering companies are met with demands about increasing production capacity. In order to produce meals with high quality at a low price it is necessary to acknowledge that meal elements are to be produced centrally and finishing preparation must be made in kitchens near the consumer.</p>
<b>Initiator:</b>	Biocentrum – DTU
<b>Participants:</b>	<p>Biocentrum – DTU  Lund University (LTH)  Danish Institute for Food and Veterinary Research  Ideon Agro Food  Danish Institute of Agricultural Science  Dining Development, Landskrona  DTU  The central kitchen at KAS Herlev  The cantina at Danisco</p>
<b>Size:</b>	About 500,000 DKR
<b>Funding:</b>	
<b>Duration:</b>	2003-2006
<b>Questions:</b>	

<b>Title:</b>	Menu elements - optimising the quality of distributed meals
<b>Objectives:</b>	The vision for this project is that by introducing the concept about menu elements it is possible to improve the overall quality impression of finished meals produced in the catering industry. Menu elements are partly cooked products that are stabilized by cooling or in some instances freezing in short time intervals, the purpose is to maintain the impression of a meal produced of fresh ingredients. Meal elements are produced centrally and are distributed so that it is easy to complete the cooking of the meal, while keeping the option of variation open as well. The concept of menu elements is based on a detailed and integrated ankle in relation to quality of finished meals and involves studies of integration between production and distribution. Therefore it is essential that research is undertaken in collaboration with catering businesses and other relevant partners.
<b>Initiator:</b>	LMC (Biocentrum-DTU)
<b>Participants:</b>	LMC (Biocentrum-DTU, Institut for Produktion og Ledelse-DTU) Danish Institute for Food and Veterinary Research
<b>Size:</b>	About 4.7 million DKR
<b>Funding:</b>	
<b>Duration:</b>	2003-2006
<b>Questions:</b>	

<b>Title:</b>	The continued wok
<b>Objectives:</b>	With support from FØTEK, FBEG has developed a wok that builds on the principles of the Asian wok frying which insures healthy and fatless products. The continued wok was invented, developed and patented by professor Jens Adler-Nissen from Biocentrum-DTU. It has been made possible through a study of the physics involved when fast frying at high temperatures. Models for heat and mass transport has made the basis for optimising the texture of vegetables and meat that can be fried in this wok. The demand for fried foodstuff is gigantic but so far the foodstuff industry hasn't had useful processes and machines to avoid that products under continued frying has been cooked instead of fried. At this point a consortium to support the commercialising of the idea is in it final stages, with the two firms Gastroprocess Technologies and ALA-Hammerum in the lead.
<b>Initiator:</b>	LMC (Biocentrum-DTU)
<b>Participants:</b>	LMC (Biocentrum-DTU) Gastroprocess Technologies ALA-Hammerum
<b>Size:</b>	About 2 million DKR
<b>Funding:</b>	DFFE
<b>Duration:</b>	1. January 2003 – 30. June 2004
<b>Questions:</b>	

<b>Title:</b>	Ion-transport and salt distribution during salting of meat.
<b>Objectives:</b>	<p>The project ion-transport and salt distribution during salting of meat aims to uncover some of the biophysical factors that have an impact on salt diffusion and salt distribution during salting. Especially dry salting and basin salting is investigated as representatives of two basically different salting methods.</p> <p>Salt diffusion will be measured in a newly constructed diffusion cell with belonging ion selective electrodes. The salt distribution in a meat matrix will be decided by the use of electromagnetic scanning methods, here in particular the method “environmental scanning electron microscopy” in collaboration with an external consultancy, the Force Institute, which is the only one in Northern Europe that masters this method. There will be measured upon different raw materials and factors like fat marbling, raw material PH, binding tissue and muscle types will be taken into consideration. The data will be used for Finite Element Modeling and it is expected that the information obtained here from will contribute to an understanding of how the current salting technology can be optimised to production of better and more alike salted products in shorter time.</p>
<b>Initiator:</b>	LMC (Biocentrum-DTU)
<b>Participants:</b>	LMC (Biocentrum-DTU) Danish Meat Research Institute
<b>Size:</b>	About 2 million DKR
<b>Funding:</b>	Danish Bacon & Meat Council FØTEK
<b>Duration:</b>	
<b>Questions:</b>	

### 3.1.2 Research projects concerning Core food products in particularly

#### 3.1.2.1 Beef

<b>Title:</b>	Documented pork quality
<b>Objectives:</b>	<p>The purpose is to investigate how an extended system for quality documentation can be used as a parameter for competition.</p> <p>From this the following objectives are derived:</p> <ul style="list-style-type: none"> <li>• To analyse German consumers' perceptions of quality and documentation demands while purchasing fresh pork to further special preferences for pork of Danish origin.</li> <li>• To analyse German retailers' perceptions of quality and documentation while purchasing pork to further Danish producers as partners.</li> <li>• With reference to the above to investigate possible measuring techniques that can gather information which is considered commercial relevant.</li> </ul>
<b>Initiator:</b>	The MAPP Centre
<b>Participants:</b>	The MAPP Centre Federation of Danish Pig Producers and Slaughterhouses Danish Meat Research Institute
<b>Size:</b>	About 2.7 million DKR
<b>Funding:</b>	DFFE
<b>Duration:</b>	1999-2002
<b>Questions:</b>	

<b>Title:</b>	Cattle: Increased eating quality of meat from cattle
<b>Objectives:</b>	<p>The objective was to conduct a consumer survey of the beef quality from slaughter cattle produced by different finalized feeding strategies to obtain:</p> <ul style="list-style-type: none"> <li>• Documentation on which finalized feeding strategies are effective in improving the eating quality experienced by the consumer</li> <li>• To establish general knowledge on consumers experience of beef from dairy stock slaughter before or after end feeding</li> <li>• To make a foundation of justification of price differentiation on slaughter cattle so that it becomes more attractive to finalize feeding of dairy stock before slaughter</li> <li>• To document the connection between consumer perceived quality and physical product specifications</li> </ul>
<b>Initiator:</b>	The MAPP Centre
<b>Participants:</b>	The MAPP Centre Danish Meat Research Institute
<b>Size:</b>	1.952.000 DKR
<b>Funding:</b>	The Danish Directorate for Food, Fisheries and Agricultural Business
<b>Duration:</b>	1999 - 2001
<b>Questions:</b>	

<b>Title:</b>	High quality beef from production to consummation – consumer attitudes towards ‘LandboOksen’
<b>Objectives:</b>	The starting point of this investigation was that the beef industry had conducted a controlled production of special produced beef, which they wanted marketed to consumers as high quality beef. In the project a marketing concept was developed under the name ‘LandboOksen’.
<b>Initiator:</b>	Danish Meat Board
<b>Participants:</b>	The MAPP Centre Jysk Analyseinstitut A/S Danish Meat Board Danish Institute of Agricultural Science Landbrugets Rådgivningscenter Danish Crown COOP Danmark Danish Meat Research Institute
<b>Size:</b>	About 7,9 million DKR
<b>Funding:</b>	The slaughter fee of the Danish meat industry The Danish Directorate for Food, Fisheries and Agricultural Business
<b>Duration:</b>	February 1996 - December 1999
<b>Questions:</b>	

### 3.1.2.2 Fish

<b>Title:</b>	Fresh fish in the retail trade: Quality in the retail trade
<b>Objectives:</b>	<p>This project is one piece of the Danish fishing industry's work with quality-documentation and improvement. It is divided into 3 parts: first telephone interviews, then a postal part and finally in-home-tests.</p> <p>The purpose of the telephone interviews is:</p> <ul style="list-style-type: none"> <li>• To measure households consumption of fish compared to other types of foodstuff.</li> <li>• To measure their preferences in relation to the different types of foodstuff in order to identify segments with different preferences.</li> <li>• To enlighten differences in opinions, knowledge and behaviour between fish-consumers and non-fish-consumers.</li> </ul> <p>The purpose of the postal part:</p> <ul style="list-style-type: none"> <li>• To give more detailed information about fish-consumers opinions, knowledge and behaviour.</li> </ul> <p>The purpose of the in-home-test is to test two fish products, which systematically differ in relevant areas. This will be done to establish a connection between the demands from consumers and the products.</p>
<b>Initiator:</b>	
<b>Participants:</b>	<p>The MAPP Centre  Danish Fish Marketing Board  Danish Institute of Fishing Research  Danish Standard Association</p>
<b>Size:</b>	
<b>Funding:</b>	
<b>Duration:</b>	
<b>Questions:</b>	

### 3.1.2.3 Fruit

<b>Title:</b>	Better Danish strawberries
<b>Objectives:</b>	
<b>Initiator:</b>	
<b>Participants:</b>	<p>The MAPP Centre  Danish Fruit Growers' Association  Danish Agricultural Advisory Centre  Fruit and Soft Fruit Advisory Service  Danish Veterinary &amp; Food Administration  Danish Institute of Agricultural Sciences</p>
<b>Size:</b>	
<b>Funding:</b>	
<b>Duration:</b>	
<b>Questions:</b>	

### 3.2 Ongoing research projects

#### 3.2.1 Research projects concerning Food Safety and Quality in general

<b>Title:</b>	Developing biochemical and molecular markers as indices for improving quality assurance in the primary processing of cocoa in West Africa.
<b>Objectives:</b>	The main purpose of the project is to improve the current quality assessment practices used both by producers and buyers of cocoa in West Africa
<b>Initiator:</b>	
<b>Participants:</b>	The Royal Veterinary and Agricultural University and others
<b>Size:</b>	About 0,2 million DKR
<b>Funding:</b>	EU
<b>Duration:</b>	2002-2006
<b>Questions:</b>	

<b>Title:</b>	Development of deep frozen baby food containing Danish ecological vegetables.
<b>Objectives:</b>	The purpose of this project is to establish a production of well tasting, healthy, nutritious deep frozen baby food containing Danish ecological vegetables. The project takes children's preferences for chosen vegetables as its point of departure, in addition to attitudes and demands from parents and personnel from day care institutions in regards to baby food. This knowledge combined with current knowledge on cultivation and production will lead to the selection of a few interesting products.
<b>Initiator:</b>	The MAPP Centre
<b>Participants:</b>	The MAPP Centre Dæhnfelds A/S Biodania Nutana AGA Danish Institute of Agricultural Science Danish Veterinary & Food Administration
<b>Size:</b>	About 7 million DKR
<b>Funding:</b>	The Danish Directorate for Food, Fisheries and Agricultural Business
<b>Duration:</b>	1999 – Ultimo 2004
<b>Questions:</b>	

<b>Title:</b>	Novel cross-linking enzymes and their consumer acceptance for structure engineering of foods (CROSSENZ)
<b>Objectives:</b>	The generic objective of this project is to develop novel enzymatic technologies for tailoring the structure and sensory properties of food. The developed enzymatic tools can be exploited in dairy, meat, and baking applications for production of novel types of products. The objective is also to assess consumer acceptance of the use of differently produced enzyme ingredients in food production. The consumer perception towards enzymes produced in plants, GMO-microbes or traditionally using non-GMO production technologies, has a key role in future process development. The scientific objective is to discover novel cross-linking enzymes capable of cross-linking proteins and also plant pectins and xylans. The objective is also to elucidate their reaction mechanisms on molecular level and to relate these changes to macromolecular rheological and functional properties.
<b>Initiator:</b>	
<b>Participants:</b>	VTT Biotechnology INRA University of Limerick Danish Institute of agricultural science The MAPP Centre Danisco CropDesign Raisio Group.
<b>Size:</b>	About 2 million DKR
<b>Funding:</b>	EU
<b>Duration:</b>	2003-2005
<b>Questions:</b>	

### 3.2.2 Research projects concerning core food products in particularly

None were identified.

### **3.3 Research projects proposals**

#### **3.3.1 Research proposals concerning Food Safety and Quality in general**

None were identified.

#### **3.3.2 Research proposals concerning core food products in particularly**

<b>Title:</b>	The influence of children on the decision process in a family in relation to the selection of foodstuff with focus on fruit, vegetables and healthy eating habits.
<b>Objectives:</b>	<p>The purpose of this project is, with focus and participation of 3-15 year old children, to:</p> <ul style="list-style-type: none"><li>• Investigate the decision making process in relation to purchasing and selection of foodstuff with focus on content of fruit and vegetables and the development of healthy eating habits.</li><li>• Illuminate social and cultural aspects of relevance to children's active participation in, influence on and competence in relation to the decision process of families purchasing and selecting foodstuffs.</li><li>• Reveal motives and barriers on whether children choose fruit and vegetables in their daily diet in comparison to their parent's choice, preferences and practise.</li></ul>
<b>Initiator:</b>	The MAPP Centre
<b>Participants:</b>	The MAPP Centre GASA A/S SIF
<b>Size:</b>	About 1.7 million DKR
<b>Funding:</b>	The Danish Directorate for Food, Fisheries and Agricultural Business
<b>Duration:</b>	April 2004 – October 2005
<b>Questions:</b>	

## 4 Opportunities for public and private partnerships

At the national workshop a number of research opportunities in relation to food safety and food quality were identified (see Matrix 1). Several of these research opportunities have the potential for forming the basis for public-private partnerships.

### Matrix 1 Research opportunities identified at national workshop

<p><b>Critical limits.</b> Some workshop participants suggested that critical limits have not been defined for all relevant ingredients. In relation to critical limits, it should be studied how these should be defined, communicated, harmonised and what the economic consequences of setting critical limits were.</p>
<p><b>How consumers handle foods in their homes.</b> This was argued to be the perhaps most important food safety problem. Topics for research could be how to best to communicate to consumers how food products should be handled in the home and how good housekeeping virtues were maintained. In this connection it was suggested to develop a HACCP for the home</p>
<p>A was also suggested to study <b>how foods are handled in stores and in transit.</b></p>
<p><b>Intelligent packaging</b> was suggested as a tool for identifying where in the food chain food safety problems arise.</p>
<p><b>Barriers to implementation of new technologies.</b> What are they and how can they be surmounted?</p>
<p>A related topic suggested was that quality control and food safety controls were mentioned as barriers to innovation. Is this really the case and how can this be rectified?</p>
<p>Consumers' <b>willingness-to-pay</b> for food safety and food quality was mentioned several times as a problem. It was therefore suggested to study willingness-to-pay for different products, different qualities, different countries and different types of information.</p>
<p><b>How to design process equipment.</b> It was suggested to study how process equipment should be designed from a food safety perspective, how different machines are best connected to each other, how should surfaces be treated, what lubricants should be used, what are the implications for food safety of using technical aids and what the economic consequences would be</p>
<p><b>Traceability</b> of food quality and food safety.</p>
<p><b>Spices</b> were mentioned as an area about which only little is known.</p>
<p><b>Old fashioned foods and new technology.</b> How is food safety and naturalness related</p>
<p>What <b>natural alternatives</b> are there to pesticides?</p>
<p><b>What is quality?</b> It was suggested to review different definitions and meanings of food quality.</p>
<p>Is food safety used as a <b>technical trade barrier</b>?</p>
<p>A discourse analysis of <b>the food safety discourse.</b> What actors are heard and influence actions, legislation and perceptions.</p>
<p><b>Primary productions in distant areas.</b> How can producers be informed and their practices changed so that they meet European standards and requirements.</p>

It will be possible to seek financing of research investigating these or related topics through a new research programme entitled “The food sector of the future” [*Fremtidens Fødevarer*], which is currently under preparation. The programme will focus on three main themes: food quality, food safety and sustainable aquaculture. These themes are at the core of the Global Food Network project. The programme will run from 2004 to 2008 and the total budget is expected to be about DKK 73m (approximately €10m). The deadline for applications under this programme will presumably be around August-September 2004.

## **5 Overall impression of WP5**

As this report has documented there is already considerable experience with public-private partnerships in relation to food quality and food safety in Denmark. The majority of these projects have focused on Danish issues, but there is also a number of projects which have focused on issues related to cross-border supply chains and networks.

There are, however, many issues that need further clarification and thus pose opportunities for establishing public-private partnerships. In connection it is noted that there has been and continues to be government support for funding research related to food quality and food safety in Denmark, in particular if there is a practical contribution to business.