Improving the quality of pork and pork products for the consumer

Development of innovative, integrated, and sustainable food production chains of high quality pork products matching consumer demands

Klaus G. Grunert

*MAPP Centre for Research on Customer Relations in the Food Sector, Aarhus University, Denmark*

www.q-porkchains.org
Green growth is smart growth

- Sustainable growth in the agricultural sector requires research-based innovation
- Research needs to
  - cover all aspects of sustainability – environmental, social and economic
  - cover the whole food chain and not only the agricultural sector
  - be based on cooperation of researchers from different disciplines
Q-PorkChains - Facts

An EU FP6 integrated project

Lifetime: 60 months (January 2007 – December 2011)

62 partners
- Europe (DK, NL, DE, SE, GR, BE, UK, PL, ES, FR, FI, IE, IT, NO, HU, BG).
- Non-European countries (CN, ZA, BR, US)

Budget: 20.7 million € (70% from EU)

Project coordinator
Prof. Anders H. Karlsson
University of Copenhagen
Denmark
Over 46% of all meat consumed in the EU is pork, with the figure surpassing 50% in some Member States, and EU produces over a fifth of the world’s pork.

The high demand has also increased consumer interest. The quality, healthiness and safety of pork and its products is a crucial issue for consumers who are also interested in how pigs are produced.

Meanwhile, producers need production systems that are both profitable as well as environmental sustainable, in order to stay competitive.
Consumer
citizen roles
Attitudes to pig production
Pork consumption

Europeans vis-à-vis pig production and pork consumption
Findings from the Module | pan-European consumer survey

The quantitative survey related to European citizens' attitudes towards pig production systems and pork consumption behaviour was undertaken in module 1. Data obtained from 1,911 households in four European countries (Belgium, Denmark, Poland and Germany) were used. The overall objective of the study was to map peoples' attitude towards pig meat production systems, and to investigate whether these attitudes associate with pork and pork product consumption. Therefore, a two-fold segmentation study was performed.

The first segmentation task was based on people's attitudes towards pig farming and its characteristics, from the perspective of the citizen. Clear-cut clusters of citizens were identified, which pay attention to specific pig farming attributes (environmental conscious, animal welfare conscious, and citizens who support "green" small-scale pig farming), in addition to one cluster that covers the bulk of ambivalent average citizens. The second dimension that clusters consumption behaviour, thus from the perspective of the consumer role, frequencies of pork consumption were relatively high within the overall sample. One cluster (high variety/ high frequency) clearly stands out in terms of pork consumption frequency.
The overall objective of the study was to map peoples’ attitude towards pig meat production systems, and to investigate whether these attitudes associate with pork and pork product consumption.

Europeans vis-à-vis pig production and pork consumption

Findings from the Module I pan-European consumer survey

The quantitative survey is based on European consumer behaviour in relation to pig production systems and pork consumption, and is undertaken in Module I. Data was obtained from 1,903 households in four European countries (Belgium, Italy, Ireland and Spain). The overall objective of the study was to map peoples’ attitudes towards pig meat production systems, and to investigate whether these attitudes associate with pork and pork product consumption.

The first segmentation task was based on people’s attitudes towards pig farming and its characteristics. This task revealed that people assign most importance to animal and environmental well-being, rather than the technical and process characteristics, as criteria to discriminate between “good” and “poor” pig farming practices. Moreover, three small disabled clusters of citizens were identified, which pay attention to specific pig farming attributes (environmentally conscious, animal welfare conscious, and citizens who support greater small-scale pig farming), in addition to one cluster that covers the bulk of respondents across citizens. As such, these clusters seem to have the highest levels of consumption and are associated with specific consumer attitudes towards pig farming.

The second segmentation task was based on people’s reported pork consumption behaviour. This segmentation task was based on the perspective of the consumer: the frequencies of pork consumption were relatively high within the overall sample. One cluster (high frequency) stands out in terms of pork consumption frequency. This segment consists of consumers who are likely to be the early adopters of new pork products. Owing to their market and innovation, the consumers are likely to be the early adopters of new pork products. Among the second “high frequency” cluster, a

Consumer

Consumer
that people assign most importance to animal and environmental well-being, rather than the resulting end product characteristics, as criteria to discriminate between “good” and “bad” pig farming practices. Moreover, three small-sized,
Primary production
• Production systems
  • Breed
  • Housing and rearing conditions

Relevant sustainability parameters
Evaluation of the sustainability of 15 contrasted pork production systems

Research for assessing the sustainability of 15 contrasted pork production systems at farm level. The aim is to increase knowledge on the strengths and weaknesses of the variety of pork production systems existing in Europe and to derive opportunities and possibilities for future development.
Figure 1. The 10 differentiated systems currently being evaluated for sustainability in Denmark, France, Netherlands, Spain and United Kingdom. In each country, 2 differentiated systems are evaluated against a conventional one. The main claims for differentiation are given between brackets.
Nutrition enhancement of pork products
- Reduced fat and sodium content
- Addition of prebiotic and probiotic cultures to produce safe, health promoting products

Development of convenience pork products

Pork and meal patterns
- Use of pork depending on time, situation, availability
- Satisfaction with pork products

Idea generation, concept development and testing
- Consumer acceptance and market potential
Medallions
Gammon Roast
Ribs
Collar Roast
Tenderloin
Shoulder
Liver and Kidney
Minced Meat
Sausages
Skewers
Small Cuts
Scallops
Mixed Sliced Meat
Stuffed Meat
Cordon Bleu
Marinated
Spaghetti Bolognese
Pizza
Lasagne
Cooked Ham
Salami
Dry Cured Ham
Wieners and Frankfurters
Dry Cured Meat
Pizza Toppings
Canned Meat
Weekday
Any Day
Weekend
Special Occasion
Alone
Family
Friends
Other Company
At Home
Away from Home
Overall Satisfaction
Value for money
Taste
Health
Convenience
Liver Pâté
Overall Satisfaction
-0.80 -0.60 -0.40 -0.20 0.20 0.40 0.60 0.80 1.00
-0.80 -0.60 -0.40 -0.20 0.00 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
European pork chains
Diversity and quality challenges in consumer-oriented production and distribution

- Governance: contract forms, integration, coordination
- Sustainable logistics
- Feed, breed
- Farming
- Processing
- Customer channel
- Information systems
- Quality Management Systems

Product management
Quality management
Sustainable management
Nutrition management

Product quality
Nutritional value
Nutritional content
Nutritional profile
Nutritional characteristics
Nutritional composition
Nutritional aspects
Nutritional content
Nutritional profile
Nutritional characteristics
Nutritional composition
Nutritional aspects

Consumer

Product production

Feed production

Quality control

Product management
Quality management
Sustainable management
Nutrition management

Product quality
Nutritional value
Nutritional content
Nutritional profile
Nutritional characteristics
Nutritional composition
Nutritional aspects
Nutritional content
Nutritional profile
Nutritional characteristics
Nutritional composition
Nutritional aspects

Customer channel

Governance: contract forms, integration, coordination

Information systems

Quality Management Systems
Breakdown of GHG emissions from pork chain by process unit

- Feed use (soy meal) - 0.7 kg CO₂e/kg meat slaughter weight
- Feed use (cereals, mineral feed) - 2.8 kg CO₂e/kg meat slaughter weight
- Manure export - 1.4 kg CO₂e/kg meat slaughter weight
- Slaughtering
- Transport of feed
- Transport of weaners and finishers
- Transport of meat
Transport and its contribution to global warming

Slaughtering in Denmark

Global warming
+ 8%

Global warming
+ 3%

Distance: 300 km

Hamburg in Germany

Global warming
+ 0.2%

Distance: 670 km
1 day, + 5°C

Harwich in UK

Distance: 21,000 km
40 days, -20°C

Tokyo in Japan

Global warming
+ 7%

Global warming
+ 3%

Global warming
2.4 kg CO₂- eq. per kg pork from farm gate

Global warming
+ 0.2%

Global warming
+ 3%

Distance: 670 km
1 day, + 5°C

Harwich in UK

Global warming
+ 0.2%

Distance: 21,000 km
40 days, -20°C

Tokyo in Japan

Global warming
+ 7%
Small-scale pork chains are regional chains, which include the biological/organic chains. They deliver mostly regionally and high-quality products to local markets. Their importance is expected to grow, as European consumers increasingly demand regional products at high quality. In contradic-
tion, large-scale production has international sourcing and trade, and professionalization of the chain links.

A regional chain has therefore some complementary challenges in the production. Due to their special character and smaller dimensions, they are more vulnerable and are forced to adjust themselves continuously to the changing requirements of consumers. On the other hand, they can often sell the products at a higher price due to the higher added value (i.e., food safety and quality level) of their special products. Two examples of such regional chains are the Mangalica pig from Hungary and a small chain in Middenbeemster in the Netherlands.

Mangalica pig
The most common types of Mangalica pigs in Hungary are the Blonde, the Swallow-Bellied, and the Red Mangalica. The meat is characterised by a high degree of Intramuscular Fat (approx. 7.5-9%), high extent of satu-
rated fat and the meat has a strong taste and has a high juiciness. Consumption of this meat containing proteins, fatty acids and other nutrients in optimal proportion and composition is very healthy. In addition, the meat is

In module IV inventories of existing pork chains in Spain, Hungary, Greece, Germany, Netherlands, China and South Africa are being compiled with the aim to achieve extensive insight into the structure and variety of the European and international pork systems. Special attention is given to regional production systems, as these have a special place in the European market.
Pilot Chain

Implementation of regional pork chain concepts and new pork product concepts

Greek business group

German partner

Research partners
Selecting muscle and fat tissue

Analyse for omics and MQ traits

Relationships among omics and meat quality traits

Select genes for confirmation

Select genes and proteins for validation

Development of tools by industry

**FIGURE 1.** The relationships between the genome and the technologies for evaluating changes in gene expression (transcriptomics), protein levels (proteomics), and small-molecule metabolite effects (metabonomics).
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