IMPROVING QUALITY AND SAFETY IN PORK CHAINS - ADDRESSING THE CHALLENGE OF CHAIN WIDE INFORMATION MANAGEMENT

G. Schulze Althoff and B. Petersen
University of Bonn, Faculty of Agriculture,
Department for Preventive Health Management, Katzenburgweg 7-9, 53115 Bonn, Germany

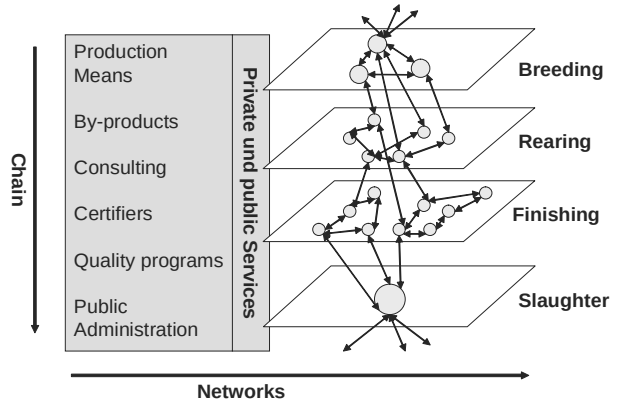
Introduction

To maintain and improve consumer trust in the quality and safety of food, legislative actors have induced new framework conditions on food production: The EU General Food Law (EU 178/2002) demands traceability, transparency and a "stable to table"-approach throughout agricultural production while governmental food safety inspection is currently under reorganisation towards a „control of control"-principle. EU has consolidated its Food hygiene legislation into a consistent set of four new regulations, often referred to as the Hygiene package (EU 852, 853, 854 and 882/2004). They include specific rules for the documentation of products and processes and information sharing between chain actors. This new legal environment provides a unique chance to boost innovation and to improve chain wide cooperation in pork production.

It has been widely agreed that information and communication systems linking different parts of food chains can aid to meet individual information needs of chain actors. The potential for pork chains mainly lies in the fields of animal breeding, animal health management, improved cooperation between abattoir and meat processing and risk based meat inspection. Effectively implemented and supported by innovative information technology it can assist to improve productivity, raise consumer confidence and finally result in higher profits (1, 4). Despite this broad consensus successful applications are missing in practice. Main reasons are a high demand for coordination and negotiation including the question of cost sharing as well as a lack of organisational support and technical tools.

Material and Methods

Figure 1: Generic model of a pork netchain (from production to slaughter)



The theoretical framework used in this paper combines the models of netchains and of processes from EN ISO 9000:2000. A netchain (Figure 1) has been defined as a contraction of chain and network to extend the concept of supply chain towards the reality of vertical and horizontal dependencies and interactions in chains (3). The process model describes product and optimal information flows between clients and suppliers for their individual decision making. Extended to the entire netchain, a multitude of such relationships exist. Their information exchange should be jointly coordinated. Then information can be exchanged along the chain and processed according to needs of their actors (6). Traceability is a means to couple yet unlinked information.

In this Dutch German R&D project of GIQS (German abbreviation for trans border quality assurance) the concepts of chain quality management are turned into the real world of pork production. As a sub-project a food chain information system is developed to support animal health management and a risk based meat inspection. Aim of this research is to find the critical success factors and to reduce motivational limits of its practical implementation. Three pilot chains in Germany and the Netherlands implement and validate the system.

This sub-project concentrates on two key aspects:

1. Organisational aspect to set up organisational structures as "Trusted third parties" that moderate communication and cooperation between chain actors.
2. Technical aspect, to develop chain wide IT systems that integrate existing solutions, standard systems and available data sources that reduce implementation time and cost. Here special focus lies on:
   a. Identification of the products,
   b. Capturing of relevant data - preferably from existing sources,
   c. Data processing - Tools and methods that maximise the use of food chain information for the various chain links.

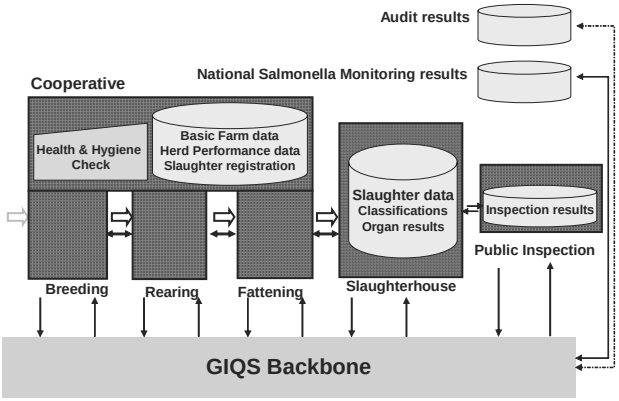
Results

The central food chain information system is built on standard systems and links existing data sources to enable cost effective and practical solutions. Therefore the concept of inter enterprise data warehousing has been adopted. Following DEVLIN's (2) definition, relevant quality information is selected and obtained from a variety of data sources along the whole production chain and structured according to the information needs of the different users. Through specific access rights and internet based interfaces information is made available to various end users, who can use it in their individual context (2). Similar to a backbone in the body, the GIQS Backbone performs a centralised data management for all chain actors.

The architecture of the GIQS Backbone supports a variety of analyses, including elaborate queries on large amounts of data. Information on chain oriented health management can be specifically processed:

- as static reports
- as interactive reports
- as ad hoc analysis through OLAP (Online Analytical Processing), an decision support application that allows the user to quickly analyse information that has been summarized into multidimensional views.

Figure 2: GIQS Backbone – integration of eight data sources in one pilot chain



To efficiently and consistently make available the information on products and processes over a longer period of time, information sets from different data sources are integrated. As an example, chain data from eight different sources are integrated in one of the pilot chains (Figure 2).

The coupling of information to the different herd groups allows a fast tracking and tracing throughout the chain. Depending on their access rights and specific information needs chain actors are provided with individually processed information:

- **Farmers:** Regular reports with analyses and benchmarks on animal groups and over time:
  - **General overview -** a quick one page overview on core figures on health, classification and performance results of recent groups
  - **Sorting –** report on economic losses from suboptimal feeding and sorting (male/female, slaughter date)
  - **Organ results and health check –** overview and comparison of health status during fattening and organ results at slaughter; comparison of animal groups and over time.
  - **Hitlist organ results** – an anonymous benchmark with similar farms of the cooperative.
- **Veterinarians, extension service, consultants:** use their clients' reports and benchmarks for advisory service; OLAP tool for a profound analysis of specific problem complexes on farm level and with farmers suppliers.
- **Chain Coordinator:** OLAP tool for chain management, supplier analyses and benchmarking;
- **Slaughterhouse:** OLAP tool for logistics and process optimisation, supplier benchmarking;
- **Public meat inspection services:** traffic light system decision model for the new risk based meat inspection (5).
- **Meat processing:** Reports on meat quality, muscle characteristics in combination with yield of the different processing steps.

Discussion

Information exchange in netchains is more and more established, but often paper based and point-to-point. A variety of databases contains valuable information. To set up a cost effective quality information systems that meet the above described demands, existing information sources should be linked or integrated into a comprehensive system. Data warehousing technology is a means to integrate this information and support effective information exchange, continuous improvement and provide an added value for all stakeholders of a netchain.

Powerful analytical tools are of high importance to make use of available information on the various aspects of pork production to chain actors. A key driver is the aim to reduce uncertainty through prior knowledge on emerging decision alternatives at control points and provide a means to improve preventive health management on the farm and quality management in the netchain. For the first time actors responsible for the health management can jointly use one common information and communication system to improve their services.

Conclusion

Additional information does not necessarily lead to knowledge gain. Specific tools for pork chain actors are necessary. They are developed within this project and enable key actors of animal health management and food safety to extend their information base for more precise decisions on disease and zoonosis management, performance improvement and a risk based meat inspection. Benchmarking analyses between animal groups, suppliers and production methods become possible. Further data should be integrated in future. Especially information on the administration on pharmaceuticals is expected to reveal major optimisation potential.

Acknowledgements

The GIQS project is co financed under the EU Interreg IIIa Programme of the Euregio Rhine Waal, by the European Commission, the Dutch Ministry for Agriculture and the Ministries of economical affairs from the regions Lower Saxony and North Rhine Westphalia (Germany)

References

(1) Clemons, E.K. and M.C. Row, 1992. Information technology and industrial cooperation. In: J. of Mgmnt Information systems. 9 (2): 9-28
(2) Devlin, B., 1997. Data Warehouse: From Architecture to Implementation. Addison-Wesley, Reading, USA
(3) Lazzarini, S.G., F.R. Chaddad and M.L. Cook, 2001. Integrating supply chains and network analyses, the study of netchains. In: J. on Chain and Network Science, 1 (1):7-22
(4) Petersen, B., S. Knura-Deszczka, E. Pönsgen-Schmidt, S. Gymnich. 2002. Computerised food safety monitoring in animal production, In: Livestock Prod. Science. 76:207-213
(5) Pöcker, C., G. Schulze Althoff, B. Petersen and T. Blaha. 2004. In: Fleischwirtschaft 3/2004:113-116
(6) Schulze Althoff, G. and B. Petersen. 2004. Chain quality information system. In: Dynamics in Chains and networks. H.J. Bremmers, et. al. (editors). Wageningen Academic Publishers. 166-174