

CERTIFICATION SYSTEMS IN THE MEAT INDUSTRY: OVERVIEW AND CONSEQUENCES FOR CHAIN-WIDE COMMUNICATION

Ludwig Theuvsen, Cord-Herwig Plumeyer, Jana-Christina Gawron

Department of Agricultural Economics and Rural Development, University of Goettingen, Germany

Key words: certification schemes; quality-related communication; IT-supported agrifood chains

Information sharing between supply chain partners is considered essential, not only for improving the competitiveness and innovativeness of agribusiness firms but also food safety and traceability. Referring to this, quality assurance schemes are becoming increasingly popular in the food industry and agricultural sector. With the support of different stakeholders numerous schemes were developed guaranteeing quality and processing standards. With this trend in mind and due to the lack of research, this paper presents an overview over certification schemes in the food industry, their characteristics and scopes. Furthermore, we analyze the state of the art of certification schemes in the European agrifood sector, determine which quality-related information is exchanged according to these schemes and examine the consequences for chain-wide communication. The paper presents initial results of a research project on IT-supported agrifood chains for improved traceability of meat products (IT FoodTrace) financed by the German Federal Ministry of Education and Research (code: 0330761).

LIST OF ABBREVIATIONS AND SYMBOLS

B2B – Business-to-Business; **B2C** – Business-to-Consumer; **BRC** – British Retail Consortium; **EC** – European Commission; **EU** – European Union; **Fami-QS** – European Feed Additives and Premixtures Quality System; **GlobalGAP** – Global Good Agricultural Practices; **GMO** – Genetically Modified Organism; **GMP+** – Good Manufacturing Practice; **IKB** – Integrale Keeten Beheersing; **ISO** – International Organization for Standardization; **IT** – Information Technology; **PDO** – Protected Designation of Origin; **PGI** – Protected Geographical Indication; **Q&S** – Qualität und Sicherheit; **QSG** – Danish Quality Guarantee; and **TSG** – Traditional Speciality Guaranteed.

INTRODUCTION

In recent years, certification schemes have been widely introduced into the European agrifood sector [Schiefer & Rickert, 2004; Hatanaka *et al.*, 2005; Theuvsen *et al.*, 2007]. The reasons for this were the growing quality demands of customers, particularly large retailers, and several food crises, which undermined consumers' trust in food safety and revealed a lack of transparency in food supply chains. Furthermore, systematic quality assurance and improved traceability are considered cornerstones for improving the competitiveness of European agribusiness [Bogetoft & Olesen, 2002; Theuvsen & Hollmann-Hespos, 2007].

The European Union strongly supports this trend through

legislative actions, such as the introduction of EU-wide certification systems, for instance, in the organic farming sector or in the form of the PDO, PGI and TSG systems, the establishment of European food safety agencies and passing demanding food safety and hygiene rules. All in all, EU activities seek to establish a "quality-driven single market in foodstuffs" [Verhaegen & Van Huylenbroeck, 2002].

A strong market orientation that directs all of a firm's efforts towards meeting customer demands is often considered a prerequisite for successful business operations [Kohli & Jaworski, 1990; Martin & Grbac, 2003].

In recent years the supply chain perspective has gained much relevance in agribusiness research since it is considered paramount for the understanding of various current issues in the management of the agri-food sector such as traceability [Theuvsen & Hollmann-Hespos, 2005], transparency [Frentrup & Theuvsen, 2006], logistics [Fritz & Hausen, 2006] and governance [Schulze *et al.*, 2006].

Food supply chains are characterized by more or less intensive division of labor. The division of labor results in efficiency gains through specialization and economies of scale, but also in a need for improved coordination and for a solution to agency problems [Theuvsen, 2004]. The coordination problems can be traced back to separate decision-making by different companies in the food supply chain. Since each decision by a farm or firm has effects on all other companies in the supply chain, there has to be a certain amount of communication in order to coordinate activities. Agency problems are a second consequence of the division of labor in food

supply chains. Supply chains are characterized by reciprocal multi-stage agency relationships in which companies delegate tasks to each other. Farmers, for instance, delegate processing to food manufacturers, who in turn delegate production of agricultural raw materials to farmers. Principals and agents in food chains behave opportunistically, that is, they act in self-interest with guile [Williamson, 1985]. For this reason, the correctness and completeness of information transferred throughout the food supply chain cannot be taken for granted. Besides opportunistic behavior, agency relationships are characterized by information asymmetries. Opportunistic behavior and information asymmetries result in agency problems known as hidden characteristics, hidden action and hidden intention [Akerlof, 1970; Arrow, 1985]; these problems influence the amount of information shared in food chains [Theuvsen, 2003].

Coordination and agency problems in food supply chains are highly relevant for quality assurance and quality management due to their influence on the amount and reliability of quality-related information shared between farms and firms. Therefore, the growing legislation by EU and national authorities and the above-mentioned certification schemes focus primarily on the quality-related information stored and transmitted in food supply chains, and supply chain approaches have become an integral part of nearly all quality management literature.

In food supply chains many firms do not have direct relationships with consumers. For these firms dissemination of information through communication between supply chain partners is an absolute condition for market orientation [Mohr & Nevin, 1990] and an important driver of product and process innovations [Dyer & Singh, 1998]. Furthermore, in the agribusiness sector improved documentation and information sharing are important building blocks for quality assurance and food safety [Windhorst, 2004].

In this paper we analyze the prevalence and characteristics of certification systems in the European agriculture and food industry, their effects on quality-related communication between supply chain partners and chain-wide communication. In doing so, we focus on the pork industry, especially business relationships between farmers and abattoirs, but neglect certification systems implemented in upstream industries, such as the GMP⁺ and the Fami-QS (European Feed Additives and Premixtures Quality System) standards, which have been widely implemented in the animal feed industry.

CERTIFICATION SCHEMES

“Certification is the (voluntary) assessment and approval by an (accredited) party on an (accredited) standard” [Meuwissen *et al.*, 2003]. Neutral and independent third-party audits by a certifying party with the aim of assessing the compliance of a certifiable party—a farm or a firm—with a standard typically laid down in a systems handbook are at the heart of certification procedures. Firms successfully passing the audit procedure receive a certificate that can be used as a quality signal in the market to reduce the quality uncertainty of buyers and, thereby, lower transaction costs [Luning *et al.*, 2002]. Certification has to be distinguished from the activities

of public surveillance and control authorities that control fulfillment of legal requirements and from second-party audits by, for instance, customers checking compliance with their own standards [Meuwissen *et al.*, 2003].

The ISO 9000 family once triggered the increasing prevalence of industry-neutral certification standards. Agriculture and the food industry turned back the clock by establishing industry and, in some cases, even product-specific standards. This has resulted in a large number of certification standards. Although the sometimes cited number of more than 380 certification schemes in the EU [Wesseler, 2006] is presumably somewhat exaggerated, in Germany alone about 40 different such schemes are used for certifying farms and firms in the agribusiness.

Figure 1 presents preliminary results of a study on certification schemes in Europe financed by the European Commission. Significant differences can be observed between Western and Central and Eastern Europe. In the German meat industry, for instance, 31 certification systems have been allocated, whereas only two schemes are widely used in Poland. A closer look at the systems implemented in the EU reveals a broad spectrum that can be organized along different dimensions [Spiller, 2004; DG JRC/IPTS, 2006]: standard setter, addressees, foci, objectives, geographical coverage, number of participants and supply chain coverage. (In the following, examples are given in brackets.)

With regard to the **standard setter**, we can roughly distinguish between private and public standards [Jahn *et al.*, 2003]. Public standards can be laid down by the EU (Regulations (EC) 2092/91 and 510/2006) or by national or regional governments. Private standards can be laid down by customers (BRC Global Standard, International Food Standard), suppliers (Assured Farm Standards in the UK), norming institutions (ISO 9001, ISO 22000), inspection and certification institutes (Food TUEV Tested; Fresenius Quality Seal) or nongovernmental organizations interested in, for instance, fair trade (TransFair) or higher animal welfare standards (Freedom Food). Furthermore, combinations are possible, as in the case of the German Q&S system where industry associations representing different stages of the supply chain have joined to set a standard. The French Label Rouge standard is an example of a public-private partnership in which the French government, consumer organizations and producers collaborate for the production of high quality food products.

Addressees of the certificates can be either other businesses or consumers or—in some cases—both. Business-to-Business (B2B) standards are not communicated to the final consumers, who are often unaware of the existence of standards, such as GlobalGAP, BRC Global Standard, International Food Standard, ISO 22000 or IKB. B2B standards seek to reduce quality uncertainties in food supply chains and, in that way, serve as quality signals, reduce transaction costs and liability risks and favor spot market transactions [Schulze *et al.*, 2006]. They typically represent major parts of an industry, for instance, more than 90% of the Dutch pork market [Schouwenburg, 2004]. Business-to-Consumer (B2C) schemes address the final consumer, typically by displaying a logo on the products produced by certified farms and firms (Freedom Food, Label Rouge, PDOs, PGIs, TSGs). The B2C

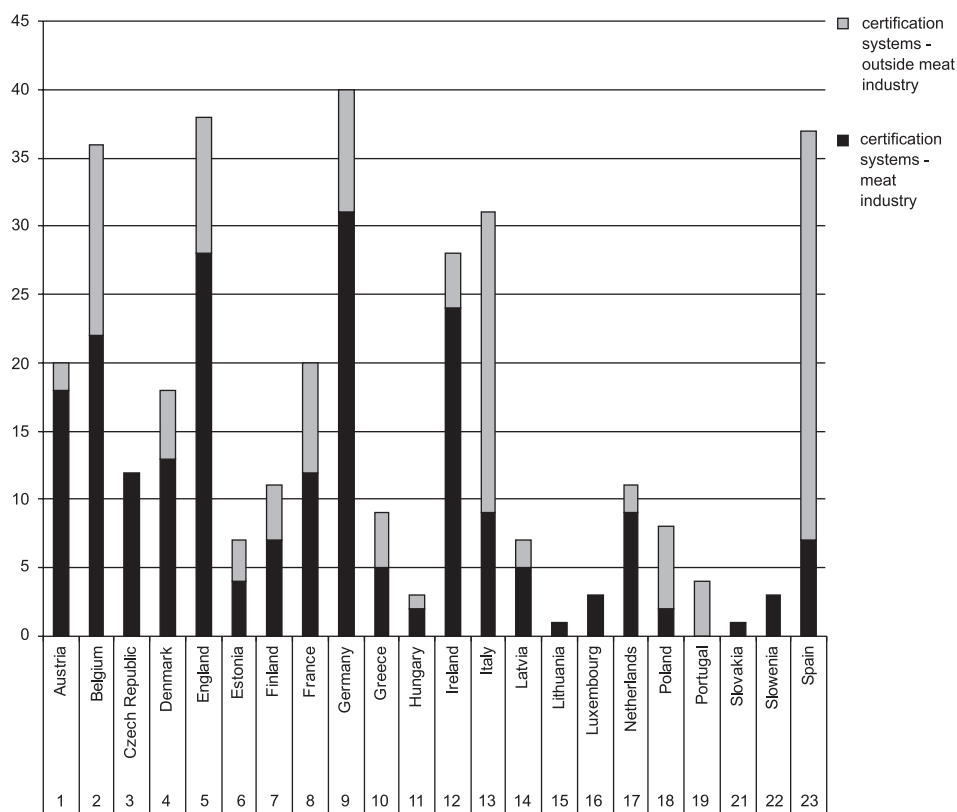


FIGURE 1. Number of certification systems in Europe [Joint Research Centre, 2007].

standards represent the majority of certification schemes in the EU but often (although not always) operate in market niches. Well known examples are Pecorino Toscano from Italy as a PDO or some kinds of olive oils like Olio Toscano as a PGI [Belletti *et al.*, 2007]. Some schemes have a B2B as well as a B2C focus. Examples are the German Q&S system and the British Assured Food Standards (with the well-known Little Red Tractor logo). Since these schemes address not only consumers but also other businesses, they typically represent major parts of the market, for instance, Q&S accounts for about 80% of the German pork market and Little Red Tractor for 65% (beef) to 90% (pork, poultry) of the British meat market [Defra, 2007]. In acquiring high market shares, the B2B as well as the mixed standards benefit from the bottleneck function of large processors or retailers who often threaten to delist non-certified producers and processors. In this respect, large retailers act as the “new masters of the food system” [Flynn & Marsden, 1992] and, by doing so, make participation of food farms and food manufacturers in certification schemes “quasi-voluntary” [Meuwissen *et al.*, 2003].

Certification schemes can have very diverse **objectives**, which can be roughly described as the improvement of food safety by guaranteeing compliance with minimum standards and differentiating food products. Minimum standard schemes reduce quality uncertainties, especially with regard to credence attributes, such as freedom from microbiological risks. Often these schemes confine themselves to systematically compiling legal rules, norm standards (governing, for instance, cleaning and disinfection) and industry guide-

lines (such as good hygiene practices) but largely refrain from defining higher standards. Enforcing compliance with minimum standards is typical of many B2B schemes, like the BRC Global Standard, GlobalGAP and the International Food Standard. The private enforcement of legal rules prior to certification often only incompletely controlled by public authorities might be an explanation why many certified farms and firms perceive even the minimum standard schemes as additional burdens [Gawron & Theuvsen, 2007].

Differentiation strategies seek to create product offerings that are perceived as superior by customers. Differentiated products enjoy higher prices and higher customer loyalty than undifferentiated products, which compete only on price [Porter, 1980]. Product differentiation is typical of the vast majority of schemes addressing the final consumer. Differentiation can be based on compliance with above-average process standards, such as organic farming (Bioland, Demeter) or animal welfare (Freedom Food), guaranteed region-of-origin (Regulation (EC) 510/2006), freeness from genetically modified organisms (as in the case of the German Wiesenhof concept’s non-GMO guarantee) or higher organoleptic qualities (Label Rouge). Often two or more differentiating aspects are combined, for instance, as in the case of many PDOs and PGIs, region of origin, traditional production methods and higher organoleptic qualities.

The **focus** of certification schemes can be systems, processes or products [Pfeifer, 2002]. Quality management system audits are typical of schemes seeking to guarantee minimum standards in a B2B environment (ISO 9001, ISO

22000, GlobalGAP, International Food Standard, BRC Global Standard, Q&S, IKB). Production processes are the main focus of, for instance, organic farming labels and the EU egg classification system. A product focus is often characteristic of PDOs, PGIs and TSGs or product awards based on sensory tests. Combinations can also be found, for instance, when some process characteristics, like those pertaining to animal husbandry, are added to a process standard such as Q&S to form a regional quality initiative.

The **geographical coverage** of the certification schemes implemented in the EU is very diverse. Local standards admit only local producers and processors as partners, as is the case in many PDOs and PGIs. Regional certification schemes are often founded by regional governments or medium-sized processors. Q&S in Germany and IKB in the Netherlands are mainly national systems. Both are also used outside their home countries, but the vast majority of the farms and firms they certify are in Germany and the Netherlands, respectively. International schemes have been broadly implemented in two or more countries. Examples are the International Food Standard (France and Germany), GlobalGAP and ISO 9001 and 22000.

The **number of participants** and respectively the **number of the slaughter pigs** vary considerably. For example the smallest certification scheme currently operated in Germany has hardly more than 130 members (Unser Land) whereas the Q&S system, with more than 83.000 participating farms and firms, is one of the largest standards. Other large-scale certification schemes like the IKB (95% of the slaughter pigs in the Netherlands) or the QSG (15% of the slaughter pigs in Denmark) cover a major share of the national production.

Supply chain coverage is also diverse. Some schemes focus only on one stage of the supply chain, for example, agriculture (GlobalGAP) or processors (International Food Standard). Other standards include several or all stages, for instance, Q&S (animal feed industry, agriculture, processors, retailers).

All in all, the certification landscape in the European Union reveals a multi-faceted picture with remarkable differences between different regions. In the northern and western parts of Europe, minimum requirement schemes dominate whereas differentiation schemes are of less relevance in these food markets. The situation is different in the Mediterranean countries where a stronger tradition of high quality and highly differentiated food and a longer tradition of protecting regional and traditional specialties favors the spread of differentiation systems such as PDOs and PGIs. Central and Eastern Europe are in a catching-up process with regard to certification systems. Nevertheless, some schemes established in the Eastern and Central European EU member states, for instance the Czech KLASA system, have already gained considerable publicity.

CHAIN-WIDE COMMUNICATION IN CERTIFICATION SYSTEMS IN THE MEAT INDUSTRY

The prevalence of certification schemes in today's food supply chains raises the question of the extent to which they

contribute to information sharing between suppliers and customers and advance quality-related communication in food supply chains. Other potential drivers of information exchange are legislation (like the so-called EU hygiene package), firm-specific requirements (such as documents required to accompany products) and managerial information needs (on prices and available quantities and qualities, for example).

One current controversy in agricultural economics circles around the question whether higher food quality and safety standards can be met in traditionally organized food supply chains [Windhorst, 2004; Schulze *et al.*, 2006]. Some authors identify the increasing requirements of consumers, large retailers and fast-food companies concerning product quality and traceability as important drivers towards more integrated food supply chains. Den Ouden *et al.* [1996], for instance, identify customers' growing quality requirements as a major impetus behind contracts and vertical integration. In particular, product differentiation in order to meet changing consumer demands regarding credence attributes, such as animal welfare, food safety and environmental issues, are considered important drivers of closer ties in the meat supply chain. Transmitting changing demands to farmers is considered more transaction cost efficient under contracts and in vertically integrated systems. Lawrence *et al.* [1997] offer a similar explanation for the changing organization of US meat supply chains. They argue that long-term contracts allow abattoirs transaction cost savings compared to traditional marketing channels when securing their slaughterhouses a consistent supply of high quality slaughter pigs in adequate quantities. Hornibrook and Fearn [2005] found similar results in the British beef market. They observed that retailers put greater emphasis on product safety and quality after suffering several food crises, strengthening their influence on meat supply chains and largely refraining from spot market transactions.

Obviously, food quality and safety are expected to influence the organization of food supply chains, especially in the meat sector, which is susceptible to food hazards and confronted with growing and sometimes contradictory consumer demands. Strengthening market orientation by more efficiently communicating consumer demands to all supply chain partners seems paramount. If it turns out that certification schemes contribute to the spread of quality-related information in food supply chains, this could have far-reaching effects and even make it possible to forgo the fundamental redesign of meat supply chains. Because of its importance, we will analyze the effect of certification schemes on information sharing in greater detail.

We chose three European certification schemes as research objects: "Qualität und Sicherheit" (Q&S), "Integrale Keten Beheersing" (IKB) and "Danish Quality Guarantee" (QSG). Q&S is the leading German certification scheme in the meat sector most prevalent in the pork and poultry sectors but also gaining relevance in the beef market. IKB is the most important scheme in the Netherlands covering all meat products. The participants of the IKB system are obligated to exchange their information among each other. QSG is a farmer-owned scheme covering the pork industry in Denmark. Characteristic of the QSG systems is its close integration into the cooperatively structured supply chain. It is noteworthy that all three

TABLE 1. Three European certification schemes [Q&S, 2007; IKB, 2007; QSG, 2007].

| | Q&S | IKB | QSG |
|--|--|--|--|
| Standard setter | Private | Private | Co-operative |
| Addressees | Businesses and consumers (B2B and B2C) | Businesses and consumers (B2B and B2C) | Businesses and consumers (B2B and B2C) |
| Objectives | Minimum standard | Minimum standard | Minimum standard |
| Focus | Quality management system | Quality management system | Quality management system |
| Geographical coverage | National | National | National |
| Number of participants / number of slaughter pigs | About 83,000 | 95% of the slaughter pigs | 95% of the slaughter pigs |
| Supply chain coverage | All stages | All stages | All stages |

schemes recognize each other so that farms and firms certified according one of the schemes can also deliver into the competing supply chains. To simplify comparison between the schemes under analysis, Q&S and IKB were only analyzed with regard to pig meat production. Table 1 describes these schemes in more detail with reference to the classification criteria introduced above.

All three certification schemes require the exchange of information between supply chain partners. Interestingly, although they are based in different countries, all three schemes









restrict obligatory communication mainly to those areas already mandated by legislation. The legal communication requirements are complemented by a few scheme-specific requirements on, for instance, duration of animal transport or animal feed used during the fattening period. The main difference between the schemes is the integrated farming-mentoring tool used by IKB and QSG. This tool aims at improving the exchange of information between the feed industry, farmers and slaughterhouses. It is used collaboratively by farmers, extension workers and veterinarians. In Denmark application of the tool is mainly based on the high degree of vertical coordination of the meat supply chain dominated by the cooperative abattoir Danish Crown. In the Netherlands compliance with the system is based of the obligation to communicate with supply chain partners laid down in the IKB standard.

Table 2 gives an overview of those quality-related information exchanges mandated in the certification schemes surveyed. In general, the level of quality-related communication in meat supply chains required by certification schemes is low, irrespective of the nature of the schemes. Additional analyses of differentiation schemes, for instance in the organic farming sector, revealed similar results.

THE FUTURE OF CHAIN-WIDE COMMUNICATION

All three certification schemes so far mainly rely on analog communication technologies when sharing quality-related information between supply chain partners. Their preferred and regularly used data media are delivery notes, registered goods issue slips, transport certificates and slaughter documents informing farmers about the results of pig classification. Generally speaking, up to this point, information transfer

TABLE 2. Mandatory information exchange in three European certification schemes.

| Feed industry | Q&S | IKB | QSG |
|---|---|---|---|
|   | - Q&S-certificated feed - information on feed ingredients | - GMP+-certified feed - information on feed ingredients | - QSG-certified feed - information on feed ingredients |
| Pig fattening farm | | | |
|   | - pig number / marking the pigs - documentation of transport - salmonella status - slaughter account | - pig number / marking the pigs - documentation of transport - salmonella status - slaughter account | - pig number / marking the pigs - documentation of transport - salmonella status - slaughter account |
| Slaughterhouse | | | |
|   | - Q&S-certified meat - batch number | - IKB-certified meat - batch number | - QSG-certified meat - batch number |
| Processor | | | |
|   | - Q&S-certified meat - batch number | - IKB-certified meat - batch number | - QSG-certified meat - batch number |
| Retailer | | | |

vertical integrated system – mentoring

vertical integrated system – mentoring

and data media are strongly influenced by supplier-customer relationships, for instance vertically integrated supply chains, and the flow of goods (in this case, slaughter pigs or pork meat). Electronic communication is currently still in its infancy and mainly restricted to providing online access to or email transmission of slaughter documents. In practice different slaughterhouse companies use different firm-specific electronic systems to transmit the slaughter data to farmers, for instance, "Westfleisch"-Extranet or „Vion“-Farming-Net. All in all, the current situation is characterized by media disruptions between the various stages of the supply chains. Against this background, several IT projects have been started or have already entered their implementation phases.

With regard to the chain-wide communication, communication between supply chain partners will be supported by the mandatory information exchange between farmers and slaughterhouses according to Regulation (EC) 853/2004. Since January 1, 2006 (transition period until January 1, 2008), farmers have to comply with the principles of food chain information, according to which certain information has to be transmitted to the slaughterhouse no less than 24 hours before the arrival of animals there. This Regulation defines new and more demanding communication requirements for the meat business without requiring more vertically integrated supply chains. This is important for many countries such as Germany and Poland, where vertically disintegrated meat supply chains still prevail. When most slaughter pigs are traded on spot markets, an IT-solution has to be developed which is compatible to every farmers' and abattoirs' IT equipment. Furthermore, many slaughter pigs sold on spot market are not directly marketed to abattoirs but traded by private or cooperative livestock dealers. In these cases, food chain information is also these traders' obligation.

Currently Farmer's Friend software developed by Hof-frogge & Doehring Consulting Company GmbH [Farmers-friend, 2007] is one of the most advanced general approaches in Germany. Farmer's Friend is a web-based software solution that addresses the documentation and communication needs of farmers, livestock traders and abattoirs. On the farm level, the system allows in-depth analyses and benchmarking of pig classification results and the financial success of the fattening period. It is noteworthy that the software supports the mandatory information exchange between farmer and slaughterhouse according to Regulation (EC) 853/2004. Livestock traders are also provided with software that supports financial settlements and analysis of pig classification results. For this reason, Farmer's Friend also supports food chain information by livestock dealers. In slaughterhouses, Farmer's Friend supports upstream communication with farmers and livestock dealers (such as administering incoming food chain information and transmitting slaughter documents).

Compared to prevailing analog data media, solutions like Farmer's represent a big step ahead. One of the remaining major shortcomings is that the software does not support upstream industries, like feed mills, or downstream processors, wholesalers or retailers. Therefore, it only partially solves the problem of media disruptions. This is the starting point of the IT FoodTrace project. This project represents a partnership between software firms, universities and processors financed

by the German Federal Ministry of Education and Research as a building block of the German federal government's e-government 2.0 initiative. The project vision is ambitious: to create a chain-wide IT infrastructure that allows non-redundant data entry, open standards and interface solutions based on the latest web technologies. The more demanding EU legislation on food hygiene becomes, the more probable it will be that the future of IT infrastructure resembles the IT FoodTrace vision [Doluschitz *et al.*, 2007].

REFERENCES

1. Akerlof G.A., The market for "lemons": Quality uncertainty and the market mechanism. *Quart. J. Econ.*, 1970, 84, 488-500.
2. Arrow K.J., The economics of agency. 1985, *in: Pratt J. W. and R. J. Zeckhauser (editors): Principals and agents: The structure of business.* Harvard University Press, 37-51.
3. Belletti G., Burgassi T., Maescotti A., Scaramuzzi S., The Effects of Certification Costs on the Success of a PDO/PGI. 2007, *in: L. Theuvsen et al. (editors), Quality Management in Food Chains,* Wageningen Academic Publishers, Wageningen.
4. Bogetoft P., Olesen H. B., Ten Rules of Thumb in Contract Design: Lessons from Danish Agriculture. *European Review of Agricultural Economics*, 2002, 29, 185-204.
5. Defra – Department for Environment, Food and Rural Affairs, <http://www.defra.gov.uk>, 03.06.2007.
6. den Ouden M., Dijkhuizen A.A., Huirne R.B.M., Zuurbier P.J.P., Vertical cooperation in agricultural production-marketing chains, with special reference to product differentiation in pork. *Agri-business*. 1996, 12, 277-290.
7. DG JRC/IPTS (editor), Food Supply Chains Dynamics and Quality Certification. Working Paper, 2006, Seville (Spain).
8. Doluschitz R., Brockhoff K., Jungbluth T., Liepert C., Rückverfolgbarkeit von Lebensmittel tierischer Herkunft. 2007, *in: S. Böttinger et al. (editors.), Agrarinformatik im Spannungsfeld zwischen Regionalisierung und globalen Wertschöpfungsketten,* Koellen, Bonn, 55-58.
9. Dyer J.H., Singh H., The Relational View: Cooperative Strategy and Sources of Interorganizational Competitive Advantage. *Academy of Management Review*, 1998, 23, 660-679.
10. Farmersfriend, <http://www.farmersfriend.de/>, 05.06.2007.
11. Frentrup M., Theuvsen L., Transparency in supply chains: Is trust a limiting factor? 2006, *in: Fritz M., U. Rickert, G. Schiefer (editors): Trust and risk in business networks.* ILB-Press, 65-74.
12. Fritz M., T. Hausen, Tailored improvement of supply chain processes in agri-food networks. 2006, *in: Bijman J. et al. (editors): International agri-food chain and networks: Management and Organization,* Wageningen Press, 179-195.
13. Flynn A., Marsden T., Food Regulation in a Period of Agricultural Retreat: The British Experience. *Geoforum*, 1992, 23, 85-93.
14. Gawron J.-C., Theuvsen L., Die Bewertung des International Food Standard durch Unternehmen der Ernährungsindustrie: Ergebnisse einer empirischen Untersuchung. 2007, *in: P. M. Schmitz, F. Kuhlmann (editors), Good Governance in der Agrar- und Ernährungswirtschaft,* Landwirtschaftsverlag, Muenster-Hiltrup.
15. Hatanaka M., Bain C., Busch L., Third-Party Certification in the Global Agrifood System. *Food Policy*, 2005, 30, 354-369.
16. Hornibrook S., A. Fearn, Demand driven supply chains: Contractual relationships and the management of perceived risk.

2005. Paper presented at 2nd European Forum on Market-Driven Supply Chains, Politecnico di Milano, April 5 – 6 2005.
17. IKB – Integrale Keeten Beheersing System, <http://www.ikbvarken.nl>, 13.04.2007.
 18. Jahn G., Peupert M., Spiller, Auf dem Weg in eine Zertifizierungsgesellschaft? 2003, *in*: H.-J. Budde *et al.* (editors), Proceedings of 24th GIL Annual Conference, Goettingen, 61-64.
 19. Joint Research Centre, <http://foodqualityschemes.jrc.es/>, 21.02.2007.
 20. Kohli A.K., Jaworski B.J., Market Orientation: The Construct, Research Propositions and Managerial Implications. *J. Mark.*, 1990, 54(2), 1-18.
 21. Lawrence J.D., Rhodes V.J., Grimes G.A., Hayenga M.L., Vertical coordination in the US pork industry: Status, motivations, and expectations. *Agribusiness*, 1997, 13, 21-31.
 22. Luning P.A., Marcelis W.J., Jongen W.M.F., Food Quality Management: A Techno-Managerial Approach. 2002, Wageningen Academic Publishers, Wageningen.
 23. Martin J.H., Grbac B., Using Supply Chain Management to Leverage a Firm's Market Orientation. *Industrial Marketing Management*, 2003, 32, 25-38.
 24. Meuwissen M.P.M., Velthuis A.G.J., Hogeveen H., Huirne R.B.M., Traceability and Certification in Meat Supply Chains. *J. Agrib.*, 2003, 21, 167-181.
 25. Mohr J., Nevin J.R., Communication Strategies in Marketing Channels: A Theoretical Perspective. *J. Mark.*, 1990, 54(4), 36-51.
 26. Pfeifer T., Quality Management: Strategies, Methods, Techniques. 2002, Hanser, Munich and Vienna.
 27. Porter M.E., Competitive Strategy. Techniques for Analyzing Industries and Competitors. 1980, Free Press, New York.
 28. Q&S – Qualität und Sicherheit GmbH, www.q-s.info, 04.05.2007.
 29. QSG – Danish Quality Guarantee, www.danskeslagterier.dk, 14.04.2007.
 30. Schiefer G., Rickert U. (editors), Quality Assurance, Risk Management and Environmental Control in Agriculture and Food Supply Networks. 2004, ILB-Press, Bonn.
 31. Schouwenburg H.J.N., Quality Management in IKB Chains. 2004, *in*: Schiefer G., Rickert U. (editors), Quality Assurance, Risk Management and Environmental Control in Agriculture and Food Supply Networks. ILB-Press, Bonn, 631-636.
 32. Schulze B., Spiller A., Theuvsen L., Is More Vertical Integration the Future of Food Supply Chains? 2006, *in*: J. Bijman *et al.* (editors), International Agri-food Chains and Networks. Wageningen Academic Publishers, Wageningen, 49-63.
 33. Spiller A., Qualitäts-sicherung in der Wertschoepfungskette – Vor- und Nachteile unterschiedlicher Organisationskonzepte. 2004, *in*: Dachverband Agrarforschung (editor), Lebensmittelqualitaet und Qualitäts-sicherungssysteme, DLG-Verlag, Frankfurt/M., 83-96.
 34. Theuvsen L., Motivational limits to tracking and tracing: Principal-agent problems in meat production and processing. 2003, *in* Schiefer G., U. Rickert (editors): Quality assurance, risk management and environmental control in agriculture and food supply networks, Vol. A, ILB-Press, 223-230.
 35. Theuvsen L., Transparency in netchains as an organizational phenomenon: Exploring the role of interdependencies. *J. Ch. Net. Sci.*, 2004, 4, 125-138.
 36. Theuvsen, L., T. Hollmann-Hespos, The economics of traceability: A model of investments in tracking and tracing systems in agriculture and the food industry. J. Boaventura Cunha, R. Morais (editors), Proceedings of the EFITA/WCCA 2005 Joint Conference. 2005, Vila Real (Portugal), 914-921.
 37. Theuvsen L., Hollmann-Hespos T., Investments in Tracking and Tracing Systems: An Empirical Analysis of German Food Manufacturers. 2007, *in*: Parker C. (editor), Proceedings of EFITA Conference 2007, Glasgow, July 2-4 2007.
 38. Theuvsen L., Spiller A., Peupert M., Jahn G., Quality Management in Food Chains. 2007, Wageningen Academic Publishers, Wageningen.
 39. Verhaegen I., Van Huylbroeck G., Hybrid Governance Structures for Quality Farm Products. 2002, Shaker, Aachen.
 40. Wessler G., Qualitäts-sicherung in der Stufe Landwirtschaft – Was kommt auf die Bauern zu? 2006, Paper presented on November 3, 2006, Berlin.
 41. Williamson O.E., The economic institutions of capitalism. 1985, Free Press.
 42. Windhorst H.-W., Qualitäts-sicherung in der Lebensmittelkette: Wo liegen die Herausforderungen? 2004, *in*: Dachverband Agrarforschung (editor), Lebensmittelqualitaet und Qualitäts-sicherungssysteme. DLG-Verlag, Frankfurt/M., 21-33.