DECANETHUS

- Project Report -

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Executive Summary

THE PROJECT

1. **Structural changes in the pork supply chain.**
   The world-wide pork and hog sector is in a process of structural change. Market segmentation, higher demands from the consumer for food safety, animal welfare etc. and the need for increased efficiency promotes improved vertical co-ordination in pork supply chains to increase competitiveness and product value.

2. **An experimental comparative study.**
   This report describes the results of an international comparative study on vertical co-ordination in the pork industry in four countries; Denmark, Canada, the Netherlands and the United States. This experimental study was initiated and sponsored by the Agri Chain Competence Foundation (ACC) in the Netherlands. The objectives were focused on developing the benchmark method and a first description of the co-ordination mechanisms. The results are based on desk-research and are more or less subjective. The results are to be regarded as preliminary and be seen as a starting point for further activities.

3. **Chain Benchmark Methodology**
   The methodology used in the project consisted of three elements: a structure for describing the co-ordination mechanisms between the different stages in the pork supply chain; a five-step framework for analysing the chain and a set of performance indicators to compare the performance of the chain. The applied methodology, appears to be a good basis for describing and analysing chains.

THE RESULTS

4. **Co-ordination Mechanisms**
   Denmark has the most integrated and co-ordinated structure for the production and marketing of hogs and pork. In the Netherlands there is a relatively high degree of co-ordination between the various stages of pork production whilst in Canada there is maximum co-ordination between the suppliers of feed / genetics and hog producers and also between slaughtering and processing. The United States show the least co-ordination. While open market arrangements are dominant across countries, there are some highly co-ordinated pork supply chains in all countries.

5. **Chain Performance per country**
   The relative chain performance of the four countries is compared by with the help of seven core issues. There are many differences in the outcomes. The core issue “chain knowledge” is seen as weak in all countries. Denmark assumes that it should improve its “chain flexibility”.

6. **Pressures for change**
   All four countries note high importance to the fact that consumers are becoming increasingly interested in healthfulness and safety of food. They also agree that economies of scale and environmental sustainability are becoming very important issues. The US, Denmark and the Netherlands state that the shift from government responsibility to industry responsibility and the shift from domestic market protection to international market access are important developments.

7. **Shift from an open market to a more co-ordinated pork supply chain system**
   The need for consumer responsiveness, food safety, new technology and increased pressure for efficiency changes the pork supply chain in all countries and drives it to a more co-ordinated system in the next decade.

8. **Capability to respond per country**
   All four countries are capable to address the most important chain care issues, they have, however, more concern in the field of chain optimisation issues like risk management and chain re-engineering activities. Most activities of the service organisations (supporting industry) who support the pork supply chain are focused on chain optimisation issues and less on chain care and chain management. The governments in all four countries only support the pork supply chain in chain care issues like chain quality systems. Only in Canada the government supports product and process development. It can be concluded that the supporting industry and government are neither really inhibiting nor enhancing the pork supply chain.

9. **Barriers to overcome; mutual trust, physical infrastructure and communication**
   The lack of mutual trust, restrictions in the physical infrastructure and inadequate (systems for) chain communication are seen in all countries as the most important barriers to improve the pork supply chain. Besides that, the supporting industry and the government could offer more support.
   Finally, it becomes clear that in all countries the attitude of the individual stages is still more focused on improving the stage results rather than improving the results of the entire chain. Therefore, a shift in the attitude from stage re-engineering to chain re-engineering is necessary to improve the competitiveness of the pork supply chain.

RECOMMENDATIONS

10. Development of a Chain Benchmark Toolbox

In this project a new methodology for the benchmarking of chains was developed. It proved to be a good basis but needs widening and deepening of the structures used. Further research and development is therefore necessary.

11. Further research

In the next decade, pork supply chains will convert to more co-ordinated systems. Therefore attention is needed for questions like 'how much co-ordination is desirable?', 'How to manage co-ordination?' etceteras. The most important barrier for improving the pork supply chain is the lack of mutual trust. Hence, research in order to gain more insights into the elements of mutual trust and the way to improve this, is crucial. With the pork sector developing towards a more differentiated and co-ordinated market, attention is also welcome for the shift in role and function of resources.

12. Widening the benchmark

In the project, the comparison of pork supply chains on a country level was opted for. This will give limited results because chains are active internationally and because there is a wide variation and difference in the existing pork supply chains within countries. It is recommended that future research more be more focused on individual pork supply chains. Moreover, the research should be accomplished with a larger group of representatives from the industry, the government and the supporting industry.

Project Report Decanethus

1. Introduction

This report describes the results of an international comparative study on vertical co-ordination in the pork industry in four countries: Denmark, Canada, the Netherlands and the United States. The project, carried out from 1996 to 1998, was initiated and sponsored by the Agri Chain Competence Foundation (ACC).

The general objective of the project was the comparison of the essential characteristics of vertical co-ordination of the pork chain using a common approach to describing and analysing vertical co-ordination in and between the four participating countries. The following questions were defined as the route to achieve this general objective:

1. How does the current system work?
   (parts, players, linkages)

2. What are the pressures for change?
   (opportunities, threats and issues)

3. What is the apparent capability of chains to respond?
   (strengths, weaknesses)

The pork chain consists of the following business stages: genetics, farrowing, finishing, slaughtering, processing, distribution/wholesale and retail/food service. Analysing the pork market system provides a deeper understanding of how business stages should evolve in order to increase competitiveness. This allows industry decision makers, government, and supporting industries to adjust their strategies, activities and policy decisions in relation to vertical co-ordination of the pork sector.

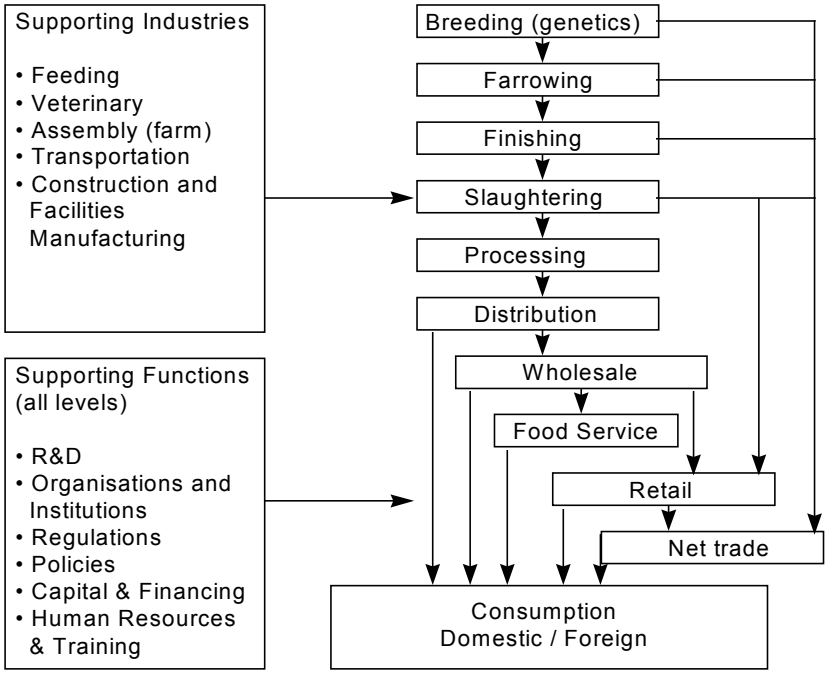


Figure 1: Stages of Pork Production

Comparisons in the project are carried out on two levels; the country level and the individual chain level. The individual chain level is described in four case studies. This approach made it possible to draw conclusions on a country and individual company level.

The project had an experimental character. So far, there has hardly been any experience in the benchmarking of chains, nor were there chain-benchmark methodologies available. The project was therefore based on two steps: developing the benchmark methodology and the benchmark itself. Besides that, the results are mainly built on desk-research and a limited number of interviews. Added to this the modest resources in time and budget, it will mean that the ***results must be judged carefully****. They have a inventory, qualitative, subjective and more or less broad character. This project must therefore be seen as a starting point for further action by industry, government and research organisations.*

In this Project Report are the most important results of the benchmark analyses are presented, as well as some remarkable results of the four Country Reports. In Chapter 2 the project organisation is described and in Chapter 3 the methodology used is discussed. The results are presented in Chapter 4 and the conclusions and implications in Chapter 5 and 6. The authors of the four Country Reports supported this comparative study by completing the tables for the benchmark. The Project Report has a summarising character. More detailed information can be found in the four Country Reports and the four case descriptions. More information on these reports can be found in Appendix II.

2. Project organisation

The project was initiated by the *Agri Chain Competence Foundation* and was carried out by the following organisations:
- The MAPP Centre, Aarhus School of Business, Denmark;
- Ministry of Agriculture and Agri-food, Ottawa, Canada;
- Agricultural University Wageningen, the Netherlands;
- Purdue University, West Lafayette, Indiana, United States of America;
- Rijnconsult Agrifood, the Netherlands (general project management).

A working group was formed in each country. The project leaders of the four countries formed together with the general project leader the project team. This project team reported to an International Steering Committee. See figure 2 and Appendix I.

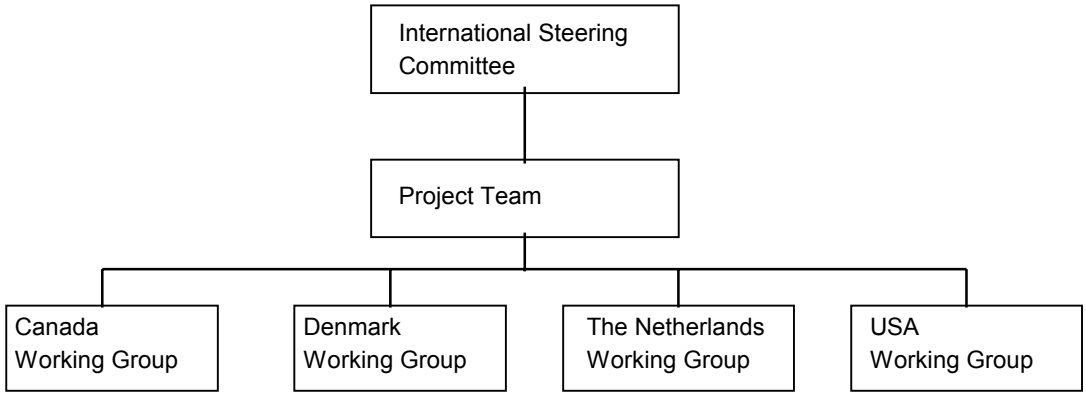


Figure 2: Project structure of the Decanethus project.

The working programme of the project was divided into three phases; an initiation phase, the research phase and the integration phase. In figure 3 below the activities and results per phase are summarised.

PHASE	INITIATION-PHASE	RESEARCH-PHASE	INTEGRATION-PHASE
ACTIVITIES	. kick off meeting . methodology . planning	. environment . pork market . pork supply chain . changes . capabily to respond . case descriptions	. comparing . conclusions . barriers . further research
RESULTS	. common project approach	. Country Reports . Case descriptions	. Project Report

Figure 3: Activities and results per phase of the project.

3. Research Approach

To ensure that the comparison between the countries and chains took place on a common base and to ensure a proper and accurate interpretation of the results, the following benchmark methodologies were developed for the project:
- a methodology for describing the co-ordination mechanisms between stages in the chain;
- a framework for analysing the pork supply chain on a country level;
- a framework for describing individual pork supply chains by means of case studies.

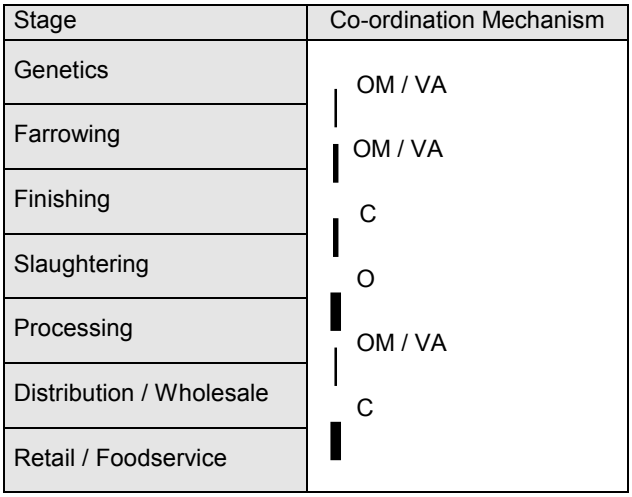
3.1 Co-ordination mechanisms between stages

For analysing the pork supply chain, it is necessary to describe the co-ordination mechanisms (arrangements) that are used to facilitate the flow of the product from one stage to another. In the project four types of arrangements have been distinguished: *Open Market (OM), Verbal Agreement (VA), Contract (C) and Ownership (O).* Contracts vary from simple to very complicated. Verbal agreements are non-written arrangements between two participants. Ownership refers to a complete (integrated) control of a part of the supply chain. Open markets refer to the absence of the use of any arrangement.

Arrangements can deal with different issues: Financial arrangements can refer to, e.g. price-setting, profit-sharing, cost-sharing, joint investigations; Production arrangements can refer

to availability, quality, production method; Information arrangements can refer to information access, speed of information exchange and accuracy of information.

In the project it was not possible to work out the arrangements, for all these three (financial, production and information) issues in the participating countries on the same level of detail, but some survey of arrangements in the participating countries appeared to be very enlightening. In section 4.2.1.5 of this Project Report the arrangements on a general level are discussed. Figure 8 shows the most commonly applied co-ordination mechanisms between the stages of the Pork Supply Chain, and figure 9 presents the most common chain structures. The following figure demonstrates the structure of the Pork Supply Chain and illuminates the range of co-ordination mechanisms which are used in figures 8 and 9.



C: Contract; VA: Verbal agreement; O: Ownership; OM: Open market
The level of common features of the co-ordination mechanisms is explained by the thickness of the lines.

= not so common = common = very common

Figure 4: Framework for describing co-ordination mechanisms in pork supply chains (an example)

As shown in the above framework, the supply chain consists of 7 stages: genetics, farrowing, finishing, slaughtering, processing, distribution / wholesale and retail / foodservice. Moreover, figure 4 shows possible co-ordination mechanisms. For example, in this case slaughtering and processing are co-ordinated by ownership. The thickness of the line shows that this is a very common co-ordination mechanism between these particular stages.

3.2 Framework for analysing the pork supply chain on the national country level

The description and analysis of the pork supply chain on the national country level was accomplished by the following steps: At first the current pork supply chain is discussed in

sections 4.1.and 4.2. In this discussion special attention is given to the applied co-ordination mechanisms in the current pork supply chains. The performance of the supply chains in the four participating countries is benchmarked as well. In section 4.3, the benchmark methodology shows differences and similarities between the countries in pressures for change. Section 4.4.demonstrates the impacts on the business climate of these pressures for change. Moreover, the section describes whether there is enough capability to respond. Finally, in section 4.5 implications and actions are summarised in barriers to overcome.

The business environment is described in the Country Reports. Figure 5 gives the structure of this methodology. The chapters of this report are organised parallel to this methodology. In figure 5 the chapters are illustrated in yellow.

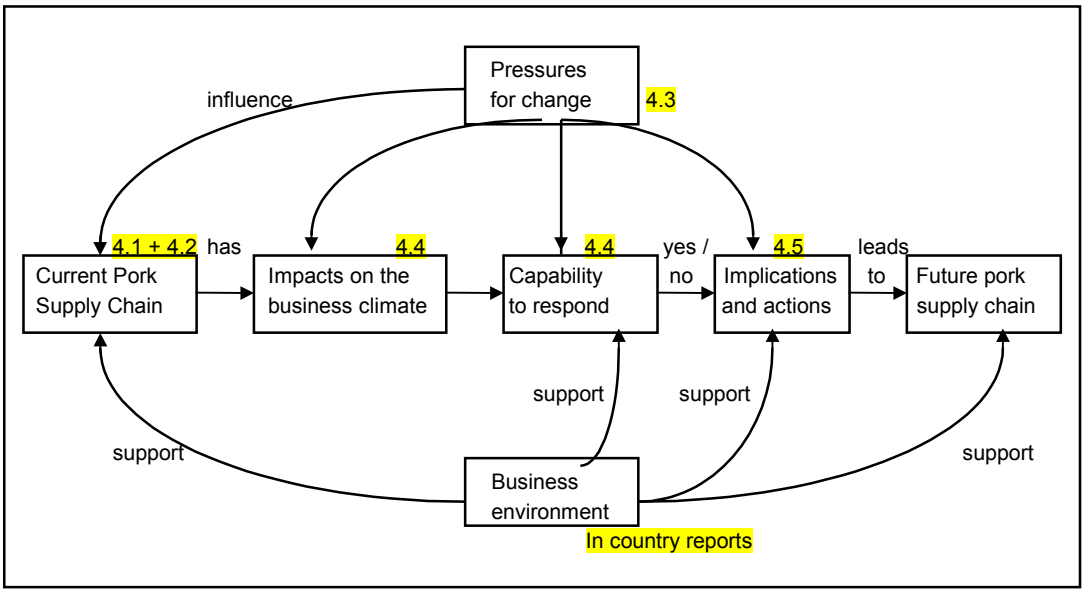


Figure 5: Methodology used for the pork chain benchmark

3.3 Pork supply chain description on an individual chain level

A case description is worked out for one particular pork supply chain in each country. The cases are: Alberta Pork Producers (Canada), Farmland Industries (US), Danish Crown (Denmark) and Sturko Meat (the Netherlands). For each case the following issues were worked out: current situation, drivers for change, impacts on the business climate and actions undertaken and barriers to overcome.

4. Results

This chapter shows the results per step of the framework as described in section 3.2: The world pork market, the current pork supply chain, the pressures for change, the impacts on the business climate, the capability to respond and finally, the barriers to overcome.

4.1 The World Pork Market

The international pork industry is undergoing a structural and organisational change as a result of changes in the method of pork production and processing technology. Today, pork constitutes nearly 50 percent of the world's total meat consumption. Recent trends indicate that pork consumption in absolute numbers is likely to increase in future. This section describes in brief the trends in consumption, production and trade in pork.

4.1.1 Consumption

Pork (pig meat) has accounted for the largest share of the world meat consumption since the mid 1970s. World pork consumption had increased over 200 percent from 1970 to 1996, when it reached 76.33 million tones. Chicken consumption also increased dramatically in this period and continues to show a higher rate of growth than pork. Beef and mutton consumption are declining steadily (see figure 6).

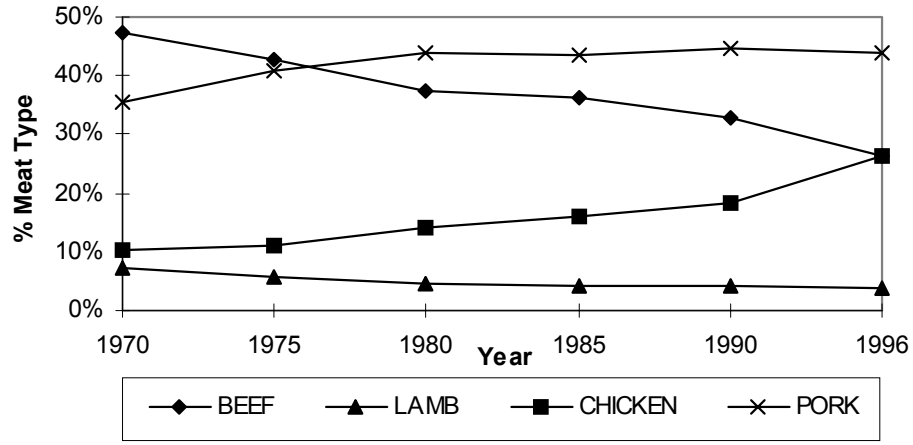


Figure 6: World meat consumption pattern

China, the European Union (EU), the United States (US), the Former Soviet Union (FSU) and Japan accounted for 86 percent of total pork consumption in 1996. In terms of per capita pork consumption, Hong Kong ranks first with 41.0 KGs followed by the European Union (38.9 KGs), China (31.9 KGs), the US (30.8 KGs) and Canada (27.3 KGs). Japan consumed ate 16.8 KGs/capita while the FSU consumed only 9.4 KGs. Within the EU, per capita pork

consumption is quite high in some countries (Denmark 65 KGs, Spain 52 KGs, Germany 46 KGs, The Netherlands 45 KGs). The largest net importers are Japan, the FSU and Hong Kong. On an aggregate basis, the EU is a net exporter, but Germany, Italy and the UK are very large net importers.

4.1.2 Production

World pork production had increased about 200 percent from 1970 to 1996, when it reached 76.82 million tonnes (figure 7). China is the largest producer, accounting for 51 percent of total world production in 1996. The European Union is second with 19 percent (Germany 3.8%, France 2.9%, The Netherlands 2.1%, Denmark 2.0%, Belgium 1.3%), followed by the United States with 11 percent. Canada accounted for 1.6 percent of the world pork production in 1996.

	1970	1975	1980	1990	1996
United States	6.667	5.343	7.537	6.965	8.312
Canada	746	655	1.034	1.133	1.250
EU	8.152	9.730	11.687	14.084	14.488
USSR / FSU	3.194	5.651	5.138	6.642	2.535
China	n.a.	7.094	11.341	22.808	39.000
Japan	734	1.039	1.475	1.555	1.315
Taiwan	320	322	537	1.009	1.175
World total	25.545	39.126	49.552	64.988	76.819

Figure 7: Pork production by country / region (1000 Tonnes) (Source USDA 1996)

Collectively, China, the EU, the US, the FSU, Japan and Canada produced 87 percent of the total world pork in 1996.

US production expanded very little between 1970 and 1990, but expanded to 8.3 million tonnes in 1996. Canada's production has changed little since 1980. Production in the EU increased with 49 percent between 1975 and 1996. Production in the FSU has declined sharply since 1990, as a result of economic and political collapse.

Chinese production increased dramatically (450 percent) in the period 1975 to 1996. Production in Japan doubled between 1970 and 1980, grew slightly between 1980 and 1990, but has since declined due to increasing environmental costs. In Taiwan, production more than doubled in the period 1980 to 1996.

4.1.3 Trade

Volume of the world trade in pork increased by about 6 to 7 percent between 1970 and 1996. The EU, the US, Canada and Taiwan accounted for 96 percent of total world pork exports in 1996.

In terms of exports as a percentage of production, the world's largest traders were the EU (27.1%) (Denmark 79.9%, the Netherlands 63.6%, Belgium 54,3%), followed by Canada (26.8%) and Taiwan (25.5%). While China exported only 0.5% of its production, it ranked as the fifth largest exporter in 1996.

4.2 The current pork supply chain

In this section the current situation in the pork supply chains is presented. Firstly, co-ordination mechanisms between the stages of the supply chain are described and discussed for each participating country. These co-ordination mechanisms are illustrated as well, see figures 8 and 9. A discussion of the performance of the current pork supply chain is also presented. More detailed information about the structure of the pork supply chains can be found in the Country Reports.

4.2.1 Co-ordination mechanisms

This section follows the pork chain downstream, from genetics to retail, with the focus on co-ordinating arrangements at each stage interface. Stages are defined by activities that may be separated by markets. Each stage transfer could be accomplished by a variety of means from open spot market to full integration of more stages within one firm. Like the structure of the industry, co-ordinating mechanisms are also in a state of transition. This section describes the mechanisms in each country from a *co-ordination-, pricing-* and *informational* point of view.

Denmark

Genetics - Production
The genetic stage is characterised by both co-operative and private breeding companies, and direct sales between farmers. The direct sales account for about 50 percent of all pig sales. The direct sale covers farmers who are gathered in groups (“Griseringen”), where they deliver to a certain group of slaughter-pig farms. This provides the opportunity to track the origin of the pigs.

The breeding companies determine their price according to the price for breeding stock set by the National Committee for Pig Breeding, Health and Production. Not only does the Committee provide the weekly pig prices, it also provides a reference price for piglets (weight 30 KGs). These reference prices are published weekly and transformed by breeding companies and farmers to a standard net price for breeding stock.

The National Committee for Pig Breeding, Health and Production, co-ordinates the information between the genetic stage and the production stage. The producers record information about incoming and outgoing breeding stock as well as the cyclic events of service, farrowing and weaning.

Production - Slaughtering
In Denmark, the slaughtering stage is dominated by four slaughterhouses. This stage is characterised by vertical integration between the pig producers and the slaughterhouses, while all four slaughterhouses are co-operatives owned by the farmers. The Danish pigmeat industry works with direct information exchange, fixed-term commitments, residual payments and classification of pigs.

The four slaughterhouses all pay the producers the same price for pigs. The price is fixed by the weekly prices set by The Federation of Danish Pig Producers and Slaughterhouses: Danske Slagterier. The weekly prices are determined by a committee and are geared to market conditions. Incentives are paid to encourage pig producers to deliver pigs of a certain weight and meat content which is measured objectively by “classification centres”. In addition, this the pig producers get residual payments each year.

The pig producers all have the right to obtain the information they require. There is a high information flow between the pig producers and the slaughterhouses, in regard to quality, payments, price etc.

Slaughtering - Processing
All four slaughterhouses have their own processing department; in some cases, the processing activities have been physically separated from the slaughterhouse activities and accommodated in independent production plants. Recent mergers between slaughterhouses as well as the capital injection by so-called institutional investors, positions firms for economic and physical separation of slaughterhouse- and processing activities. This separation was pushed forward by the investors wishing to restructure the economic organisation of the processing industry from co-operatives to limited companies, and by the wish to make profitability in the processing industry more visible. Pork distribution to independent meat processing companies is often subject to some long term contractual arrangements.

Where slaughtering and processing are joined physically and economically in one company, it can give rise to priority conflicts. The pig producer and the slaughterhouses are interested in the highest raw material price, and the processing company in the lowest possible. It is difficult to determine the price according to an “arm’s-length” principle, that is to say, a completely commercial market price as this depends on the selected product strategy and the processing structure. Furthermore, the price is also determined by the degree of certainty that the raw materials are delivered.

Because of the above mentioned ownership structure, the information flow between the slaughterhouses and their own processing division is, in general, high in all aspects, and this may increase the effectiveness of production planning, product development, etc.

Slaughtering / Processing - Distribution / Wholesale
All four slaughterhouses are also directly involved in wholesale, and sometimes through jointly owned sales firms (with another slaughterhouse and / or meat processing firm). The slaughterhouses also have activities in wholesale and supply the wholesale industry. At the same time, many meat processing companies are involved in wholesale, too. All in all, this means that the importance of the independent distribution / wholesale is declining in Denmark. However, the wholesale industry is at times used by the slaughterhouses when they supply the foodservice industry.

Most transfers between the slaughterhouses and independent distribution / wholesale are based on open-market negotiated prices. This also accounts for the supplies that are subject to contractual arrangements.

Generally, the information flow to the wholesale industry from the slaughtering / processing industry deals with products, prices and quantities.

Slaughtering / Processing - Retail / Foodservice
There is a strong relation between firms in the slaughtering and processing industries and the retail industry. It is often the retail industry that decides on what conditions the slaughter and processing industry must deliver, which means that the power relationship between these two industries is often benefiting the retail industry. Besides that, the retail industry gets more and more influence on what form the products must have and what they contain. There is yet no vertical integration between slaughtering / processing and retailers in Denmark. But some form of vertical co-ordination is used in some areas. The retailers put great emphasis on issues like guarantees for delivery, uniformity etc. Transactions with the retail industry are based on daily or weekly orders depending on the demand. If private label delivery is involved, relationships are developed on a long-range basis. There is some form of co-operation between retailers and slaughterhouses in regard to special pigs with emphasis on health and animal welfare. In the foodservice industry the large food-chains have special contracts with suppliers.

There is a high degree of co-operation between the retail and the pork industry based on trade contracts. These trade contracts are general contracts with regard to co-operation between companies. Some retailers use a pig exchange market where the slaughterhouses and / or the processing companies make competitive offers for the weekly requirements of the retailers. The actual price is mostly based on the open market price.

The flow of information between the retailers and the slaughterhouses is relatively high. About 16 percent of all fresh meat is sold as private label / branded products. For these product types, information such as hygiene, health and animal welfare are requested to ensure that the brand requirements are met.

Canada

Feed / Genetic - Production
In Canada, the complete pork supply chain is neither vertically co-ordinated nor integrated. There is maximum co-ordination between input suppliers of feed and genetics, and hog producers. There are mainly three types of production systems in Canada:

1) Traditional producer-owned and producer-operated enterprises
2) Feed / genetics company-owned / co-ordinated enterprises
3) Community-based investor-owned hog operations

At traditional producer-owned and producer-operated enterprises (type 1), all or most of the feedgrains required are grown on the farm. Producers typically buy vitamins and mineral supplements from local feed companies and mix their own feed on-farm, or they deliver their own grain to the local feed mill to be used for manufacturing complete feed to be supplied to the farmer. There is little, if any, formal vertical co-ordination in these operations. Genetics and feed inputs are purchased through normal market channels.

Feed companies began (in the early 1970s) offering grower contracts to producers and supplying feeder pigs, feed, and herd health services as part of a contractual arrangement whereby producers provide the buildings and the day-to-day management in return for a guaranteed fee per pig produced (type 2). The feed companies retain ownership of the pigs and usually also enter into contracts with slaughter-processors in those provinces where selling through the hog marketing board is not mandatory. More recently, genetics suppliers have started making similar arrangements with producers.

There is an emerging trend toward community-based investor-owned hog operations (type 3), where, in some cases, a group of grain producers form a company. This company contracts a management company that specialises in building the hog barns, arranges the genetic supplies, and often provides the management and labour for the hog operation. Ownership of the complete facilities is held by the producer-owned company. The management company is employed to operate the facilities, and the individual producer-owners often contract to provide feedgrains to the hog operation.

Information flows both ways between producers and feed companies. Many feed companies are involved in feed and nutrition related research and keep the producers informed about the latest feed mixes available and their nutritional impacts on the animals.

Production - Slaughter / Processing
Provincial hog marketing boards have a legislated right to market all hogs on behalf of producers. The boards act as single-desk sellers in each province and negotiate pricing and supply arrangements with individual slaughter / processors. Recently, the boards in Alberta, Saskatchewan and Manitoba have voluntarily given up right to act as the exclusive seller of all hogs in their respective provinces. They continue operating as marketing agents for those producers who wish to use their services. To date, the majority of producers have continued to use the hog boards as their primary marketing agent. Marketing arrangements between hog boards and slaughter-processors tend to be short-termed.

Slaughter-processors produce branded products. They are interested in maintaining brand quality and are beginning to express interest in contracting for hogs of specific genetic composition, size and type which were fed a particular way.

Contracts are rarely, if ever, fixed price contracts. Prices are often derived from U.S. markets and are commonly negotiated on a periodic basis and may reflect premiums for specific characteristics, or timeliness of delivery etc. Some Canadian plants are negotiating prices with producers in advance to ensure a continuous supply of hogs. A number of Canadian hog producers, particularly in Manitoba and Ontario, have business contracts or marketing arrangements with slaughter plants in the U.S. as well.

Traditionally there has rarely been any vertical co-ordination between these two stages. However, as noted above, the larger type 2 and type 3 hog operations tend to favour longer term contractual arrangements with slaughter-processors. Slaughter-processors are also

expressing increased interest in such arrangements as they engage in plant upgrading to capture economies of size and scale.

Slaughter / Processing - Wholesale / Distribution
There is a very high degree of co-ordination between slaughter and processing stages of the pork supply chain. Most Canadian slaughter plants also conduct primary processing operations and may produce some cooked or smoked products in addition to fresh, chilled and frozen cuts. There are a number of plants that are engaged in further processing only. Between the slaughtering / processing and the wholesale / distribution stage there is little, if any, vertical co-ordination. These stages tend to rely on the open market system and price negotiations on a daily basis.

Wholesale / distribution and Retail / Foodservice
Canada exports almost one third of its total pork production to wholesalers and retailers in about 70 countries. In the domestic market, most further processed pork products are sold to retailers by wholesalers/distributors. The role of foodservices is increasing.

In general, the move towards Efficient Consumer Response (ECR) in Canada is driven by the wholesalers/distributors. They are working with retailers to streamline the shipping and handling processes and apply a just-in-time delivery system. Retailers have not yet begun seriously exploiting the information they collect on consumer purchasing patterns or applying Electronic Data Interchange (EDI) with their suppliers. The necessary trust between the various players is still being established. Wholesalers/distributors have stepped in to fill this gap based on their information about retail orders.

Large foodservice chains are most likely to be involved in contractual arrangements with whole/distributors, processors or further processors. Smaller independent food services operators tend to rely on open market arrangements with wholesale/distributors, where prices are determined on a daily basis.

Retail to Consumers
Most branded meat products are owned by the slaughter-processors or further processors that produce them. Retail chains also have branded products usually supplied on co-packing arrangements with processors and further processors. In the past, retail brands emphasised the low-end commodity-type products marketed on the basis of price. Recently, some retailers have introduced high-end, gourmet-type branded products, but most branded meat products are trade-marked by the manufacturers.

In the absence of a well-established trend toward retail brands, there is little incentive or need for retailers to have explicit or implicit arrangements with consumers. The food product manufacturers are, for the most part, the stage of the chain with the greatest interest in establishing consumer relationships through branded product recognition and advertising.

The Netherlands

Genetics - Farrowing
The genetic stage includes the spectrum of the co-operative and private breeding companies. Usually they are integrated into the multiplier stage of grandparent or parent stock. The co-ordination mechanism of the supply of grandparent and parent stock differs. If grandparent stock is supplied then these transactions are relatively quite often arranged by contracts. Parent stock at the multiplier stage is mainly supplied by breeding companies, although less is arranged by contract and based on some form of verbal agreement. If contracts are used, the most common contracts are labourwage contracts; integrator / breeder contracts based on supply of sows and boars, boars, feed and / or delivery of piglets, and financing contracts. The use of contracts and importance of breeding companies in general has increased because more 'brands' are used at the multiplier stage.

The breeding companies determine their prices according to the prices for breeding stock at the pig trade exchange in Vleuten. These prices are published on a weekly base and transformed by breeding companies to a standard net price for breeding stock. The price of breeding stock in general is determined by supply and demand developments in the open market.

Most breeding companies have breeding programmes focused on fertility and production features, which are highly valued by farmers and which meet the processors' needs. Exchange of information is based on these features.
If the multiplier is participating in the Integrated Chain Control program (IKB programme) he is obliged to record information in accordance to the requirements of this programme. The IKB programme defines the responsibilities of the actors in the entire pork supply chain with regard to the production and processing of pork meat as well as to relations between actors

Farrowing - Finishing
Contracts, in the meaning of laid down arrangements, are not very common, but if contracts are used than they include deals with breeding companies, feed suppliers, co-operative trade companies or foreign purchasers. If the farmer is a member of a co-operative trade company, he is obliged to deliver his feeder pigs to the co-operative trading company without the use of contractual arrangements (this is considered to be a verbal agreement). If contracts are used, the most common contracts forms are supply / delivery contracts.

In the early days the price of feeder pigs was determined by price setting in the open market. Nowadays the price is more and more determined by 'published' feeder pig prices. These prices are published on a weekly base and transformed to a standard net price, based on an average feeder pig group size, the availability of feeder pigs and the exclusion of quality bonuses. The price of feeder pigs on the domestic market is to a large extent affected by developments on the EU-market. This means that pork producers have to compete with prices on the EU-market.

The information exchange between the stages contains information about feeder pig group size, uniformity, animal health status and other requirements if necessary (such as origin, medicine use, etc.). If the multiplier participates in the IKB programme he is obliged to record information in accordance with the requirements of the IKB programme.

Finishing - Slaughtering
Contracts, in the meaning of laid down arrangements with regard to delivery and price for long-term periods are not very common, but if contracts are used they include deals with co-operative trade companies and slaughter companies. One has to notice that if farmers are members of a co-operative trade company, they are obliged to deliver their feeder pigs to the co-operative company without the use of contractual arrangements.

If contracts are used, the most common contract forms are supply / delivery contracts, minimal-price-warranty contracts, minimal bring-in contracts and labourwage contracts.

Prices of pork pigs are determined by traders at the pork pig trade exchange in Vleuten. Determination of the demand is mainly based upon developments in the German market. This price acts as the basic price for purchase combinations of meat processing companies and is subject to many deductions and bonuses.

All pork pig producers have the right to receive information about the slaughter date, slaughter weight, basic price, price / kg VAT included, gross / net payment and, if paid based on quality, information about lean-meat percentage and type. Besides this information, some slaughterhouses exchange information about slaughter-deviations. If both are participating in the IKB programme they are obliged to record information in accordance with the requirements of the IKB programme and to provide this information.

Slaughtering - Processing - Wholesale
Many slaughterhouses are involved in both processing and wholesale. Besides this, slaughterhouses supply to the meat processing industry and wholesale. On the other hand, many meat processing companies are involved in wholesale. Pork distributed to meat processing companies is very often subject to some form of contractual arrangement for a 0.3 - 1.0 - year period, because of more stringent requirements with regard to product composition (cut, fat and meat).
Most transfers are based on open-market negotiated prices. In the domestic market week prices are used, while in the export market daily prices are used.

In general, information exchange is based on product information (cut and composition), quantities and price. If participating in the IKB-programme one is obliged to exchange information in accordance with the requirements of the IKB-programme.

Processing - Wholesale - Retail - Foodservice
Transactions with retailers are merely based on daily or weekly orders, depending on demand, even when products are delivered under private label. If private label is involved longer-term relationships will develop. Long-term contracts (one-year period) are not very common, except in cases where products are delivered under private label and special requirements are requested (f.e. free-range pork). This also applies to the foodservice industry, where large food chains have special contracts with suppliers. There is, on the other hand, a trend of large meat-processors integrating in the foodservice industry (ready-to-cook meals).

Most transfers are based on open-market negotiated prices, which also applies to supplies, that are subject to contractual arrangements (f.e. private label products, arrangements with foodservice industry).

Especially when meat products are delivered for private label, additional information is requested to assure that requirements are met. Aspects involved are e.g. origin, hygiene and health and animal welfare. New trends are the exchange of information based on scanning techniques and aimed at improving logistics (f.e. efficient consumer response).

USA

Genetics - Farrowing
The genetic stage includes the spectrum from relatively small pure-bred breeders to major breeding companies. The major breeders command an increasing share of market - now exceeding 40 percent. Open market transactions consists predominantly of the traditional group. The products sold by major breeders include great-grandparent stock, grandparent stock and parent stock. For the larger breeding companies the relationships tend to be more in the nature of a contract covering several years. The longer-term relationship is considered necessary to assure the volume and timing of delivery of breeding stock demanded by producers.

Pricing of breeding stock is typically negotiated as a premium over the value of market hogs. The exception is the sale of pure-bred stock at auctions. The premium over market price depends on the perceived value of the genetics involved. Grandparent or great-grandparent stock is priced to the producer at market plus a premium and a royalty on all gilts produced. The contract normally allows for sale outside the producer firm or network only with permission from the breeder.

Genetics companies recognise that the ultimate value of their product lies in acceptance by consumers. They therefore work directly with downstream slaughtering and processing firms to incorporate factors valued by consumers into the product. This achieves a level of communication that would be difficult to achieve by market price alone.

Farrowing - Finishing
The 1990s brought the development of very large production units and technologies with separate but co-ordinated farrowing, nursery, and finish operations to attain significant improvement in herd health. The current wave of change further diminishes the independent production of feeder pigs. Transfers from farrowing to nursery are typically integrated, although nursery services may be provided by contract operations. The new very large producers typically operate the farrowing stage and often the nursery stage as company-owned units.

Pricing of open market feeder pigs typically follows closely the prices of finished hogs. Some auction markets for feeder pigs are still operative.

The role of co-operatives in hog production are becoming more and more important. For example, Alliance Farms, associated with Farmland Industries, is a co-operative (with hog finishers as members) to produce feeder pigs in volume and timing to fit 900-1,000 head capacity finishing farms. Other multi-function co-operatives have established feeder pig production units to supply their members or to supply contract production farms of their own.

Feed - Production
Traditional hog production in the North Central states was oriented around own-farm feed production. Manufacturers of supplements and base mixes sold directly to farmers or through dealers on a current market basis. Today’s more sophisticated production technology has moved the industry toward off-farm feed preparation.

Feed companies, viewing the diminished share of independent producers, are actively promoting producer networks to exploit state-of-the-art technology. This role varies across companies and within companies, depending on the needs of the customer. Generally, the networks span genetics to slaughter with an emphasis on cost control and producing hogs that command a premium at slaughter.

Finishing - Slaughtering
One must recognise assembly as a function in the chain; however, it has become less and less significant as a separate operation. The traditional system of relatively small producers

left a role for firms at this assembly level. Direct shipments from producers to slaughterers and slaughterer procurement through country-buying stations have diminished the role of livestock marketing firms.
Coinciding with the decline of a separate assembly function, hog marketing moved from a largely spot market basis with live weight pricing to greater use of long term arrangements and rapid shift to carcass weight and grade pricing.

Informed observers indicate that the long-term contract proportion will have reached more than 35 percent in 1997. In 1993, approximately half the packers involved in long-term arrangements required a minimum volume, and a minimum quality of hog or specific breeding or genetics for producers involved in contract arrangements. Some went so far as to specify feed or nutrition programmes and approval of facilities. A large variety of contracts are used. However, nearly all are priced based on market quotations. Usually the base markets are as quoted by Market News of the U.S. Department of Agriculture. Window contracts set a range in which prices to producers vary with quoted markets. Outside that range the producer receives only a share of prices above this level or absorbs only a portion of the loss below the specified level. Very few contracts are fixed price or priced on a cost of production formula. The duration term of the contracts varies from a single production cycle to several years. A new evergreen contract is for a term of one to three years with the term renewed every day until cancelled by one party in the contract. The very large producers are almost invariably selling to packers under a long-term marketing arrangement. Access to markets (shackle space) is a major concern for these very large operations. While several of the slaughterers have programmes with special genetics and/or feeding, most of the contracts do not specify a specific line of genetics or feed use.

Slaughter - Processing
The nature of co-ordination arrangements between the slaughter and processing stages varies with companies and products. The range is from within company transfer from slaughter to processing at the same plant site to nearly all trades negotiated and priced on a day-to-day or week-to-week basis. When processing takes place at the same site, administered transfer is expected to be the rule. However, ownership of processing and slaughter operations by the same parent company does not necessarily mean that they are closely co-ordinated . Generally, the more customised the cuts, the more likely they are traded under some formula of pricing arrangement.

Some processors are allied with one or a few slaughterers. In these cases, long term arrangements with transfer pricing by formula based on market quotes (usually USDA Market News) are the norm. These arrangements are usually informal agreements that continue indefinitely. Contracts are rare. Pricing formulas may remain unchanged from two months to two years. Other processors avoid alliances and negotiate for supplies on a day-to-day basis. When the processor’s specifications deviate from the standard commodities, they identify several slaughterers capable of meeting the specifications and negotiate within this group for supplies.

Slaughter-Retailer

Fresh pork sales to retailers are mainly negotiated on a day-to-day basis. Alliances between slaughterer and retailer are rare. There are some slaughterer brand programmes that connect the retailer and slaughterer but they are rare and, in most cases, involve only a portion of the retailer's pork volume. Informal interviews with buyers indicate a lack of trust as the major factor limiting closer relationships. At this time, slaughterers appear to be more interested than retailers in developing closer relationships at this level. More complete data available from retail sales analysis is now being exploited to only a limited extent.

Fresh pork sales of primal cuts from slaughterer to food service firms are under arrangements similar to those with retail food stores. However, much of the transfer to food service is from the processing stage or through food service distributors.

Processor-Retail
Processor to retail food stores transfers of branded products are typically on a list price basis. That is, packaged products are offered to the retailer on a fixed price, take-it-or-leave-it basis. Cases with ready fresh meats are transferred to retail under indefinite term, with formula priced arrangements.

Relationships between processors and food service organisations range from fixed price on highly processed items to day-to-day negotiation for commodity or near commodity items. Generally, the relationships between processors and food service are closer than those with food stores. The products are often produced to the customers' specifications including exact portion sizes. Transfers of these products are priced by formula with the supplier committed to supply whatever the buyer orders.

A comparison of co-ordination mechanisms

Pork chain stages are illustrated in figures 8 and 9. Letters indicate the type of co-ordination mechanism at each stage in the chain. Figure 8 gives an overview of the most common chain structures for the complete chain in the four countries and figure 9 gives an overview of most applied co-ordination mechanisms between the different links in the chain.

Figure 8 shows that there is mainly one dominant chain structure in Denmark, based on ownership. In the other countries there is more variation in the applied chain structures. The open market structure dominates in the U.S. Canada has a similar common structure but tends to have ownership between farrowing and finishing and between slaughter and processing. The Netherlands tends to favour a structure dominated by open market and verbal agreements.

From the point of view of applied co-ordination mechanisms (figure 9) it is evident that Denmark has the most integrated and co-ordinated structure for production and marketing of hogs and pork. This has been accomplished mainly through the slaughterers co-operatives and the development of Danske Slagterier. In figure 9, the illustration of Denmark shows in

which stages the initiative for co-ordination are taken. It can be concluded that the existing co-ordination is accomplished through forward integration.

In the Netherlands there is a relatively high degree of co-ordination between the various stages of the pork production, although among adjacent stages a lack of trust and an adversarial rather than a co-operative attitude is still limiting the development of customer oriented chains. Generally, the change is away from spot markets to other arrangements. However, transfer pricing under emerging arrangements depends extensively on prices generated under supply and demand within the EU-(German) market.

Compared to Denmark and the Netherlands, pork supply chains in Canada and the United States are less co-ordinated. Co-ordination does exist, but open market arrangements are the most common method of exchange between various stages of the chain. In the case of Canada, there is maximum co-ordination via ownership between farrowing and finishing operations and between slaughter and processing operations. Co-ordination between feed and genetics suppliers and hog producers is increasingly moving towards contractual arrangement. Co-ordination is increasing along the chain from feed and genetics suppliers though farrowing and finishing via a combination of ownership and contractual arrangements. There is an increased interest in longer-term contracts between finishing and slaughter-processing operations as well. This represents a move away from the traditional marketing board negotiations with slaughter-processors over prices and deliveries towards an individual production entity relationship with a specific slaughter-processor based on differentiation in the characteristics of hogs produced. The rest of the Canadian pork has an efficient flow of product and information along the chain. Prices are, to a large degree, based on the North American open market.

US hog production is also changing towards being less dependant on market co-ordination: there is a change away form spot markets to other arrangements. However, transfer pricing under emerging arrangements depends extensively on prices generated in the shrinking residual spot markets.

From the above text it will be clear that co-ordination practices are in a state of transition and that external changes in the pork supply chain drive countries and chains in the same direction from the point of view of co-ordination mechanisms.

Figure 8: Most common chain structures in the Pork Supply Chain

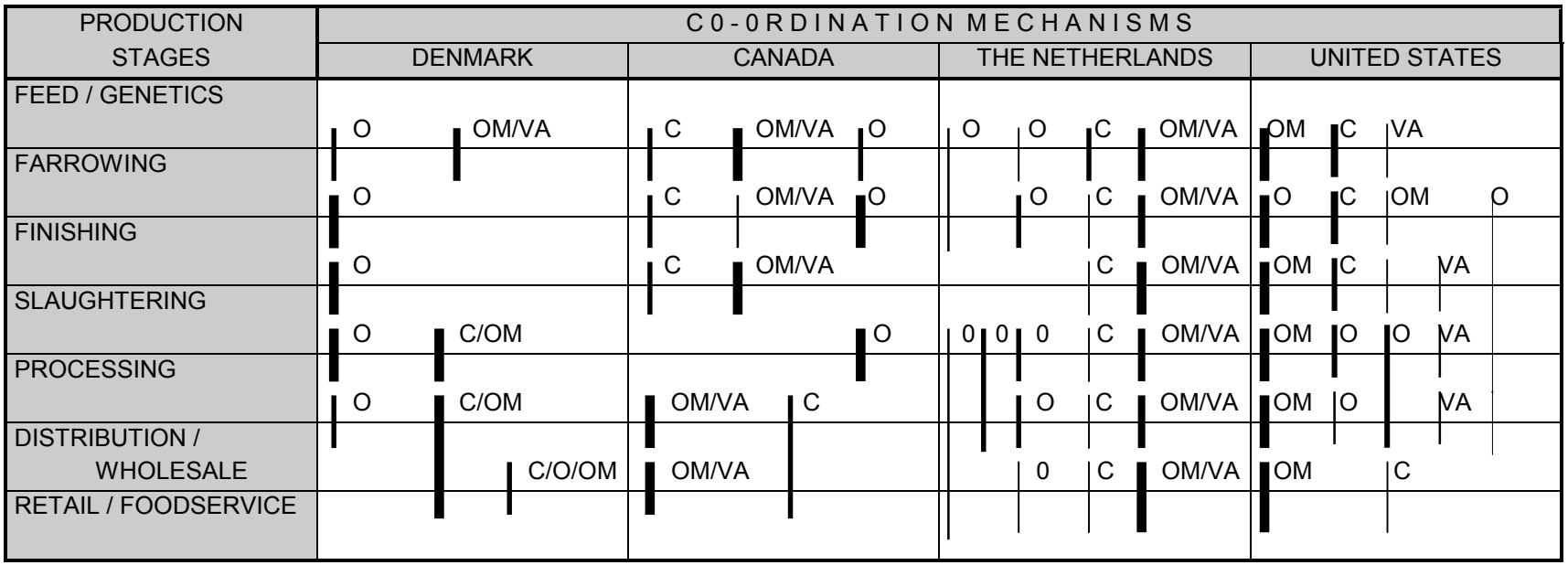
PRODUCTION STAGES	CO-ORDINATION MECHANISMS			
	DENMARK	CANADA	THE NETHERLANDS	UNITED STATES
FEED / GENETICS				
FARROWING	C	C O OM	C OM/VA	OM C OM
FINISHING	O	C O O	O OM/VA	OM C O
SLAUGHTERING	O	C OM OM	OM/VA OM/VA	OM C OM
PROCESSING	O	O O O	O OM/VA	OM VA C
DISTRIBUTION / WHOLESALE	O	OM OM OM	O OM/VA	OM VA VA
RETAIL / FOODSERVICE	C	OM C OM	OM/VA OM/VA	OM VA OM

OM: Open Market
VA: Verbal Agreement
C : Contract
O: Ownership

——— = Not so common
——— = Common
——— = Very Common

This diagram gives an overview of the most common chain structures in the pork industry per country. Arrows show from which stage the initiative comes.

Figure 9: Most common applied co-ordination mechanisms in the Pork Supply Chain



OM: Open Market
VA: Verbal Agreement
C : Contract
O: Ownership

——— = Not so common
——— = Common
——— = Very Common

The diagram gives an overview of applied mechanisms between stages. The level of common features of the co-ordination mechanisms is explained by thickness of the lines. No line means no co-ordination mechanism.

4.2.2 Performance of the supply chain

The competitiveness of a chain depends on the competitiveness of individual stages in the chain and the functioning of the total chain itself. In the Country Reports detailed information is presented on individual stages, e.g. in the field of farm and company size, costprice, quality levels and location aspects. In this summary Project Report, seven core-issues are chosen and used in order to obtain a general impression of how chains are performing in the four countries and the possibilities for development and re-engineering of chains. It is clearly a more or less subjective and qualitative approach restricted to chain issues. The following core-issues are identified:

Market directness is defined as the possibilities to identify and to react on (international) changing consumer and market demands in regard to e.g. product and process development, and in introducing new production methods.

Sector structure is the total of issues that influences the competitiveness of pork supply chains, such as costprice levels, landuse restrictions, location issues, legislation and rules and resource availability.

Chain-orientedness is the total of aspects that stimulates chain co-operations such as chain awareness, chain management skills, attitude of employees, mutual trust and financial stimulating programmes.

Co-ordination mechanisms (contracts, agreements, etc.) are important tools that should be available to be employed at different stages in the chain.

Chain knowledge in the field of Chain-logistics (Value Added Logistics, Electronic Data Interchange EDI, efficient consumer Response ECR, Information Communication Technology ICT), Chain marketing (micro-marketing, tuning supply/demand, priceforming mechanisms, cross-cultural marketing), Chain organisation (chain diagnoses, chain formation, product flow description) and Chain management (management tools, risk management, integral chain care systems).

Chain flexibility is an important issue in consumer driven supply chains due to the importance of continuous product improvement, shorter product life cycles, just-in-time delivery, reduction of stocks, and the higher speed of product flows through the chain.

Chain care systems for food safety, health care, environment, labour, quality, animal welfare, energy use; and re-use of resources will become more and more important to keep the consumers' trust.
In the following diagram a comparison is made between the four countries with regard to the seven core issues. This information is supplied by the authors of the Country Reports. They were asked to identify three factors under strong, two under mean and two under weak.

Therefore, the results have to be seen as relative outcomes. For example, a weak result for Canada on chain flexibility means this country considers its performance on chain flexibility weak with respect to the other subjects.

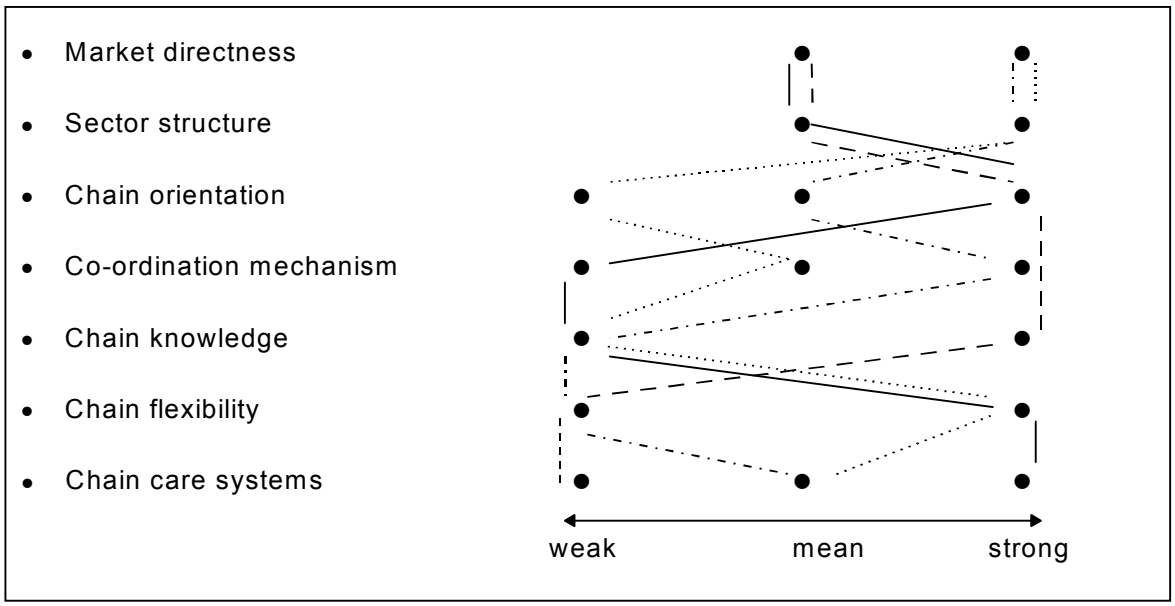


Figure 10: Performance of the pork supply chains per country

comparing the outcomes

It is clear that there are many differences in outcomes between the countries: results show no congruence. With regard to the specific issues it can be stated that the core issue 'chain knowledge' is seen as weak in three countries: the US, The Netherlands and Canada. Denmark, on the contrary, considers its performance on this issue as relatively strong. This reflects that Denmark has presently one of the most integrated and co-ordinated structures for production and marketing of hogs and pork. In line with this, Denmark has the opinion that their performance on 'structure' is strong. At the same time, the country indicates that, due to the future competitive demands, the chain might need time to undergo some changes regarding the structure of the chain (fewer stages) or a change in the ownership structure. Also Denmark thinks that it must improve chain flexibility and chain care systems.
The United States, with a relatively low co-ordinated pork industry, consider their performance on chain orientation weak. Logically their chain flexibility performance is strong. At last, it is noteworthy that none of the countries consider their performance on 'market directness' weak.

4.3 Pressures for change

In this section, there is a description of the pressures for change in the field of demand and consumption, productivity and technology, government policy and resources. Country priorities within these developments are presented and discussed

4.3.1 Changes

The need for structural changes in the international pork industry is the result of a number of pressures. Four categories of driving forces for change are taken into account. Figure 12 shows these four categories including a selected number of developments within each category. Descriptions of the issues can be found in Appendix III. Subsequently, in figures 13 to 16 comparisons are made between the four countries with regard to these developments.

Drivers for change

Demand, consumption and demographics
- healthfulness and safety
- taste and variety
- convenience and freshness
- availability and timeliness
- price
- internationalisation
- product origin
- animal welfare and environmental care
- processing methods

Productivity and technology
- economies of size and scale and specialisation in production
- information technology
- logistic technology
- biotechnology
- environmental technology
- measuring and monitoring technology

Government, regulations and policies
- shift of responsibility from government to industry
- shift from domestic market protection to international market access
- changes in traditional forms of subsidies
- trend towards increased harmonisation

Resources: environment, capital and labour
- location of production
- resources and labour sustainability
- environmental sustainability
- technological advancement and increased awareness

Figure 11: Driving forces for change

4.3.2 Priorities per country

The following four figures present the ranking of several changes by country. This ranking is useful in relation to optimising the pork supply chain on an individual country level. It will also help to get a better mutual understanding of the different pork markets. The information for the following figures is collected by the authors of the Country Reports. Again, authors were asked to identify three items in each category of importance

Demand, Consumption and Demographics

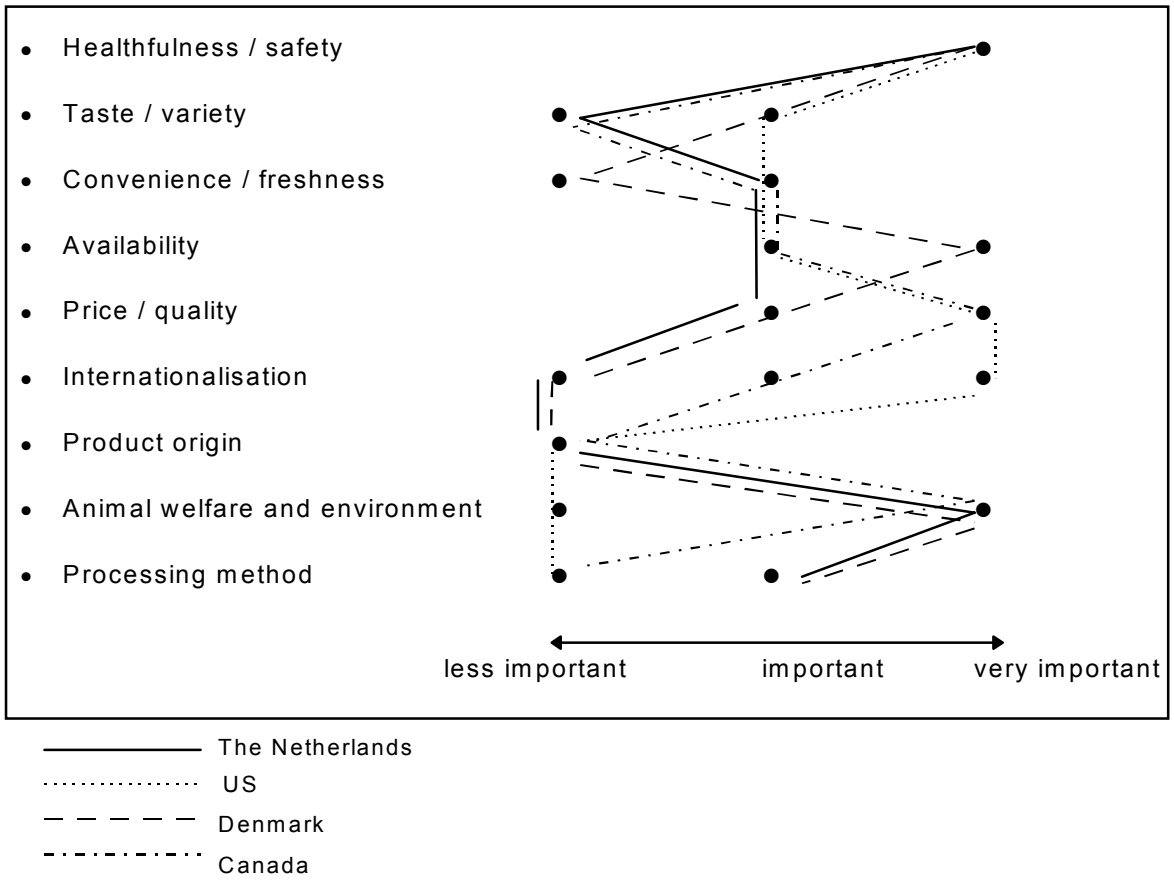


Figure 12: Priorities per country: Demand, Consumption and Demographics

comparing the outcomes

All the participating countries attach high importance to the trend that consumers are becoming increasingly interested in the healthfulness and safety of the food they eat. For the Netherlands, Denmark and Canada, animal welfare and the environment are also issues of

high importance. In the US, however, this item is considered as less important. The issue product of origin is unanimously seen as a less important pressure for change.
With respect to the last core issue it can be stated that consumer interest in husbandry practices and the food given to the animals as criteria for selecting food products has not yet seen such wide development in the North American marketplace as in Europe.

Productivity and Technology

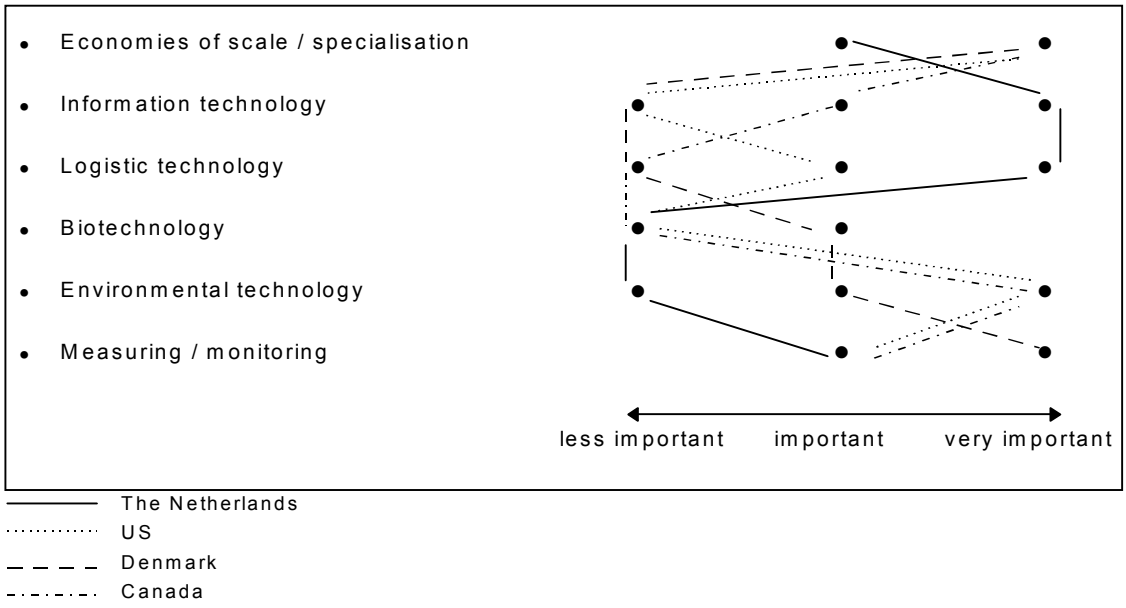


Figure 13: Priorities per country: Productivity and Technology

comparing the outcomes
Regarding productivity and technology developments, it is clear that all four countries state that economies of scale / specialisation is important or very important. Second, the Netherlands attributes high priority to information technology and logistic technology. This is assumed to be due to the price sensitivity of Dutch competition. Efficient use of these technologies reduce costs and make the industry more competitive.
In all four countries biotechnology played an important role in developing high yielding varieties of feed grains and in producing leaner and bigger hogs, though in Canada, the US and the Netherlands this issue is considered to be a less important issue in new developments. Public resistance to genetically manipulated products are assumed to be of influence. The ratings for the Netherlands and the US on the issue of environmental technology are noteworthy. In figure 13, the Netherlands notes high importance to the environment for changes in demands and consumption. As shown in the figure above, this country does not put high importance on environmental technology. For the US the opposite seems to be the case. Environmental technology is seen as very important, but lower priority is given to the environment as to changes in demand and consumption.

Finally, the scores on the last issue show that Denmark attributes higher importance to measuring and monitoring technologies. This suggests that the growing awareness of the upcoming pressure for developing capabilities to track and to gather more information about eating habits and growing conditions, is of major concern for Denmark in developments in technology and productivity.

Government Regulations and Policies

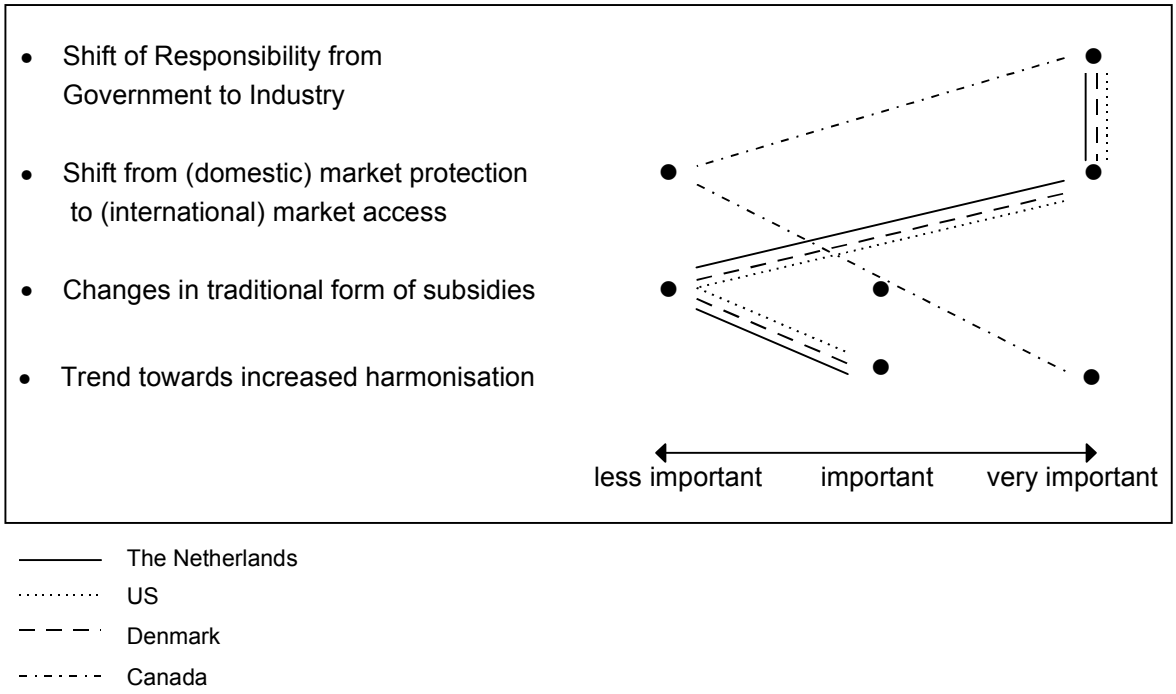


Figure 14: Priorities per country: Government Regulations and Policies

comparing the outcomes

In the field of government regulations and policies the similarity between the Netherlands, Denmark and the US is noteworthy. The three countries allocate the same priorities to the issues of developments in Government Regulations and Policies. The shift of responsibility from government to industry and the shift from (domestic) market protection to (international) market access are considered to be very important for their hog/pork industry.

Canada attaches, like the other three countries, high importance to the shift from government to industry. As a consequence of this shift in responsibility, the pork industry will face higher competition. Most countries consider changes in traditional forms of subsidies to be less important and the trend towards increased harmonisation to be important.

It should be noted that lower priority rankings indicate that these issues have already been addressed. For example, in the case of Canada, the rating for shift from market protection to market access reflects the fact that Canada has always had very low market protections in

the hog / pork sector and additional attention to this factor is therefore not as important to future development of he industry as other factors are.

Resources - Environment, Capital and Labour

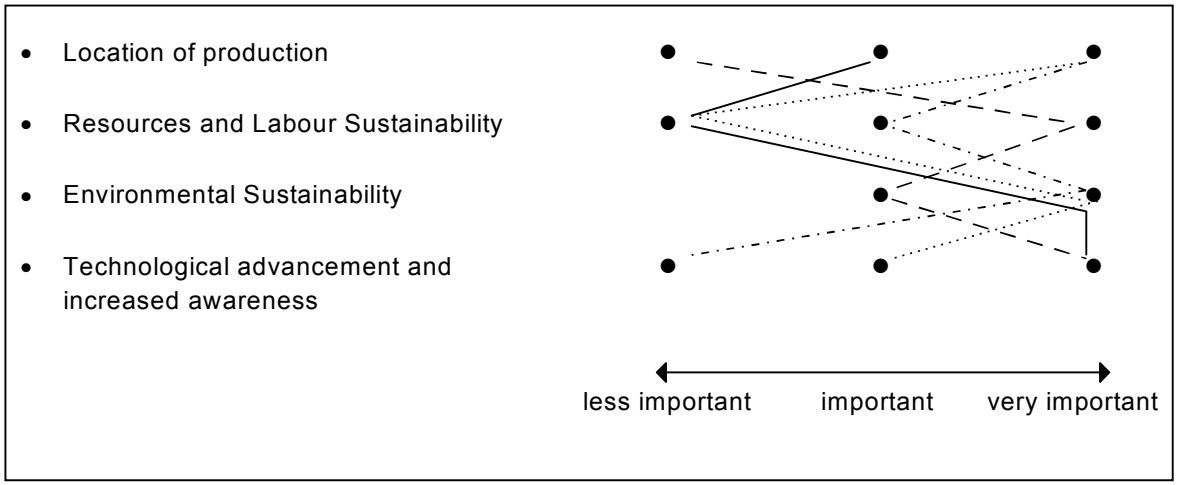


Figure 15: Priorities per country: Resources

comparing the outcomes

As far as Resources - Environment, Capital and Labour is concerned, three countries, the Netherlands, the US and Canada consider environmental sustainability to be a very important issue. They perceive pressure on the industry to adopt environmentally sustainable production practices. Denmark focuses more on resources and labour sustainability, while the Netherlands and the US consider this issue as less important. Notably, the large countries, Canada and the US, consider the issue location of production as more important than the much smaller countries Denmark and the Netherlands do. This may reflect the fact that, being large, these countries have greater options in locating production in areas where population density and environmental risks are low.

4.4 Impacts and capabilities to respond

The pressures for change will have their impact on the pork supply chains. Pork supply chains will try to adapt to these new developments. In doing so they will try to optimise their competitiveness.

4.4.1 Impacts on the business climate

In this section there is a description of the impacts on the business climate. Three different categories of impacts are taken into account:
- Chain differentiation (Product differentiation);
- Chain optimisation (System efficiency);
- Chain care (System management).

Figure 16 shows these three categories including a selected number of issues within each category. Descriptions of the issues can be found in Appendix IV. In the following paragraph comparisons are made to the four countries with regard to the capabilities to respond to these issues.

Impacts on business climate

Chain differentiation (Product Differentiation)
1. increased product and process development
2. market flexibility to meet changing consumer demands
3. differentiation of outlets
4. improved responsiveness and customisation

Chain optimisation (system efficiency)
5. focus on cost control
6. improved risk management
7. logistic optimisation
8. (re)-engineering the chain

Chain care
9. emerging emphasis on chain quality assurance
10. increased attention to chain management
11. more emphasis on knowledge and education
12. shift from horizontal to vertical co-ordination

Figure 16: Impacts on business climate

4.4.2 Capability to respond

The above discussion identifies directions that the pork industry should consider to be competitive domestically and internationally. The question at this point is how capable the industry is of responding to these challenges and the degree to which supporting industries and government further enhance these efforts. This section describes these capabilities to respond and the capabilities to stimulate the industry of both the supporting industries and government.

Capability of the industry to respond

The following diagram indicates the capability of the industry to respond to the driving forces for change and their impacts for each participating country. Whether the apparent capability of the pork industry to address these concerns is “yes”, “more or less”, or “no” is shown by the use of “+”, “0”, “-” signs respectively.

Industry

	Denmark	Canada	The Netherlands	US
Chain differentiation				
1. Increased product and process development	+	0	+	0
2. Market flexibility to meet changing demand	-	+	+	+
3. Shift from retail to foodservice	0	0	+	+
4. Improved responsiveness and customisation	+	+	-	0
Chain optimisation				
5. Focus on cost control	+	+	+	+
6. Improved risk management	-	0	+	0
7. Logistic optimisation	+	+	+	-
8. Re-engineering the chain	-	+	-	0
Chain care				
9. Emerging emphasis on chain quality assurance	+	+	+	+
10. Increased attention for chain management and control	+	+	+	0
11. More emphasis on knowledge and education	+	0	0	0
12. Shift from horizontal to vertical co-ordination	+	+	0	+

Figure 17: Capability of the industry to respond.

comparing the outcomes

Firstly, it appears from figure 17 that all four countries feel that they are capable of addressing the most important chain care issues (with the exception of chain knowledge and education). There is, therefore more concern for chain optimisation issues (risk management and re-engineering activities) and for chain differentiation issues (increased product and process development and shift from retail to food service). Most countries assume, that these issues be given more attention to improve capability of responding. Secondly, Canada seems to be the most optimistic and the US the least optimistic in regard to their capability of responding. One must recognise that the US represents a vast market and a market which, today, depends primarily on commodity pork produced by a sector that is co-ordinated largely by open markets. With regard to the second issue, market flexibility, Denmark is uncertain about their capability of responding to continuously changing consumer demands. There is a potential danger that Danish slaughter companies may focus too much on their present earnings and not enough on upkeeping their future competitiveness in the most important export markets. The US, Canada and the Netherlands suggest that chain management and chain knowledge must be improved. With respect to the last issue, the Dutch pork industry has to gain strength in their shift from horizontal to vertical co-ordination, and improve its responsiveness and customisation. To a greater or lesser degree, all countries have experienced improved efficiencies at individual stages along the pork supply chain. The next challenge will be to focus on optimising the entire chain.

Capability of the supporting industries and government

The two ensuing figures overview the capabilities of supporting industries (figure 17) and government (figure 18) of supporting the industry in its attempt to respond to pressures and impacts. Whether the apparent capability of supporting industries and government of supporting the pork industry to address these concerns is “yes”, “more or less”, or “no” is shown by the use of “+”, “0”, “-” signs respectively.

Supporting industries

	Denmark	Canada	The Netherlands	US
Chain differentiation				
1. Increased product and process development	+	0	+	0
2. Market flexibility to meet changing demand	0	+	0	0
3. Shift from retail to foodservice	0	0	+	0
4. Improved responsiveness and customisation	0	+	0	0
Chain optimisation				
5. Focus on cost control	+	+	+	+
6. Improved risk management	0	+	0	+
7. Logistic optimisation	+	+	+	+
8. Reengineering the chain	0	0	0	0
Chain care				
9. Emerging emphasis on chain quality assurance	+	+	+	0
10. Increased attention for chain management and control	0	+	0	0
11. More emphasis on knowledge and education	+	+	0	0
12. Shift from horizontal to vertical co-ordination		+	0	0

Figure 18: Capability of the supporting industries of supporting the pork industry

comparing the outcomes

Clearly, most activities of the supporting industries of enhancing the pork industry are focused on chain optimisation (cost control and logistic optimisation) and less on chain care and chain differentiation. There are a great number of issues where the supporting industries are neither supporting nor inhibiting. In most countries a more active role of supporting industries may be desirable. In Denmark, the Netherlands and the US supporting industries are less assisting compared to Canada considering responsiveness. Help for improving responsiveness may be welcome with respect to timing and the delivery of products meeting customer specifications. In all the participating countries there is no support in their attempts to re-engineer the chain.

Considering chain care issues, the Canadian industry seems to have the most stimulating supporting industry, while the other countries, especially the US, receive less support. All in all, it can be concluded that supporting industries are not inhibiting, but neither do they enhance the pork industries in all the issues.

Government

	Denmark	Canada	The Netherlands	US
Chain differentiation				
1. Increased product and process development	0	+	0	-
2. Market flexibility to meet changing demand	0	+	0	0
3. Shift from retail to foodservice	0	0	0	0
4. Improved responsiveness and customisation	0	0	0	-
Chain optimisation				
5. Focus on cost control	0	0	0	-
6. Improved risk management	0	+	0	-
7. Logistic optimisation	0	0	0	0
8. Reengineering the chain	0	0	0	0
Chain care				
9. Emerging emphasis on chain quality assurance	+	+	+	+
10. Increased attention for chain management and control	0	0	0	0
11. More emphasis on knowledge and education	+	+	+	0
12. Shift from horizontal to vertical co-ordination		0	0	-

Figure 19: Capability of the government of supporting the pork industry

comparing the outcomes

From figure 19 it is evident that in all the four countries the governments support the industry mainly in the field of chain care (chain quality systems and chain knowledge and education). Only in Canada does the government also stimulate product and process development and market flexibility. It is worth mentioning that the Danish government has some national and EU subsidy arrangements available for investments in e.g. the environment, innovation and labour. All in all, for Denmark and the Netherlands, having lots of “0” scores, the governments are not heavily interfering. For the US, however, with five issues having a ‘-‘ score, it can be concluded that the government response is rather limited. For the Canadian government the opposite can be seen. It has to be mentioned that negative ratings may indicate that government action is not required nor possible given the way the domestic industry / country is structured. In a given country, it may not be appropriate for the government to have a role in some areas.

4.5 Barriers to overcome for the industry

To be able to respond to the described pressures for change it is important for the industry to take away or solve the barriers that impede this. Barriers can exist within the industry itself or be caused by supporting industries or the government. In this section (see figure 20) possible barriers are investigated. For each country, specific barriers and their importance are noted. This table is important for benchmarking the countries with respect to the barriers which impede their progress.

A major factor limiting the development of consumer-oriented chains in all four countries is the lack of 'mutual trust' among actors at various stages. This may be due to a pricing system focusing on commodity production, a product orientation rather than a market orientation and the absence of a 'branding' history. As a consequence, it makes competition sensitive to price. In order to meet the pressures for change, it is necessary to establish mutual trust, to develop chain strategies and to become more customer-oriented.

A second barrier is the physical infrastructure. Possibilities for continued expansion of pig production are restricted. This implies that economies of size and scale may not be realised.

A third important barrier is the chain communication, especially in the Netherlands, the US and Denmark. Product cycles are becoming shorter together with the time required to identify trends developing and to communicate the necessary changes upstream to bring about the change at the appropriate stage or stages. Renewal regarding the mix of products will be required. Data that are generated at the retail level must be analysed in time fashion and communicated to the agents that can take action.

'Willingness to invest' and 'organisational infrastructure' are barriers of high importance for Denmark only. Their highly co-ordinated system may give problems due to the different objectives of the individual farmers and the rest of the pork industry (slaughterhouses, processing companies). Primary producers are not directly interested in keeping capital in the pork industry, while the industry has a need for maintaining the capital in the industry for expansion, research and development, marketing efforts and so on. A possible collapse in the co-operative structure is also important. A change in farmers loyalty against the rest of the chain could be a threat.

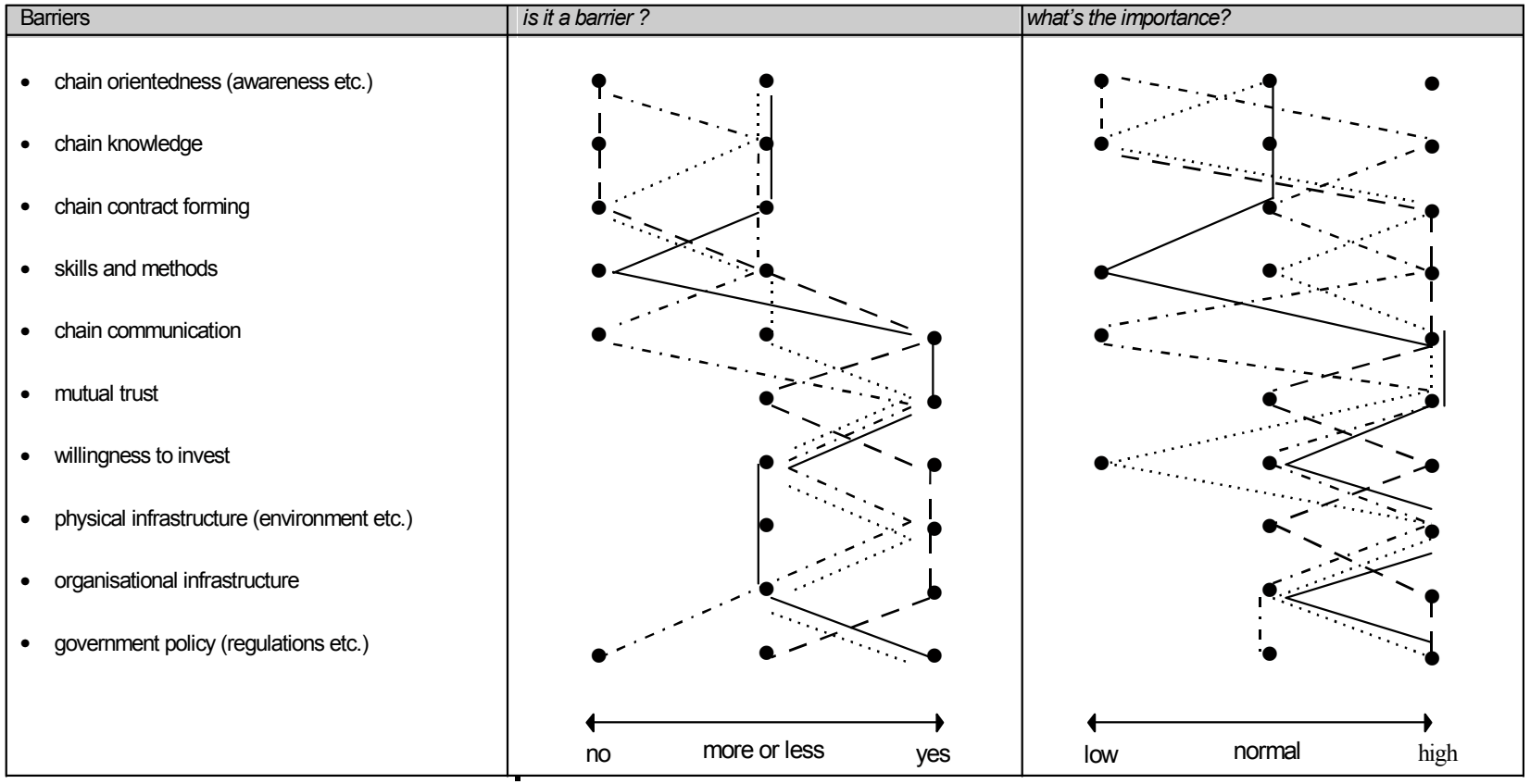


Figure 20: Barriers to overcome for the industry

The last issue, ‘government policy’, is a barrier for both the US and the Netherlands. For the Netherlands, it is expected that great efforts must be made by the entire pork supply chain, if the restructuring policy of the government is implemented. It is expected that 13,000 jobs will disappear. The remaining producers will face high investments. Expansion of production by producers will only be possible if quota are taken over of quitting farmers. This will give a competitive disadvantage. The US pork industry considers the increase in state and local regulation of confined animal production systems important. Moreover the shift of US farm policies away from supply management toward a free market for grains and oilseeds will increase the risks associated with hog production. As shown in the figure above, governmental policies are less restraining for Denmark and, to an even a lesser extent, for Canada. Denmark, however, is convinced that this issue is of high importance.

‘Re-engineering the chain’ is a barrier not mentioned in the figure above, though mentioned in the section ‘Capability to respond by the industry’. All participating countries need a shift from optimising individual stages of the supply chain towards the entire chains. That is, the objective should be to optimise system efficiency rather than optimise each stage separately. For example, while it may be possible to effect product customisation at the processing level, it may be more efficient to accomplish these at the genetic or production levels in the chain.

There are, however, a great number of issues where the supporting industries are not offering enough support. In most countries a more active role of supporting industries may be desirable. In Denmark, the Netherlands and the US more attention is needed for responsiveness.

5. Conclusion

In the country reports a description is given of the conclusions on a country level. In this general project report, the conclusions are mainly concentrated on the comparisons between the countries. The conclusions can be grouped in the following categories:

5.1 Methodology

The four types of arrangements (Open Market, Verbal Agreement, Contract and Ownership), used to describe the co-ordination mechanisms between the subsequent linkages of the pork supply chain form a good basis for comparing chains.

The method for analysing the pork supply chain applied in this research project follow the following five steps: Current situation, Pressures for change, Impacts on the business climate, Capability to respond and Barriers to overcome, proved to be a useful framework.

The seven core-issues used in this benchmark to compare the performance of the pork supply chains form a good starting point for comparing chains, but more research on qualitative and quantitative performance indicators is needed.

Pressures for change have their impact on the pork supply chain. In this study these impacts have been categorised in three sections; Chain differentiation Chain optimisation and Chain care. In comparing chains in the field of their capability of responding to changes this has proven to be a useful and well-working categorisation.

5.2 Co-ordination mechanisms in the pork supply chain

There is one dominant chain structure in Denmark, based on ownership. In the other countries there is more variation in the applied chain structures. The open market structure dominates in the U.S. Canada has similar most common chain structure but tends to have ownership between farrowing and finishing and between slaughter and processing. The Netherlands tends to favour a structure dominated by open market and verbal agreements.

With regard to the co-ordination mechanisms used between the subsequent linkages in the chain it is evident that Denmark has the most integrated structure for production and marketing of hogs and pork. This has been accomplished mainly through the slaughter co-operatives and the development of Danske Slagterier. In comparison with Denmark, the Netherlands, Canada and the United States are less co-ordinated. They do have co-ordination, though there are, to a very large extent, still open markets systems at each stage of their pork supply chains.

In case of the Netherlands, there is a relatively high degree of co-ordination between various stages of pork production, although a lack of trust between adjacent stages and an adversarial rather than a co-operative attitude is still limiting the developments of consumer oriented chains. Trends indicate that the Dutch pork industry is heading towards a more co-ordinated system and also needs more co-ordination, but not necessarily a vertically integrated system.

In the case of Canada, there is maximum co-ordination between farrowing and finishing operations and between slaughter and processing operations. Co-ordination is increasing along the chain from feed and genetic suppliers through farrowing and finishing via a combination of ownership and contractual arrangements. There is increased interest in longer-term contracts between finishing and slaughter-processing operations as well. This represents a move away from the traditional marketing boards negotiations with slaughter-processors over prices and deliveries towards an individual production entity relationship with a specific slaughter-processor based on differentiation in the characteristics of hogs produced. The rest of the Canadian pork supply chain tends to rely on traditional market arrangement or short-term contracts to achieve the efficient flow of products and information along the chain. Prices are, largely, based on the North American open market.

In case of the United States, hog production is moving towards industrialisation and increased management intensity. Virtually all relationships in the pork chain are in transition. Hog production is changing towards less dependency on market co-ordination: there is a change away form spot markets to other arrangements. However, transfer pricing under emerging arrangements depends extensively on prices generated in the shrinking residual spot markets.

To all four countries it becomes clear that the current co-ordination practices are in a state of transition and that external changes in the pork supply chain drive countries and chains in the same direction from the point of view of co-ordination mechanisms.

5.3 Performance

The relative chain performance of the four countries is compared by means of seven core issues: market directness, sector structure, chain orientation, co-ordination mechanisms, chain knowledge, chain flexibility and chain care systems. It is clear that there are many differences in the outcome. Results show almost no congruence.

Denmark is of the opinion that their performance on structure is strong, though their chain flexibility should improve. The Netherlands considers its chain orientation to be rather strong and its performance on co-ordination mechanisms to be weak. The United States and Canada, with relatively low co-ordinated pork industries consider their performance on chain orientation to be weak. It is notable that none of the countries consider their performance on “market directness” to be weak. The core issue “chain knowledge” is seen as week in most countries.

5.4 Pressure for change

All four countries note high importance to the development that consumers are becoming increasingly interested in the healthfulness and safety of food. In the Netherlands, Canada and Denmark animal welfare and environment are issues of high importance. In the US this change is considered to be less important.

All four countries state that economies of scale/specialisation are very important. The Netherlands gives high priority to information and logistic technology. Most countries state that biotechnology is a less important issue in future developments. Denmark attributes a high importance to measuring and monitoring technology.

In the field of government regulations the similarity between the Netherlands, Denmark and the US is remarkable. All three counties state that the shift of government responsibility to industry responsibility and the shift from market protection to international market access are very important issues. Most countries see changes in traditional forms of subsidies as less important than the other issues.

The US, Canada and the Netherlands consider environmental sustainability as very important. Denmark focuses more on resources and labour sustainability, while the US and the Netherlands consider this issue to be less important.

5.5 Impacts and capability to respond

The need for greater diversity, more quality-, quantity- and cost-control, the higher speed of product flow and the growing importance of timely production and delivery in the pork supply chain will decrease open and spot market mechanisms because they can neither handle these issues and will increase vertical co-ordination in the chain.

In all four countries the pork supply chain seems capable of addressing the most important chain care issues, but there is more concern in the field of chain optimisation issues like risk management and chain re-engineering activities. The US, Canada and the Netherlands assume that their chain management and chain knowledge must improve, whilst Denmark doubts its capability of being flexible in the market place.

To a greater or lesser degree, all countries have experienced improved efficiencies at individual stages along the pork supply chain. The next challenge will be to focus on optimising the entire chain.

Most activities of the supporting industries of the pork supply chain are focused on chain optimisation (cost control, logistic optimisation) and less on chain care and chain

differentiation. Here the supporting industries are not really offering support. It can be concluded that supporting industries are not inhibiting, but neither do they enhance the pork industries in all the issues.

To conclude, it is clear that the governments in all four countries mainly support the pork supply chain industry in the field of chain care issues (chain quality systems). Only in Canada does government actively stimulate the product and process development. Regarding Denmark and the Netherlands the governmental contribution to the pork supply chains developments can be noted as rather neutral. Their governments are slightly enhancing developments. For the US the government response is of lower importance, whilst for Canada the opposite can be concluded.

5.6 Barriers to overcome

The lack of mutual trust, restrictions in physical infrastructure (environment) and inadequate systems for chain communication are, in all countries, seen as the most important barriers to improve the pork supply chain. Chain orientedness, chain forming and the organisational structure are seen as less important barriers.

Willingness to invest seems to be an important barrier in Denmark whilst in the US and the Netherlands government policies are seen as a barriers. As seen in the previous chapter all countries also state that the supporting industries are not offering enough support. This, too, forms an important barrier for improving the pork supply chain.

To conclude, it becomes clear that in all countries the attitude of the individual stages is still more focused on improving the stage results in stead of improving the results of the entire chain. A shift in the attitude from stage re-engineering to chain re-engineering is therefore necessary to improve the competitiveness of the pork supply chain. This applies to all four participating countries.

6. Recommendations

As mentioned before, this benchmark study has an experimental character. Until now there was hardly any experience in the benchmarking of chains, nor were there chain-benchmark methodologies available. Because the results have an inventory, qualitative, subjective and more or less broad character, this project should be seen as a starting point for further activities and research on vertical co-ordination in chains. The recommendations in this chapter must be read in that context.

These recommendations, are addressed to ACC. According to all the authors of the Decanethus study, follow-up activities will need ACC as initiator. Clearly, three categories of recommendations can be taken into account:

1. Development of a toolbox
2. Further research
3. Widening the benchmark

Development of a toolbox

The performance of the pork supply chain is measured with the help of seven core issues. It is necessary to conduct more research into other possible core issues, into the relevance of every issue and, into more qualitative and quantitative performance indicators per issue. Research into both co-ordination mechanisms and into performance indicators can result in a “toolbox” for analysing and comparing chains. It is recommended the authors of this Decanethus study be stimulated by ACC to continue research into this field with a sequence project. A more sophisticated toolbox is presumed to be more attractive for the industry.

Further research

The need for consumer responsiveness, food safety, new technology and increased pressure for efficiency, changes the pork supply chains in all countries. In the next decade, they will convert to more co-ordinated systems. A strategic question for the industry is whether to strive for a co-ordinated pork supply chain or even for a fully integrated pork supply chain. It is recommended research into questions like how much co-ordination is desirable, how to manage the co-ordination, who has control, where the gains (if any) will reside and into comparing vertical integration and vertical co-ordination be stimulated.

The pork sector is moving from a commodity market to a more differentiated, fast moving market. One of the consequences is that this leads to a change in the role and function of resources. In the commodity markets physical and financial/cost resources (hard assets) are important, whilst in more differentiated markets resources like added value, information and communication technology, research and development, time to market, and innovation flexibility (soft assets) become more and more important. It is recommended that research into and attention to this shift of resources be increased.

The most important barrier in all four countries for further development of the pork supply chain is the lack of mutual trust. This lack has also financial, organisational, social, cultural and human backgrounds. It is strongly recommended that research be increased (awareness, attitude, skills, chain behaviour) in order to illuminate the understanding of mutual trust and the possibilities to improve this.

The four items that were applied to describe the co-ordination mechanisms proved to be useful for comparing chains. However, they were mainly focused on product flow. It is necessary that this be widened to the information flow (data exchange, data mining, data sharing etc.) and the financial flow (risk management, cost- and profit sharing etc.) In addition, it is necessary that the quantitative description of the mechanisms is deepened. It is therefore recommended to continue research in this field with a sequence project.

Widening the benchmark

As far as the pressures for change and the capability of responding are concerned, priorities and rankings were filled in by the working group members from the participating research institutes. So the results are restricted, based on mainly desk research, more or less subjective and unreliable from a statistical point of view. It should be recognised that this was not the objective of the project either. Attention was focused on describing the co-ordination mechanisms and developing the benchmark methodology. Nevertheless, ACC is recommended that:

- research with a larger group of representatives from the industry, the supporting industries and the government be repeated in order to gain less subjective and more statistical reliable results. This will also improve the support of the industry and refine the framework.
- future research be focused on individual supply chains. Comparing pork supply chain on a country level gives limited results because chains are more and more active internationally and because there are large variations and differences in the existing pork supply chains in different countries.

APPENDIX I: The DECANETHUS project participants

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APPENDIX II: Background Reports

Country Reports (public reports)

Denmark
Hundahl, L.S., and C.M. Laursen, *A Multi-Country Study of Vertical Integration in the Hog/Pork Industry: Danish Report*, Centre for market Surveillance, Research and Strategy for the Food Sector, Aarhus, 1998
Canada
Srivastava, R., and J. Bamford, *Vertical Co-ordination in the Canadian Hog/Pork Industry*, Agriculture and Agri-Food Canada, Ottawa, May 1998
The Netherlands
Ziggers, G.W., *A Multi-Country study of vertical co-ordination in the Hog/Pork industry: Dutch Report*, Wageningen Agricultural University, Wageningen, The Netherlands, March 1998
Unites States
Schrader, L., *Co-ordination in the United States Pork Chain*, Purdue University, West Lafayette United States, November 1997

Case Studies (public studies)

Denmark
proceeding
Canada
Maijers, W. and H. Folkerts, *Alberta Pork Producers Development Corporation & Western Hog Exchange: A Case description on vertical co-ordination in Canadian pork industry*, Agri Chain Competence Foundation (ACC), Rosmalen, The Netherlands, 1998
The Netherlands
Folkerts, H. and M.G.M. Peters, *Sturko: A case description on vertical co-ordination in the Dutch pork industry*, Rijnconsult, Velp, The Netherlands, 1998
Unites States
Maijers, W., and M.G.N. Vernooij, *Farmland Industries: A case description on vertical co-ordination in the American pork industry*, Agri Chain Competence Foundation (ACC), Rosmalen, The Netherlands, 1998

These Reports and Cases are available at the DECANETHUS project participants and will be published on internet (www.akk.nl).

APPENDIX III: Pressures for change

Demand, Consumption and Demographics

(a) *Healthfulness and safety:* a general trend in consumption of meat is that consumers show more interest in healthfulness and safety and ask for more information on food labels.

(b) *Taste and Variety:* There is a trend towards higher demands for taste and variety. Society is also becoming more divers and eating habits are in the process of defining a distinct life-style, but also drawing attention to the native populations.

(c) *Convenience and Freshness:* There is more need for convenience, therefore an increased demand for ready-to-cook and ready-to-eat products. There still is a great demand for fresh products.

(d) *Availability and Timeliness:* Availability and timeliness are not issues in terms of production, but efforts have to be made to meet retail and food service industry demands with regard to multiple and just-in-time deliveries. 'No sellings' /'out of stock' is no longer allowed.

(e) *Price:* Consumers are more aware of price/quality relationships. On the other hand, luxury foods are very sensitive to changes in income. Meat in general tends to be sensitive to price rise/drop, but is less sensitive to increase/decrease in income.

(f) *Internationalisation:* In the international market developing countries are steadily increasing in significance for the food industry, especially East Asia. The correlation between food consumption levels and economic factors, such as income and food prices, is most close in these markets. When income rises, meat seems to be one of the products with the highest growth potential.

(g) *Product Origin:* Consumers show more concern about the origin of the product. In export markets customers are more concerned about food safety.

(h) *Animal Welfare and Environment:* Consumers show more concern about animal welfare. Pork producers face more and more regulation and restrictions with regard to production systems.

(i) *Processing Methods:* Pork consumers, mainly in Northern Europe, show significant concern about the processing methods. There is concerns about the use of genetically modified soybeans in the feed rations for pigs for slaughter.

Productivity and Technology

(a) *Economies of Size and Scale and Specialisation in Production:* The entire pork supply chain is subject to economics of size and scale as well as specialisation of production. Productivity is still increasing because of improved technology, automation and improved use of capacity. Access to high technology is increasingly becoming a critical success factor for the food industry.

(b) *Information Technology:* Use of information and communication technology (ICT) is becoming a need to operate competitive and cost effective. Information technology is being used for a number of reasons including, monitoring market trends, price movement, electronic consumer response and data warehousing.

(c) *Logistic Technology:* Technology in packaging, advertising, stock control, transporting and distributing various products. Electronic Consumer Response (ECR) is developing very fast. Efficient use of such technology reduces cost and makes an industry more competitive.

(d) *Biotechnology*: Use of biotechnology is one of the options available to the industry to stay more competitive and cost efficient and to meet environmental goals. However, consumers have shown increasing concern about the use of biotechnology.

(e) *Environmental Technology*: The industry can use modern waste management technology for dealing with the problem of manure disposal, odour, energy use and water pollution. In order to stay competitive, use of cost efficient waste management techniques is a necessity.

(f) *Measuring/Monitoring Technology*: As a result of increasing consumers' desire to have more information printed on the product labels, the use of technology to track and trace products is paramount. The industry is aware of the issue of tracking and tracing and of addressing consumers' desire towards well-labelled products.

Government Regulations and Policies

(a) *Shift of Responsibility from Government to Industry:* There is an increased number of activities/roles that were formerly performed by the government but presently by the industry, f.e. food safety, labour care and environmental care.

(b) *Shift from (domestic) market protection to (international) market access:* As a result of recent trade negotiations and other developments, trade barriers and market protections are disappearing slowly. As a result of globalisation, focus of the trade negotiations is more on increased market access in the importing countries.

(c) *Changes in traditional form of subsidies:* Recent WTO trade agreements and various bilateral negotiations have resulted in reducing or completely eliminating the traditional form of subsidies. In the absence of subsidies, the industry has to be more cost-efficient to compete in both domestic and world markets.

(d) *Trend towards increased harmonisation:* Increased harmonisation in policies and regulations reflecting to product description, safety, contents etc. between the trading nations. This will result in a more honest and competitive structure. Increased harmonisation helps facilitate trade between countries but it also involves new costs for the industry.

Resources - Environment, Capital and Labour

(a) *Location of production:* Space for production is limited in many areas by regulation. This puts restrictions on continued expansion.

(b) *Resource and Labour Sustainability:* With an increased competition, there is a growing pressure on the industry to optimally use resources and, where possible, to recycle the resources as well. Pork production has become and will become more knowledge-intensive. This requires for a skilled and flexible workforce. On the other hand, the meat processing industry is suffering from a poor image concerning labour conditions and its workforce does have a relatively low educational level where today's technology requires better-trained and skilled workers.

(c) *Environmental Sustainability:* There is increased pressure on the industry to reduce environmental pollution and prevent the industry from further polluting air and land.

(d) *Technological advancement and increased awareness:* Recent advancements in breeding techniques, manufacturing, distributing, and information technology have increased awareness of producers, processors, packers, distributors and consumers. Most of these technological advancements have introduced various time-saving and cost-efficient methods at various stages of the pork chain.

APPENDIX IV: Impacts on the business climate

Chain differentiation (Product Differentiation)

1. *Increased product and process development:* Consumption trends indicate that there is a shift from meals prepared at home to meals eaten away from home or purchased fully prepared for use at home. This implies further moves toward tight production specification, including portion control and emphasis on uniform eating quality. It implies also closer working relationships in the pork supply chain.

2. *Market flexibility to meet changing consumer demands:* Greater flexibility, speed, and accuracy will be required in the pork supply chain to meet changing consumer demands and to react in the time required to identify trends as they develop and to communicate the changes needed upstream to effect change at the appropriate stage or stages.

3. *Differentiation of outlets:* In imitation of the consumer differentiation (mass-individualisation) the distribution structures are also differentiated: food service markets, stadions, home delivery, electronic shopping, fast-food restaurants and sport canteen, etceteras.

4. *Improved responsiveness and customisation:* To meet changing markets, a higher degree of co-ordination from consumer to genetics will be required for pork supply chains to consolidate or to increase its share of the domestic meat market and to expand sales in a (world) market. Responsiveness will need to be enhanced both with respect to timing and the delivery of products and meeting customer specifications.

Chain Optimisation (System Efficiency)

1. *Focus on cost control:* Increased competitiveness among the pork producing countries has forced the industry to control costs throughout the supply chain. This results in an increased need for co-ordination between various stages of pork production to realise cost and production efficiency.

2. *Improve risk management:* Customers, particularly in the food service and retail markets, want stable prices. Access to capital is improved with improved risk management. However, changes in support policies and a more open world market substantially increase the risk exposure at the production levels. A system approach will allow for measures to reduce or manage risks more effectively than attempting to accomplish this on an individual stage basis.

3. *Logistic optimisation:* There is a growing pressure on the industry to adopt newer and better management skills with efficient technology in the area of information exchange, packaging, transportation and distribution. Retailers, food service firms and the industry consider inventories as an expense and will more and more insist on just-in-time-delivery of

products. Slaughter and processing firms focusing on a national or international market may not always have plants suitably located to serve all portions of a particular market. In Europe, this leads to a certain level of re-allocation of production, processing and distribution facilities. This chain management consists of chain forming, chain strategy, chain planning, chain operations and chain control. For this, chain management and chain information systems are indispensable.

4. *Re-engineering the chain:* Effective competition also requires that the system operates efficiently. This requires optimisation of the full chain rather than a focus on each stage. That is, the objective should be to minimise system cost rather than minimising cost at each stage. While it may be possible to effect product customisation at the processing level, it may well be more efficient to make those at the generics or production levels in the chain.

Chain Care (System Management)

1. *Emerging emphasis on chain quality assurance:* Consumers are asking for more information about the product that includes feed types used, production technology, processing methods, use of drugs, chemical residues in the product etc. This led to a need for developing advanced tracking and tracing capabilities and increased co-ordination among the various stages of the pork chain. Hazard Analysis and Critical Control Points systems are being put in place.

2. *Increased attention for chain management:* Changing markets imply an emphasis on managing the full chain from genetics through retailing based on the demands of the customer. A shift in regulations from complete reliance on government inspection to (assigned) government monitoring of quality programmes places additional responsibility on the private sector. Procedures and arrangements will be necessary to assure that all participants are doing their parts.

3. *More emphasis on knowledge and education:* There is a pressure on the industry to improve skills of labours, both at production and at processing levels. This becomes necessary to minimise the cost of production and transaction throughout the chain, but also due to the rapid development of technology.

4. *Shift from horizontal to vertical co-ordination*: In response to changing consumer demands and increased competitiveness among the pork producing countries, various stages of pork production need to co-ordinate vertically to achieve both production and cost efficiencies. There is a shift from sector and country level solutions and structures to different chain level solution.

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1 Stages of Pork Production
2 Project organisation of the DECANETHUS project
3 Activities and results per phase of the project
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APPENDIX VI: Abbreviations

ACC	Agri Chain Competence Foundation
C	contracting
Decanethus	Denmark Canada The Netherlands United States
ECR	Efficient Consumer Response
EDI	Electronic Data Interchange
e.g.	exempli gratia
EU	European Union
f.e.	for example
FSU	Former Soviet Union
ICT	Information Communication Technology
IKB	Integrated Chain Control
KGs	kilograms
L	legislation
MAPP	the Aarhus School of Business
n.a.	not available
O	ownership
OM	open market
prod.	production
US$	American dollar
VA	verbal agreement
VAL	Value Added Logistics
VAT	Value Added Tax
WTO	World Trade Organisation

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