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

Meat safety

Health

Economy

Meat quality

Society

Sustainable Development

Animal Welfare

Working conditions

Environ-mental impact

Environment

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

Background & Motivation

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.

Innovative Sustainable Production Chains

Product quality
- Eating quality
- Technological quality
- Nutritional quality
- Food safety
- Environment
- Animal welfare

Consumer
- Consumer/citizen roles
- Attitudes to pig production
- Pork consumption

Product development
- Fat reduction
- NaCl reduction
- Iron bioavailability
- Health
- Safety
- New technology
- Market acceptance
- User-driven innovation

Knowledge synthesis
- Modelling
- Meat quality
- Meat safety
- Animal welfare

Dissemination
- E-learning
- Training
- PR

Industry
- Pilot activities
- Demonstration activities
- Implementation

Chain management
- Legislation
- Chain Logistics
- Life cycle assessment
- Chain types
  - Regional chains
  - Intensive chains
- Market differentiation
- Quality management systems
- Chain innovation
- Chain communication

Primary production
- Production systems
  - Breed
  - Housing and rearing conditions
  - Feeding
  - Slaughter age and weight

Quality control
- Biomarkers
- Eating quality
- Technological quality

Q - PORK CHAINS

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Innovative Sustainable Production Chains

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Consumer

Consumer/citizen roles

Attitudes to pig production

Pork consumption

Newsletter — PORK CHAINS
March 2009 · Number 4

Consumer — PORK CHAINS

Europeans vis-à-vis pig production and pork consumption

Findings from the Module I pan-European consumer survey

By Wim Verbeke, University of Gent

The quantitative survey related to European citizens' attitudes towards pig production systems and pork consumption behaviour was undertaken in module 1. Data obtained from 1931 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, thus from the perspective of the citi-
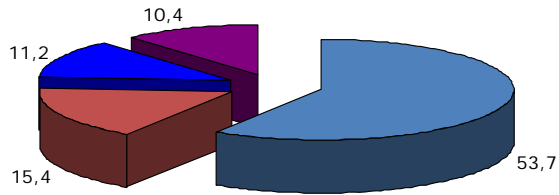
clear-cut clusters of citizens were identified, which pay attention to specific pig farming attributes (environmentally conscious, animal welfare conscious, and citizens who support "green" small-scale pig farming), in addition to one cluster that covers the bulk of ambivalent average citi-zens. It thus becomes clear that atti-

sumption 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. This segment consists of consu-mers who seem to accept all kinds of

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The first segmentation task was based on people's attitudes towards pig farming and its characteristics, thus from the perspective of the citizen role played by respondents. This task showed 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, clear-cut clusters of citizens were identified, which pay attention to specific pig farming attributes (environmentally 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. It thus becomes clear that attitudes towards environment and nature, animal welfare and the need for an environment-friendly food production are related to specific citizens' attitudes towards pig farming.

The second segmentation task was based on people's reported pork 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. This segment consists of consumers who seem to accept all kinds of pork products, and herewith represent a potentially lucrative target market for novel pork products. Owing to their interest in novelty and innovation, these consumers are likely to be the early adopters of new pork products. Among the second "high variety/medium frequency" cluster,

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Pie chart values: 53,7 · 15,4 · 11,2 · 10,4

- Broad majority with weak attitudes
- Environmentally conscious
- Animal welfare conscious
- Small farming supporters
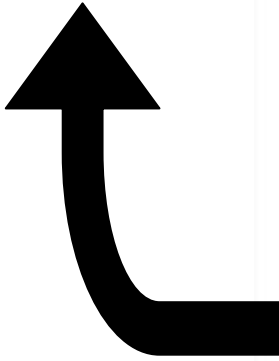
Consumer

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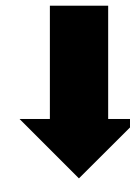
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Q-PorkChains is funded by 6th Framework Programme

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Primary production

- Production systems
  - Breed
  - Housing and rearing conditions

Relevant sustainability parameters

Evaluation of the sustainability of 15 contrasted pork production systems

By Michel Bonneau

A group of scientists, led by Michel Bonneau from INRA in France has within Module II of Q-PorkChains research for assessing the sustainability of 15 contrasted pork production systems at farm level. This work is com- plementary to the studies on pork production chains that have been, and are currently being developed within the module IV of Q-PorkChains. The aim is to increase knowledge on the strengths and weaknesses of the va- riety of pork production systems existing in Europe and to derive op- portunities and possibilities for future development taking into account all the relevant dimensions of sustainability, na- mely economy, society and environ- ment.

The 15 contrasted production systems are presented in Figure 1. In each of the 5 participating countries, 2 diffe- rentiated systems (differentiation is ba- sed on one or several claims, the main one being presented in Figure 1) are ▶
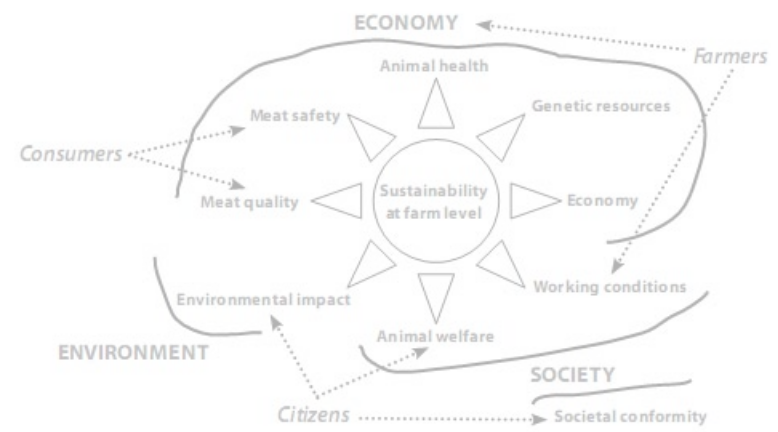
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Frilandsgrise Øko- logisk (Organic)

Bornholmergrisen (Local)

Organic (Organic)

Outdoor (Welfare)

Label rouge (Eating quality)

Basque (Local)

Mallorcan Black (Local)

Iberian Intensive (Eating quality)

Milieukeur (Welfare)

Canadian Bedding (Environment)

Four systems in colla- boration with Pilot 5 within Module A

Figure 1. The 10 differen- tiated systems currently being evaluated for su- stainability in Denmark, France, Netherlands, Spain and United Kingdom. In each country, 2 differenti- ated systems are evaluated against a conventional one. The main claims for differentiation are given between brackets

Figure 2. The **dimensions** evaluated in the handbook of tools and the corre- sponding **ISSUES** and most involved **stakeholders**

ECONOMY

Animal health

Meat safety

Genetic resources

Consumers

Meat quality

Sustainability at farm level

Economy

Environmental impact

Working conditions

Animal welfare

ENVIRONMENT

SOCIETY

Citizens

Societal conformity

Farmers

Frilandsgrise Øko-
logisk (Organic)

Bornholmergrisen
(Local)

Organic (Organic)
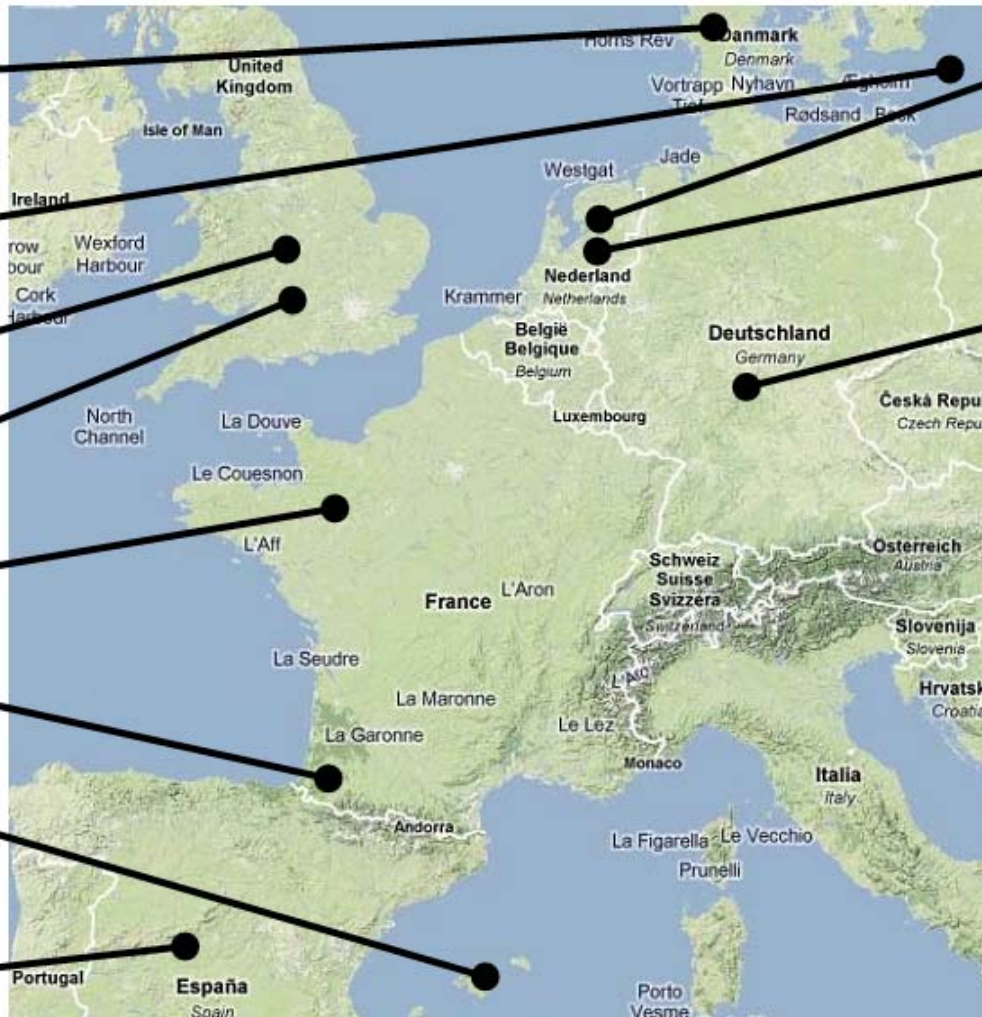
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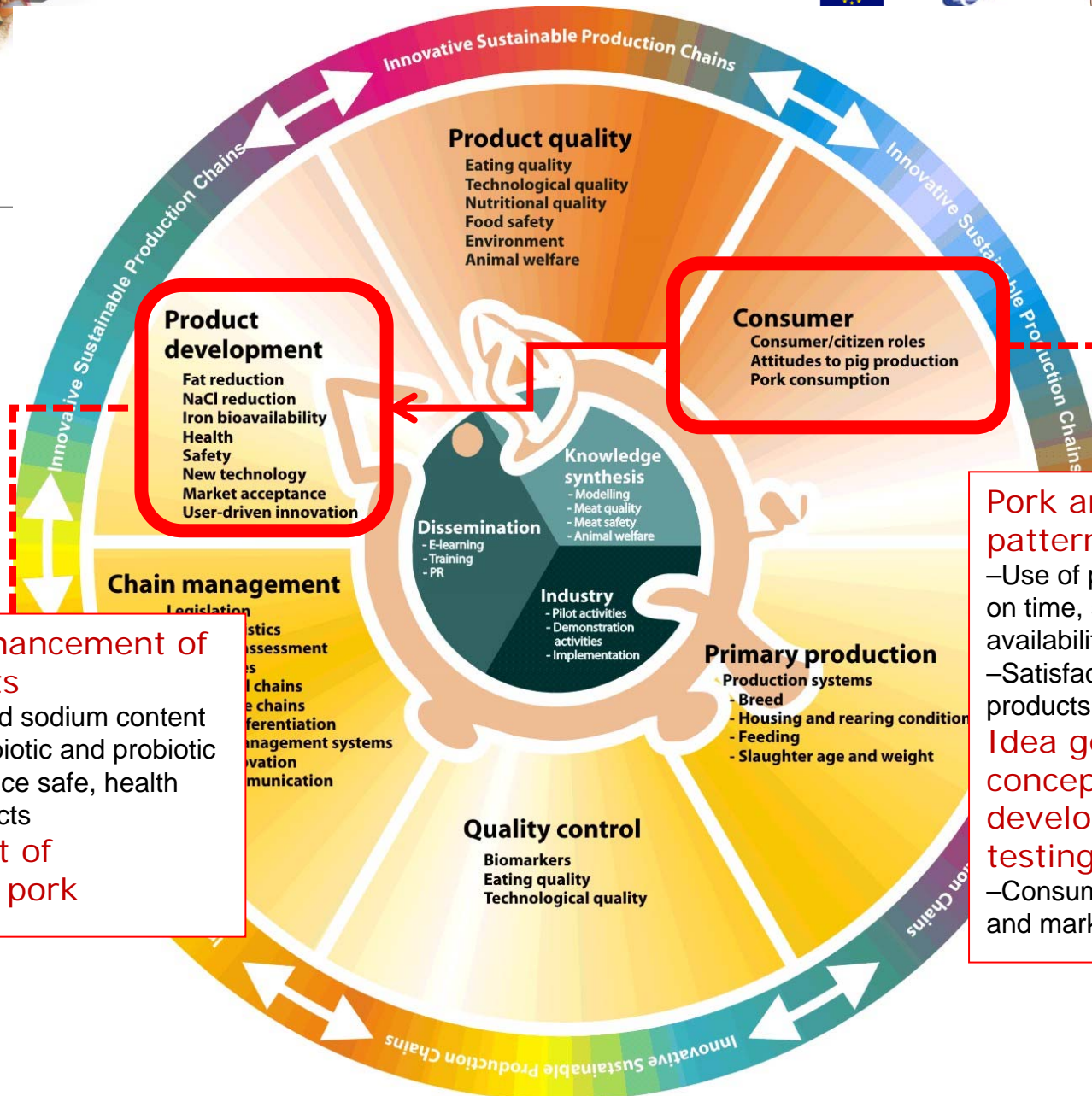Canadian Bedding
(Environment)

Four systems in colla-
boration with Pilot 5
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Figure 1. The 10 differen-
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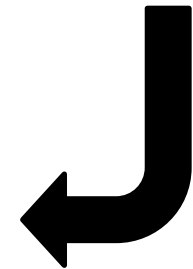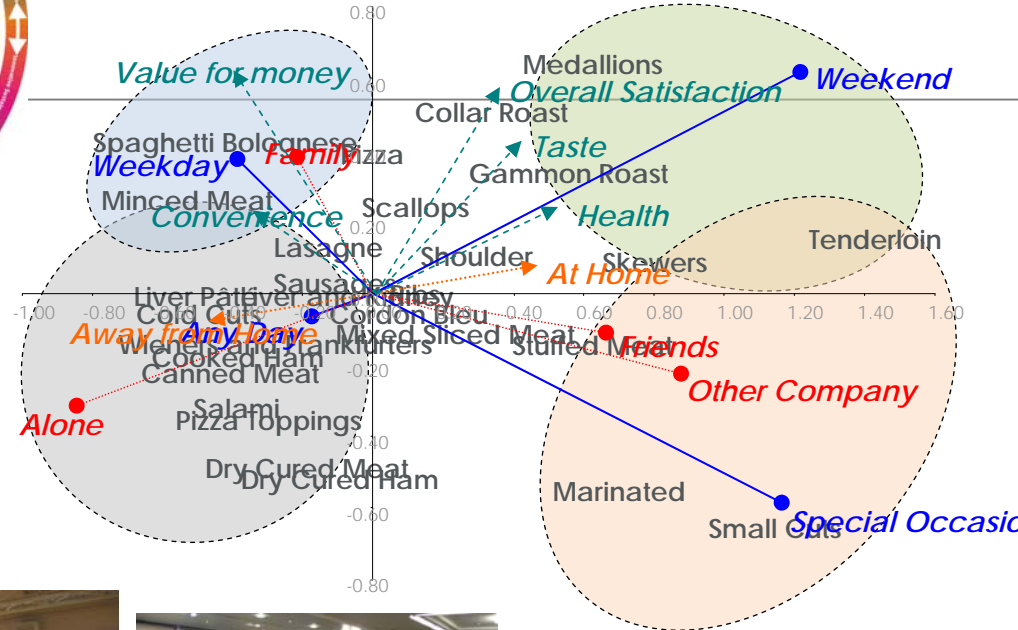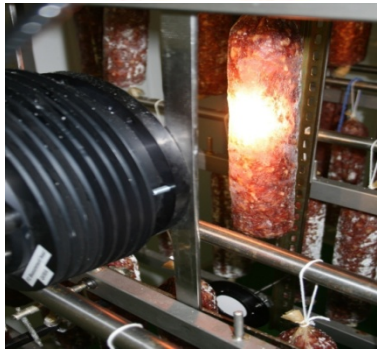differentiation are given
between brackets

Innovative Sustainable Production Chains

Product quality
- Eating quality
- Technological quality
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- Food safety
- Environment
- Animal welfare

Product development
- Fat reduction
- NaCl reduction
- Iron bioavailability
- Health
- Safety
- New technology
- Market acceptance
- User-driven innovation

Consumer
- Consumer/citizen roles
- Attitudes to pig production
- Pork consumption

Knowledge synthesis
- Modelling
- Meat quality
- Meat safety
- Animal welfare

Dissemination
- E-learning
- Training
- PR

Industry
- Pilot activities
- Demonstration activities
- Implementation

Chain management
- Legislation
- ...stics
- ...ssessment
- ...s
- ...l chains
- ...e chains
- ...ferentiation
- ...anagement systems
- ...vation
- ...munication

Primary production
- Production systems
  - Breed
  - Housing and rearing condition
  - Feeding
  - Slaughter age and weight

Quality control
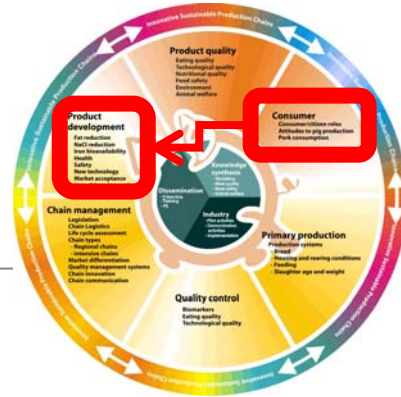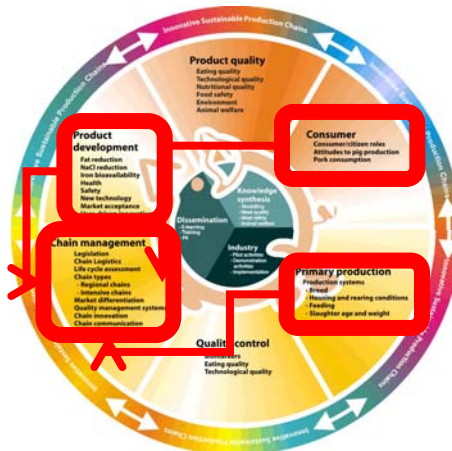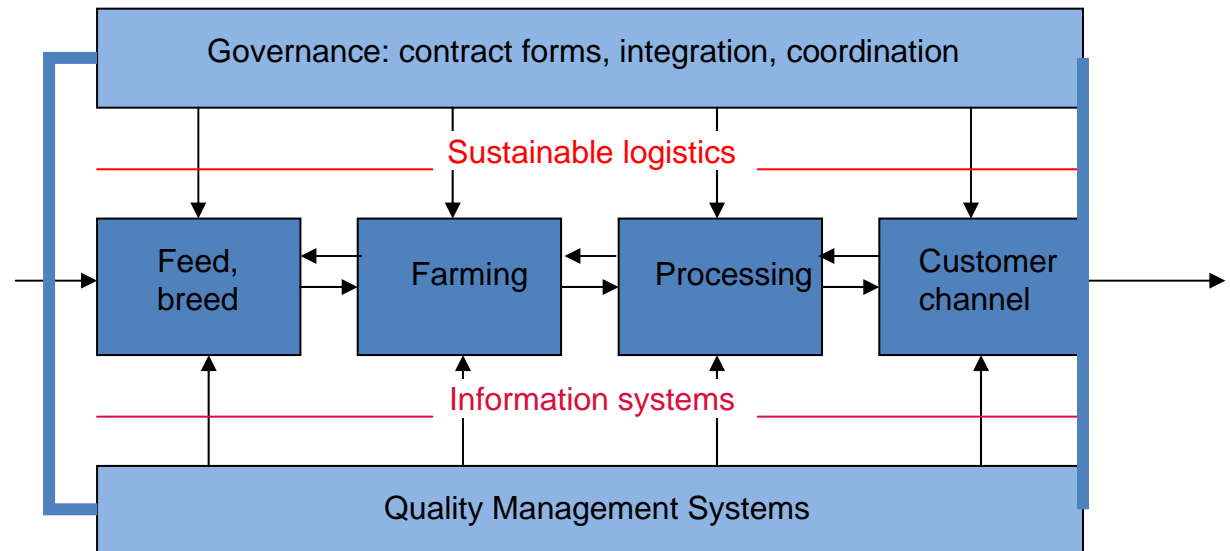- Biomarkers
- Eating quality
- Technological quality

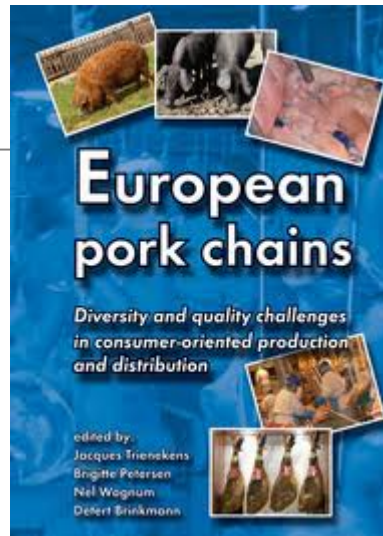Nutrition enhancement of pork products
–Reduced fat and sodium content
–Addition of prebiotic and probiotic cultures to produce safe, health promoting products
Development of convenience pork products

Pork and meal patterns
–Use of pork depending on time, situation, availability
–Satisfaction with pork products
Idea generation, concept development and testing
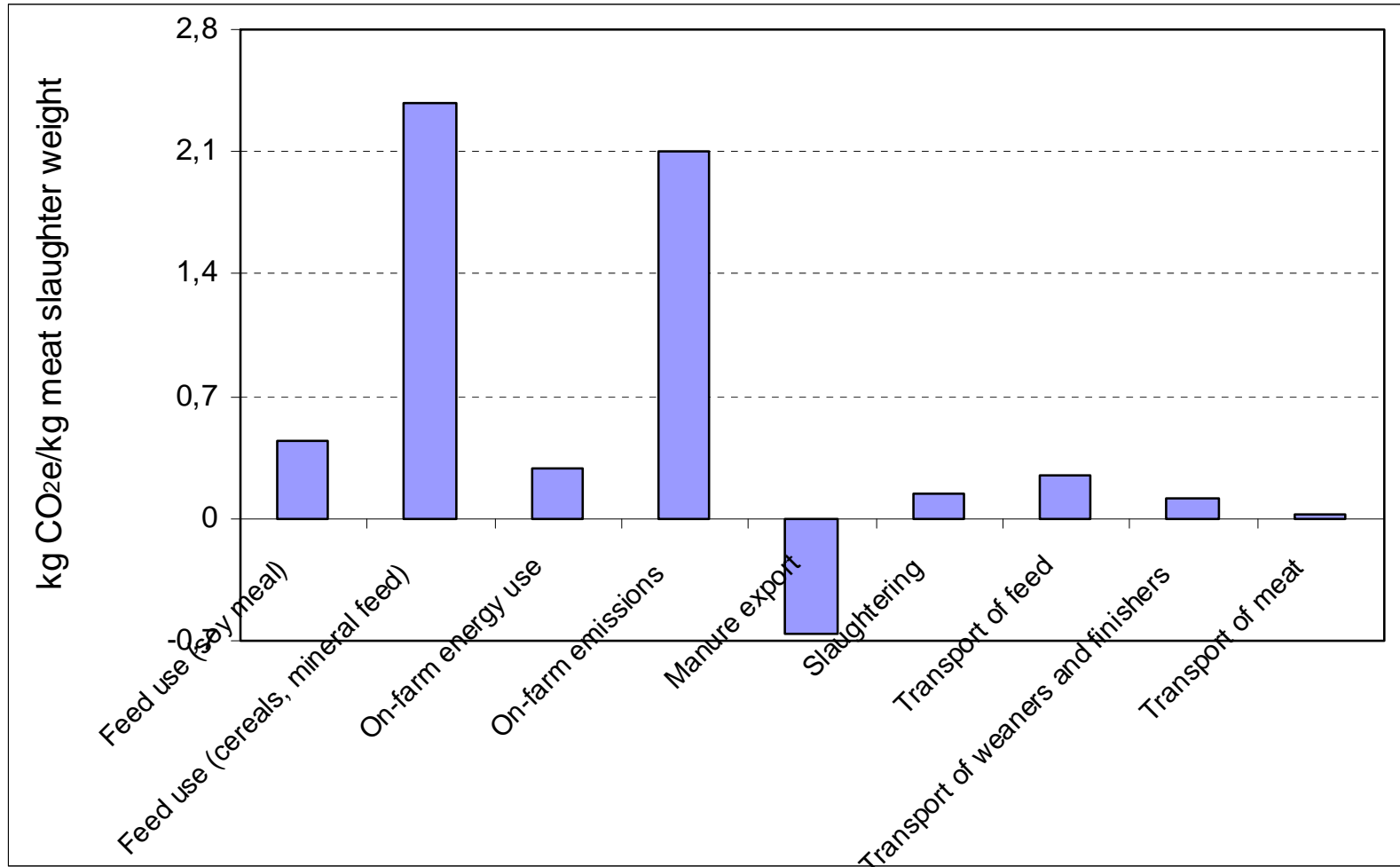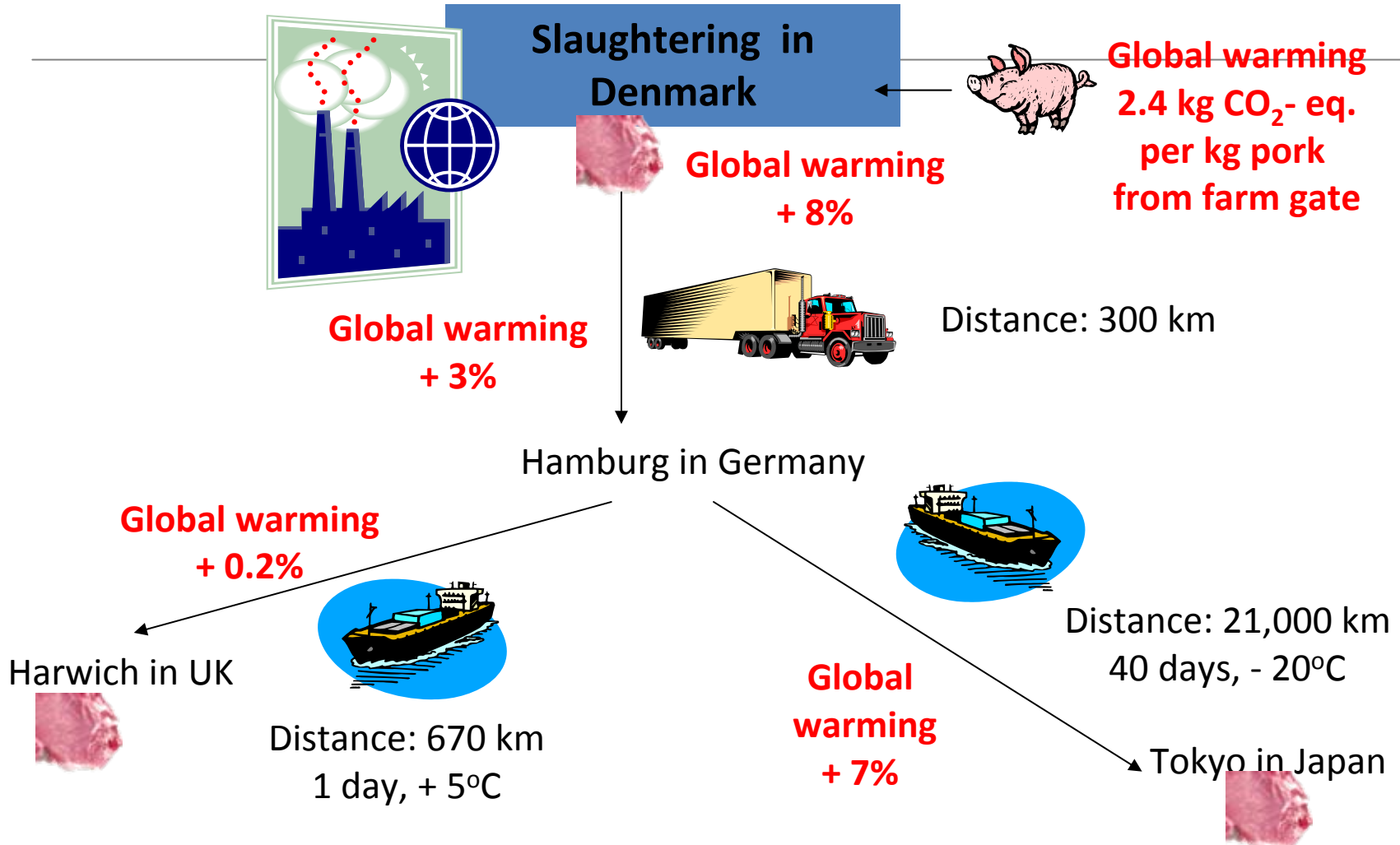–Consumer acceptance and market potential

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Quality control
Biomarkers
Eating quality
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SIXTH FRAMEWORK PROGRAMME

Q - PORK CHAINS

0.80
0.60
0.20
-0.20
-0.40
-0.60
-0.80

-1.00   -0.80   0.40   0.60   0.80   1.00   1.20   1.40   1.60

Value for money
Medallions
Weekend
Overall Satisfaction
Collar Roast
Spaghetti Bolognese   Pizza   *Taste*
Weekday   *Family*   Gammon Roast
Minced Meat   Scallops   *Health*
Convenience   Tenderloin
Lasagne   Shoulder
Sausages   Skewers
Liver Pâté   Liver and Kidney   *At Home*
Cold Cuts   Cordon Bleu
Away from Home   *Any Home*   Mixed Sliced Meat   Stuffed Meat   *Friends*
Wieners   Frankfurters   *Other Company*
Cooked Ham
Canned Meat
Salami
Alone   Pizza Toppings
Dry Cured Meat   Marinated
Dry Cured Ham
Small Cuts   *Special Occasion*

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European pork chains

Diversity and quality challenges in consumer-oriented production and distribution

edited by:
Jacques Trienekens
Brigitte Petersen
Nel Wognum
Detert Brinkmann

Governance: contract forms, integration, coordination

Sustainable logistics

| Feed, breed | Farming | Processing | Customer channel |

Information systems

Quality Management Systems

Breakdown of GHG emissions from pork chain by process unit

Bar chart — Y-axis: kg CO$_2$e/kg meat slaughter weight (scale 0 to 2,8)

Categories (X-axis):
- Feed use (soy meal)
- Feed use (cereals, mineral feed)
- On-farm energy use
- On-farm emissions
- Manure export
- Slaughtering
- Transport of feed
- Transport of weaners and finishers
- Transport of meat

Transport and its contribution to global warming

Slaughtering in Denmark

Global warming 2.4 kg CO_2- eq. per kg pork from farm gate

Global warming + 8%

Global warming + 3%

Distance: 300 km

Hamburg in Germany

Global warming + 0.2%

Harwich in UK

Distance: 670 km
1 day, + 5°C

Global warming + 7%

Distance: 21,000 km
40 days, - 20°C

Tokyo in Japan

Pork production
in regional chains

By Mette Christensen and Pal Wognum

Small-scale pork chains are regional chains, which include the biological/organic chains. They deliver mostly regionally and high-quality products to lean markets. Their importance is expected to grow, as European consumers increasingly demands regional products at high quality. In contradiction, large-scale productions have 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.

BLOND MANGALICA

RED MANGALICA

SWALLOW-BELLIED MANGALICA

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 saturated 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
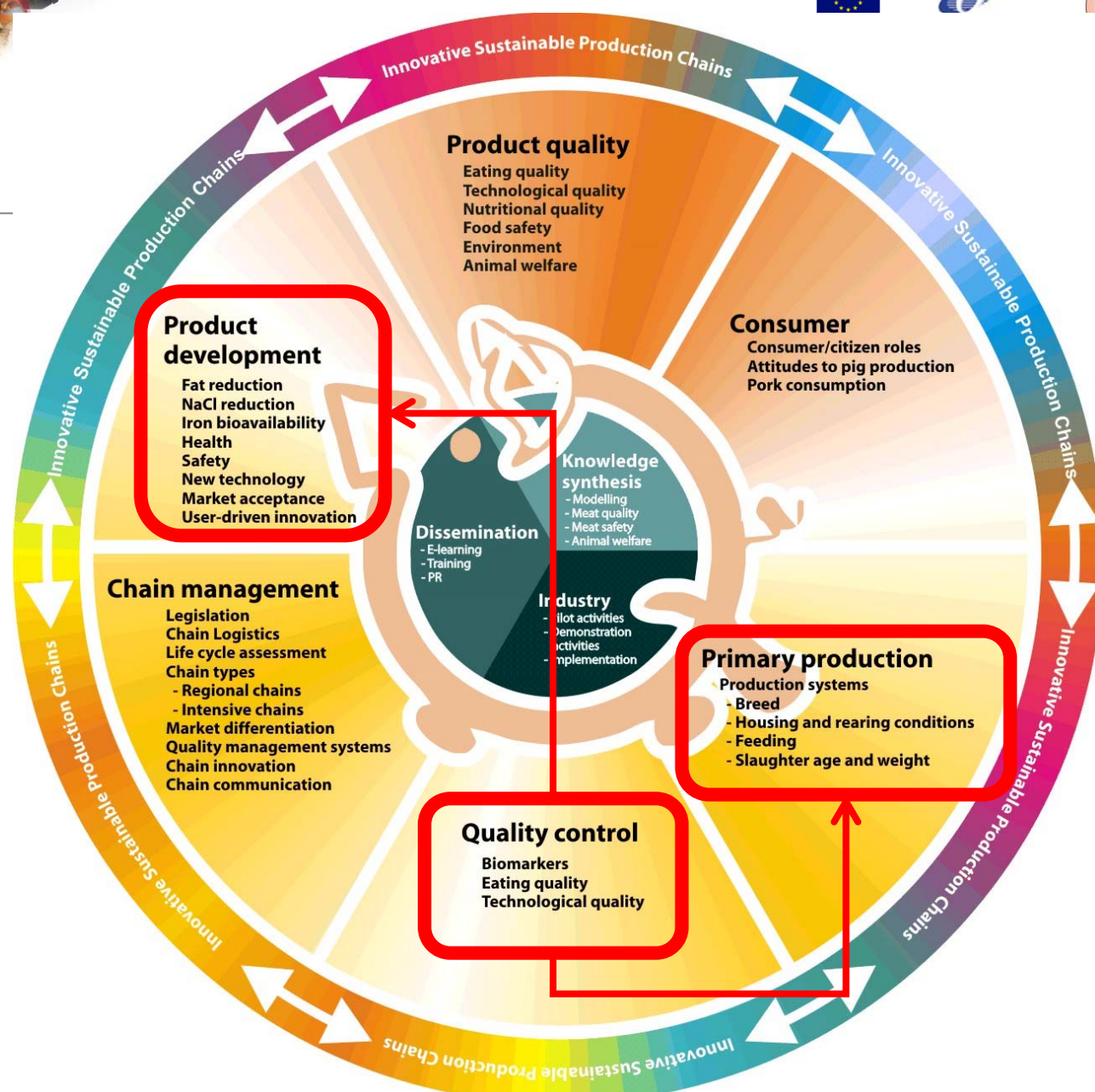
Greek business group

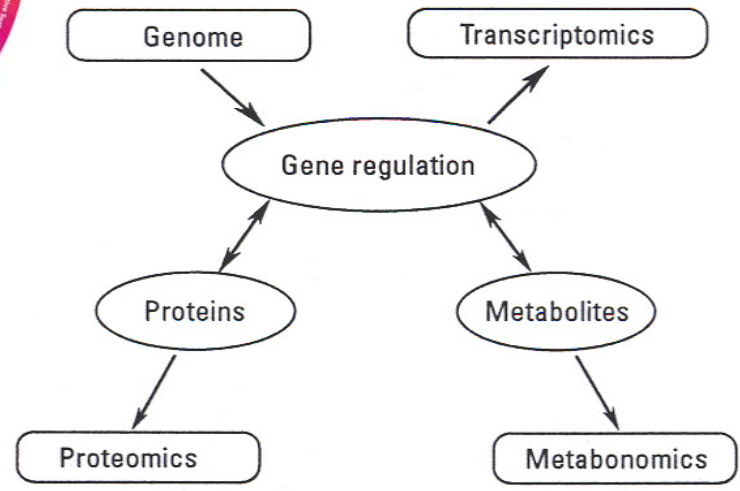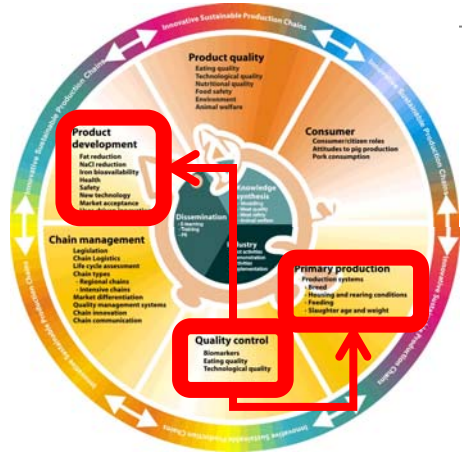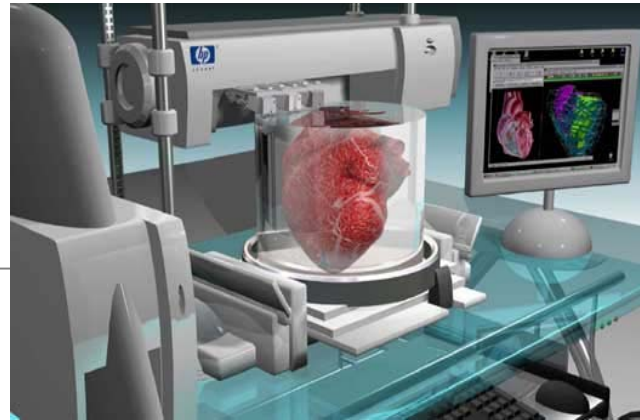German partner

Research partners

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).

Selecting muscle and fat tissue

Analyse for omics and MQ traits

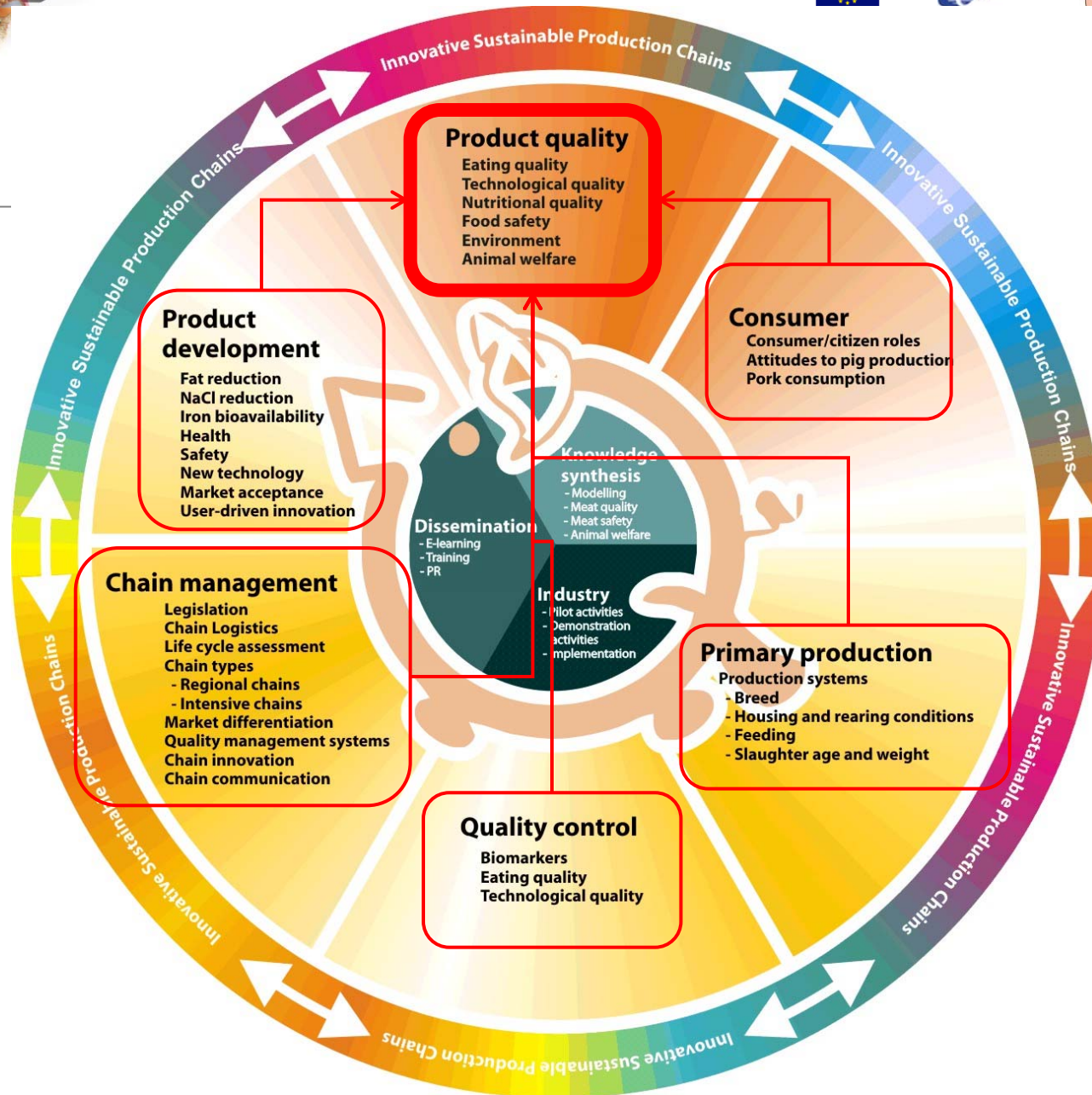Relationships among omics and meat quality traits

Select genes for confirmation

Select genes and proteins for validation

Development of tools by industry

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