

**EUROPEAN PORK CHAINS.  
THE ROLE OF STAKEHOLDERS IN DIVERSIFICATION  
OF QUALITY MANAGEMENT SYSTEMS**

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Key words: supply chains, pork market, quality management strategy.

Abstract

The paper presents the results of the diagnose concerning the characteristics of pork chains in 6 European Union countries: France, Greece, Spain, The Netherlands, Germany and Hungary. The aim of the paper is to present the differences and fragmentary character of the chains in the pork sector in Europe and diversification of demand for pork products in rapidly developing European markets. Determination of presence of differences in the quality management systems in 6 chosen European countries, i.e. France, Greece, Spain, The Netherlands, Germany and Hungary is the main hypothesis of the paper. Three of those differences apply to specialised pork chains (Spain, The Netherlands and Hungary) while the other three the regional pork chains (France, Greece and Germany). The nature of those chains results from the differences in utilisation of public and private quality management systems and the differences between inter-organisational quality management systems within the chains of supplies strengthening quality cohesion and safety between the links of the chain. The comparison of them allows formulating conclusions for reconstruction of the pork chains in Poland.

**EUROPEJSKIE ŁAŃCUCHY DOSTAW WIEPRZOWINY.  
ROLA INTERESARIUSZY W RÓŻNICOWANIU SYSTEMÓW ZARZĄDZANIA JAKOŚCIĄ**

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Słowa kluczowe: łańcuchy dostaw, rynek mięsa wieprzowego, strategia zarządzania jakością.

Abstrakt

W artykule przedstawiono wyniki diagnozy i charakterystyki łańcuchów dostaw wieprzowiny kształtujących się w sześciu krajach Unii Europejskiej: Francji, Grecji, Hiszpanii, Holandii, Niemczech i na Węgrzech. Celem artykułu jest przedstawienie różnic i fragmentaryczności łańcuchów

dostaw w sektorze wieprzowiny w Europie oraz zróżnicowania popytu na produkty z wieprzowiny na szybko rozwijających się rynkach europejskich. Główną hipotezą artykułu jest stwierdzenie występowania różnic w systemach zarządzania jakością w wybranych sześciu państwach europejskich. W trzech z nich występują wyspecjalizowane łańcuchy dostaw wieprzowiny (Hiszpania, Holandia i Węgry), w pozostałych trzech – regionalne łańcuchy dostaw wieprzowiny (Francja, Grecja i Niemcy). Charakter tych łańcuchów wynika z różnic w wykorzystaniu publicznych i prywatnych systemów zarządzania jakością oraz różnicy między organizacyjnymi systemami zarządzania jakością wewnątrz łańcuchów dostaw, wzmacniających spójność jakościową i bezpieczeństwo między ogniwami łańcuchów. Ich porównanie pozwala na sformułowanie wniosków, które można wykorzystać w rekonstrukcji łańcuchów dostaw wieprzowiny w Polsce.

## **Introduction**

The influence of globalisation processes on development of relations between food producers, particularly producers of pork products and their buyers diversified and changing as concerns its principles. Food is one of the basic factors determining human health. Changes in food production technology (among others, pork products and diversification of product range on the nutritional, health and taste values) create new hazards such as the BSE, dioxins, avian influenza that must be solved by applying new instruments concerning General Food Law (EC178/2002, EU Directives on Hygiene 852/2004, 853/2004 and 854/2004, or within the area of the European pork market – EC 2004), as well as the institutional solutions. Processes of international trade liberalisation, including food trade, at the times of the development of global corporations producing those goods, create new challenges as concerns the functions of the national states and international institutions. They also create the necessity for establishing new principles of cooperation between the public sector and the private sector institutions. The European Union as a whole is a second largest pork producer in the world after China. The changes presented below that take place in the chosen pork quality management systems of specialised nature, which applies to, inter alia, Spain – the 5<sup>th</sup> largest pork producer, or regional nature, among others in Germany – the 3<sup>rd</sup> largest pork producer in the world (FAOSTAT 2005), allow formulating conclusions for reconstruction of pork chains in Poland.

## **Methodology of studies**

The methodology of studies that lead to obtaining the results presented below encompassed:

– applying the process approach to analyses and concepts of reconstruction of the traditional distribution systems with diversified quality, fragmentary

and ineffective, into modern pork supply chains networks (LAZZARINI et al. 2001, SCHULZE et al. 2005);

- use of the achievement of strategic management, in particular those by M. Porter, for formulation of the competition strategy for supply chains and networks management (SZYMANOWSKI 2008);

- adjusting the benchmarking method to analysis of the “best practices” concerning the solutions in the European scale in the field of modern pork distribution systems within the chosen geographic markets (*European Pork Chain* 2009);

- consideration of food specificity and the necessity of using its quality and safety management systems thanks to the possibility of designing and monitoring their transparency applying the information technologies (LUNING, MERCELIS 2005, LUNING et al. 2006);

- adaptation of the continuous improvement to gradual reconstruction of the food distribution system by applying the method of continuous improvement by E. Deming as the uniform base for the redesign of distribution systems in the food supply chain (DEMING 1993).

The diagnose of differences in pork quality management systems was made on the example of 6 chosen European countries, i.e. France, Greece, Spain, The Netherlands, Germany and Hungary. Three of those differences apply to specialised pork chains (Spain, The Netherlands and Hungary) while the other three the regional pork chains (France, Greece and Germany).

### **Information requirements for participants in food supply chains and networks**

The food supply chain network concept formulated by Lazzarini, Chaddad and Cook in 2001 defines the Food Supply Chain Network (FSCN) as the direct ties connecting the actors (participants) that cooperate with one another in supply of products to consumers. Those entities may play different roles in different chains (FSCN) in which the vertical and horizontal partnership relations between them change dynamically. Schulze, Althoff, Ellebrecht and Petersen developed that concept further in 2005 for the pork chains with the focus on the possibility of determining the added value obtaining efficacy and effectiveness increase while satisfying the client requirements and minimising the costs. Such supply chain management involves gathering information on:

- reduction of uncertainty and risk resulting from unpredictable demand and supply of food that represent the source of ineffectiveness in supply, production, logistics and marketing and increased importance of security achieved through increasing transparency and quality along the entire supply chain;

- time saving resulting from shortening the product life cycle allowing increased flexibility and appropriate reaction to the market needs;
- reduction of costs possible thanks to the information from partners that is provided on time and reliable, increasing the effectiveness, reducing stocks, improving distribution effectiveness and eliminating contamination;
- effectiveness increase that allows, knowing the needs of the consumers and partners in the supply chain, adjustment of the volume and structure of deliveries to the volume and structure of demand;
- value added thanks to innovations in new products and customer service that remains the only sustainable source of competitive advantage difficult to achieve but also to copy;
- quality improvement allowing elimination of quality differences within the supply chains.

If the raw materials or semi-finished products are of low quality, the effectiveness of supply chains will decrease. Collecting information in the above areas allows exchange and information quality evaluation between all the stages: procurement, production and distribution. To achieve the quality management level satisfying the defined requirements the process of collecting the data, the documents describing the status of information concerning individual processes as well as product quality assurance planning and control should be secured.

In well-defined information systems, confidence between partners forms the base for success, which leads to a high level of loyalty and hence an increase in profitability. Confidence-based exchange creates transparent networks and chains. Network transparency means then that the stakeholders have full understanding of the information on the product that they expect, without losing it, delays, redundancy and adulteration (HOFSTEDÉ et al. 2004). The above definition indicates that the data should be appropriate, accurate, reliable, actual, provided on time and in appropriate volumes. Moreover, the information should be legible and its exchange should be defined appropriately. To improve transparency, the system of tracing and assuring food safety in supply chains and networks should be improved.

Assuring safety of products delivered to the market involves registration of data concerning them at every stage in the food supply chain, particularly fresh products, i.e. at the level of each of the enterprises participating in it. Short life products stored under inappropriate conditions, contaminated at one of the steps of the chain, represent actual hazard to human health. Awareness of that risk was the baseline for the European Union legislation. The Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures

in matters of food safety<sup>1</sup> is one of the most important among them and the one that is compulsory. The aims of that Regulation include not allowing dangerous food for trade, identification of food safety problems to assure appropriate operation of the internal market as well as protection of health and life of the citizens. Organisation of a system for monitoring food trade and procedures for withdrawing products from trade in case of risk for health or life is necessary for achievement of those objectives. Establishment of the entire system of legal acts in that area involved implementation of the Regulation (EC) No 1935/2004 on materials and articles intended to come into contact with food that came into force in October 2006. This means that the sector of suppliers of raw materials and packages related to the food industry is also required to observe the principles of traceability. The key of traceability is the possibility of applying the above-mentioned monitoring of movement and origin of the given product (batch of product) at every stage of the supply chain, i.e. the possibility of obtaining the data from the earlier stage in the chain (what was received and from whom) coupled with feeding the information to the next stage (to whom and what was sent). Use of global standards for identification of movement of the individual loads and information accompanying them satisfies the requirements of traceability.

The possibility of determining the source of actions with specific structure and the locations where other actions with equivalent structure are located in the supply chain forms the base for traceability. That is why traceability is treated as equivalent to tracking the movement of products and tracing their origin. Among many, two traceability definitions deserve attention (TRIENKENS, VAN DER VORST 2006). Those are<sup>2</sup>:

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<sup>1</sup> The detailed regulations of the Regulation (EC) No 178/2002 have been described in paper 18 concerning monitoring:

1. The possibility of monitoring food, animal feed, breeding animals and all substances intended for addition to food or feed or which can be added to them at all stages of production, processing and distribution should be provided;
2. Entities operating in the food and feed market should be able to identify every person that supplied to them a food product, feed, breeding animal or a substance intended for addition to food or feed or which may be added to them. For those purposes those entities should establish systems and procedures allowing transfer of such information on request by competent authorities;
3. Entities operating in the food and feed markets should establish systems and procedures for identification of other enterprises to which they delivered their products. Such information should be transferred to competent authorities on request;
4. Foods or feeds introduced to the market or which can be floated to that market in the Community should be properly labelled and marked to facilitate monitoring them using appropriate documentation or information according to the applicable requirements or more detailed regulations;
5. According to the procedure specified in article 58 section 2, separate regulations can be enacted for the purpose of applying the requirements of this article to specific sectors.

<sup>2</sup> Other definitions of traceability concern:

- batches for dispatch of freight *identification* (place and quantity) *and tracing* (from where and where they will be used) the information on the material. Batches for dispatch are quantities produced together with the costs incurred and their characteristics (VAN RIJK et al. 1993);

– traceability means the ability to trace and follow a food, feed, food-producing animal or substance intended to be, or expected to be incorporated into a food or feed, through all stages of production, processing and distribution (EC No 178/2002); and

– traceability means the ability of the quality management system to trace the history, application or identification of the object or activity or similar objects or activities thanks to their identification (ISO series 9000).

Traceability may be defined in the narrow or wide meaning of that term. In the narrow meaning, it allows people determining where the products are situated at every moment of time. In real time, the tracking function allows identification of not only the product but also the components of which it consists and the methods of use of every single final product. In the wide meaning, traceability means that the information on products and processes of their production may be used for optimisation and control of processes within and between the individual links in the supply chain to provide the possibility of decreasing the costs of damages, increase productivity and guarantee the quality.

Traceability has a separate meaning for organisations and for the supply chain. At the enterprise level, it allows providing information on location and placement of products and their history. At the supply chain level, it allows obtaining, in addition to the information on location of products, the information on the origin of those products.

Considering a large number of participants (the industry, government administration entities, consumers), the possibility of guaranteeing the composition of their products by developing the information system allowing cooperation within the supply chain is particularly important for enterprises. Traceability also allows:

- identification of the product and products within the supply chain. The aim of that identification is to allow data corresponding to individual operations using codes (barcodes, labels, etc.);
- tracking the movement of objects allowing location of them along their entire travel on the supply chain;
- tracking the movement of objects within the food chain allowing determination of their composition at the individual supply chain stages. In the lower

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– information necessary for description of the history of food production and the following operations or processes concerning the food along the path from the farmer to the place of consumption (WILSON, CLARK 1997);

– identification and tracking as modern tools offering insight into the sources of producing the products and their ties to all the links in the supply chain (WEIGAND 1997);

- a) characteristics allowing location of the flow,
- b) recording and tracking the numbers of dispatched batches, processes and materials used for production (APICS)

part of the supply chain, determination of the history of the object and sources of problems related to damage is the aim of tracking. In the upper part of the chain, tracking aims at determining the location of products manufactured using e.g. contaminated raw materials.

## **Characteristics of pork chains and their stakeholders**

Characteristics of pork chains and their stakeholders are presented in figure 1.

Pork chains worldwide cover the same stages of production and distribution although they may be performed by different actors (participants) that will be discussed in the following point. Figure 1 presents the basic stages taking place within the pork chain including the primary and auxiliary processes as well as the most important stakeholders operating in their environment. In the majority of European pork chains, the most important stages cover processes performed by separate organisations referred to as actors. Those stages are genetic selection, growing of piglets, growing of pigs, slaughter, processing, retail trade and sales channels, consumption (see fig. 1). In many chains, there is no differentiation between the stages of piglets growing and pigs growing or there are combined slaughter and processing plants. The seven stages identified in figure 1 contain the following processes:

1. Genetic selection organisations that provide piglets to growing farms. Those enterprises specialise in genetic improvement of pigs. They conduct tests concerning piglets; production improvement and optimisation;

2. Organisations dealing with production of piglets after fertilisation of sows. From 8 to 12 piglets are separated from sows after 2 weeks and after around 10 weeks they reach the weight of ca. 25 kg. Such companies generally provide sows for further reproduction;

3. Organisations producing mature pigs that purchase piglets to grow them to ca. 100 kg, which is usually achieved after 6 months. In some chains, those are separate companies. In the majority of cases, those are companies producing both piglets and fattened pigs;

4. Slaughter should take place in organisations established especially for that purpose. The piglets and mature pigs are not slaughtered immediately to mitigate the transport related stress. The process of slaughter is effective and conducted according to sanitary standards. After slaughter, the meat is sold to processing plants, wholesalers or retailers. For this purpose the entire meat that was subjected to cutting is used;

5. Processing plants, in most cases independent, although they may be combined with the abattoir. They produce a whole range of products such as hams, sausages and convenience food;

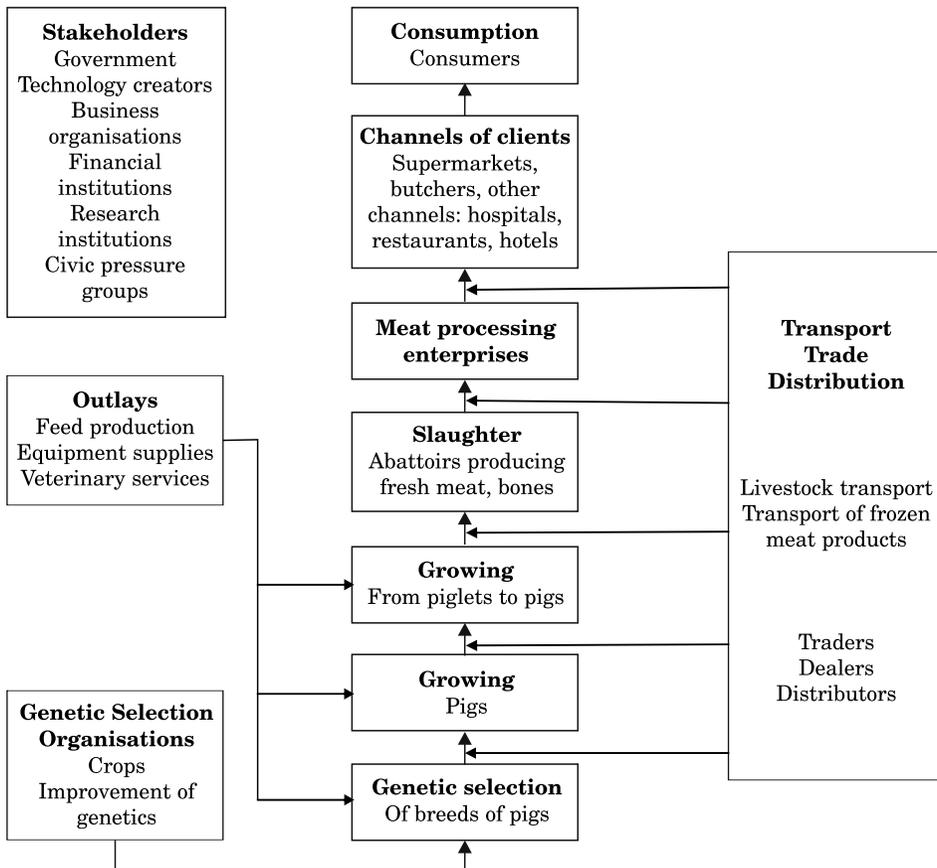


Fig. 1. Pork chains and their stakeholders' description

Source: TRIENEKENS, WOGNUM 2009, p. 27.

6. Pork is sold primarily to supermarkets but also restaurants, hospitals, hotels and canteens;

7. Consumers represent the end customers of the pork chain. Hence, they have significant influence on the nature of pork products' production.

In figure 1, other actors positioned in the environment of the chain such as feed industry were included because the feed represents one of the basic components of costs in the pork chain. The industry manufacturing equipment for pork production and processing and veterinary services related to dosage of medical drugs into the feed were also included. Food safety depends in particular on monitoring the paths animal feeds and their components take from their places of origin. Available equipment allows processing technologies

development as well as meeting the appropriate requirements concerning climate and hygiene.

Other stakeholders also have significant influence on organisation and operation of the chains. Here the public administration institutions that create appropriate regulations and monitor compliance with them are positioned. Research institutions and universities support improvement of processing processes and long-term improvement of organisation of the chains. Financial institutions offer credit and conditions facilitating the pay-off of it. Logistic operators, forming either components of finished products' manufacturers or independent logistic companies, facilitate transport of livestock, semi-carasses and meat products between the links in the chain. Traders and dealers facilitate sales and providing services. The pork chain in figure 1 presents the network of interactions between organisations supporting supply of meat products to the consumer.

Diversification of the demand in the market, manifesting through market segments, is reflected in the upper part of the chain concerning genetic selection and feed. Innovations in that area result in increased diversification of the range of products and market organisation methods. We can identify two perspectives from which pork supply chains can be viewed. The first one is the public perspective representing the perspective applied by government and consumer organisations considering also the environmental perspective (its importance), animal welfare (during production and transport) or ethical practices (related to additives and medications in feed and aspects of transparency). This is reflected in the design of the organic pork chains that are in plans in numerous European countries. The second perspective is the economic one related to the design of market-oriented chains in which the actors gain competitive advantage creating added value based on product, process or organisational innovations. This is reflected in production of food that is ready for consumption, convenient, healthy, safe and based on pork raw material.

### **Structures and standards of pork chains**

Further here, the conditions of higher quality pork products supplies to the European consumer as well as those of better matching the structure of supply and the structure of demand in the European pork chains will be presented. This will be linked to the quality standards, organisation of supply chains and the quality management systems in them.

The new food safety principles are implemented by institutions and mechanisms established for that purpose that must cooperate in a defined way. The

governmental food safety control institutions such as the European Food Safety Authority (EFSA) cooperating with the World Trade Organisation (WTO) and the World Health Organisation (WHO) influence the development of the buyer – seller relations in the food chain. Their task is to shape the public standards and appropriate behaviours of participants in food trade. The control of quality and safety of supply in raw materials and means of protection is also performed using the private standards such as e.g. the EUREPGAP. Such standards are implemented by non-public institutions such as associations of food producers, consumer interests protection associations and, first of all, the food chains; integrators i.e. the retail networks such as Tesco. Mixed market – administrative mechanisms are implemented between the public and private sector institutions. On the one hand, they order implementation of hygiene standards such as Good Hygiene Practise (GHP) and Good Manufacturing Practice (GMP) and, on their base, the HACCP system (Hazard Analysis and Critical Control Points). On the other, they employ the market mechanisms such as production limited by quotas (milk, sugar) and limitation of natural environment pollution such as carbon dioxide and trade in them. Mixed mechanisms implemented by both public and private institutions possess control competences and instruments for enforcement of compliance with the food safety principles.

As concerns the conditions of the European pork market, the organisation of the pork supply chains is implemented employing both public and private food quality standards and the relations between the actors of fresh pork chains that determine the quality management systems organisation.

The public food quality standards in the European Union countries include, among others the HACCP (implemented in pork supply chains). They are applied in particular in the countries of Northern Europe where public demand for pork is governed by the domestic law regulations. On the base of those general public systems, the EKO identification has been developed for organic foods as well as the Protected Designation of Origin (PDO) identification and the Protected Geographical Indication (PGI) system. That later type of chains presented above supplies six types of ham in Spain and the Bayonne ham in France (WOGNUM et al. 2009).

Private food quality standards are established by private institutions to assure quality and safety within food chains. Those standards concern norms encompassing food safety, product and process management, personnel hygiene conditions and natural environment protection. For example, large retailers in Europe developed standards adjusting their suppliers to the requirements of quality management systems aiming at protection of their consumers against specified hazards. Table 1 presents examples of private Quality Management Systems (QMS). In their majority, those sys

Table 1

International quality management systems in the food supply chain

System	Based on	Source	System application
British Retail Consortium Standard (BRC)	HACCP ISO	British retailers	The operational quality management system and the HACCP plan covering the requirements: environmental concerning the product, processes, personnel, at the stage of processing/distribution
International Food Standards (IFS)	HACCP ISO BRC	Germany, France and Swiss retailers	Food safety and quality of branded food products in retail trade. Concerns the stages of processing and distribution
Safe Quality Food (SQF)	HACCP ISO	Australian retailers	Segmented food safety as well as its quality, animal welfare, environmental influence, organic production at all chain stages
Dutch HACCP	HACCP	Danish retailers	Segmented food safety based on the HACCP for stages of growing, processing, distribution and logistics
International Standard Organisation (ISO-22000)	HACCP	ISO	Segmented food safety based on the HACCP for every entity in the chain including feeds and service suppliers
Retailer Produce Good Agricultural Practice (Global-GAP formerly Europe-Gap)	HACCP	European and American retailers	Global-GAP supports use of the HACCP and the members must implement national and international legislation. Growers must reduce environment pollution, make effective use of natural resources, care for health and safety of the employees, assure traceability
Qualität und Sicherheit (QS)	Eurep-GAP IKB	German retailers	Testing compliance with legal requirements and food safety criteria at all stages of the food chain

Source: WOGNUM et al., 2009, pp. 43.

tems are based on the HACCP and ISO systems and they are similar to one another.

For the suppliers such as food producers or traders delivering to the retailers directly, the Global Food Safety Initiative (GFSI) has been developed to harmonise the standards in the global scale. Although the retailers operate on their own standards such as the BRC (British Retail Consortium standard), IFS (International Food Standards), Dutch HACCP or SQF 2000 (Safe Quality Food), some of them accept their standards, e.g. British Tesco accepts BRC or IFS standards. The majority of French retailers enjoy the right to operate their

own quality policies although they participate in the work by the IFS. The Belgian retailers on the other hand are required to apply the GFSI standards. The Global-GAP system has been developed for producers of raw materials to support the HACCP principles and reduce the natural environment pollution (SZYMANOWSKI 2011a).

The quality management systems applied in pork chains – the Dutch IKB (Integrated Chain Control) and German QS (Qualitat und Sicheetheit), are compatible with the Global-Eurep/GAP<sup>3</sup> system. Almost all the pork chain actors, i.e. suppliers of raw materials, abattoirs and processing industry in the Netherlands and Germany participate in the IKB (Integrated Chain Control) or QS (Quality and Security)<sup>4</sup> system. In 2006, the IKB system covered 98% of porkers in the Netherlands while the QS system in Germany – 85% of porkers at abattoirs. The IKB and QS participants are under continual control by independent organisations as concerns food safety. Audits are conducted a number of times a year. In case of noncompliance, the actors are subject to sanctions that extend up to exclusion from the control system. The IKB and QS as well as Global-GAP systems are based on the HACCP, GMP and ISO 9004 systems. Similar systems are organised in Denmark as QSG (Quality Assurances Guarantee) covering 96% of porkers from abattoirs and in France as VPF (Viande de Porc Francaise) covering more than 90% of pork production.

The relations between the main pork chain actors were subject to fundamental changes during the last decade (WOGNUM et al. 2009). They concerned, first of all, a change in the structure of pork products production and sales in different countries of the European market. In the Netherlands and Germany large volumes of fresh meat are the object of trade while the volumes of organic meat are small representing 2% share in the Dutch market and 0.5% at the German market. In Spain, in addition to the fresh meat market, we have a large regional market with 6 types of ham. Changes in the market show the move towards convenience food, health products and packaged meat. In Hungary, in addition to trade in meat, traditional regional products are marketed such as Mangalia products representing an example of the market for traditional products for which the government administration prepared a special program. In Greece, the fresh meat market is the dominating market with 80% share. Other chains operate at the regional level where abattoirs sell their products to the consumers directly.

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<sup>3</sup> The Global-Gap System was created in 2007 as the platform for cooperation of the main European food retail networks that developed the quality control system as concerns fruit, vegetables as well as flowers, meat and fish.

<sup>4</sup> More in W. Szymanowski: Analysis of the European pork chains. Role of stakeholders in diversification of quality management systems, material prepared for publication, July 2011, p. 203.

The concentration of participants in the individual stages of the pork chain and the types of relations between them represent the second phenomenon in the aspect of relations between the main actors of pork chains. The phenomenon of concentration occurs at all stages of the pork supply chain.

At the level of retail trade, the phenomenon of concentration is observed as particularly pronounced in the countries of Northern Europe where the 5 largest retail networks control 90% of the market. In France, super and hypermarket networks sell over 80% of the fresh meat. In the Netherlands, supermarkets sell 74% of the meat. In Southern Europe, on the other hand, meat sales go through food shops. In Spain traditional shops sell 39% of meat while in Greece in 2006, abattoirs sold 77% of fresh meat while 90% of the processed meat was sold through retail networks.

In Europe, concentration at the slaughter level is even greater. The largest abattoir in the Netherlands has the market share of 70% while in Germany three largest abattoirs have 50% of the market. On the other hand, in Spain, the 10 largest abattoirs have the market share of 25% only. In Hungary, the concentration process is at the early stage with the six largest abattoirs supplying 50% of the market while around 150 abattoirs supply the other 50%. In Greece, the concentration process is not seen.

Concentration processes can also be observed at the level of meat processing. Large numbers of small processing plants can be seen in the south of Europe. They are involved mainly in production of regional products. In both the Netherlands and Germany, an increase in number of the processing plants can be observed. Some of them are large processing plants. In Spain, two processing plants control 40% of the market. The total number of processing plants in Spain is close to five thousand and 25% of them produce regional products (hams) while 5% the PDO products. In Greece, 75% of pork is processed pork in the form of hams and sausages. Six processing plants covering the full range of products control almost 60% of the Greek market.

The level of final growing exists and develops, although in Southern Europe it shows a decreasing trend. In the Netherlands there are close to 8,000 farms growing 50,000 heads of pigs. In Germany there are close to 80,000 farms of which a proportion are small farms situated in the south of the country. There are close to 100,000 farms in Spain and 13,500 of them produce regional products. France has 75 cooperative groups of farms. The number of pig growers in Hungary is close to 300,000 but it decreases rapidly while 80 largest farms produce over 50% of the total production. In Greece, there are close to 1,000 farms but their number decreases.

Strong concentration processes take place in the feed industry. Ten largest feed mills in the country supply 65% of the market in the Netherlands

and 50% of the market in Germany. The Spanish feed market is dominated by 15 feed mills while in Greece 13 feed mills supply 88% of the market with feeds. Only in France, the number of feed mills exceeds 250. In Hungary, despite the significant role of small feed mills, imports of feeds play an important role.

Finally, the first link in the pork supply chain is also characterised by concentration processes. The Netherlands, Germany and Denmark possess large genetic selection organisations that supply the entire Europe. Also at that level reduction in the number of enterprises is observed, which is coupled with effectiveness increase in the organisations remaining in the market.

The type of market relations existing between their actors both at a given chain level and between the levels also determines the supply chains organisation. Contracts are the dominating form of transactions at the genetic selection level in different European countries while market transactions dominate at the connection between the production farm and the abattoir in, e.g. the Netherlands and Germany. Mixed or hierarchic management structures can be found in Spain and Greece as well as in Denmark. In Greece, the trend of vertical integration of all the supply chain links is observed although the integration between abattoirs and retail outlets is less pronounced. In majority of the European pork chains there are no formal contracts. More frequently vertical integration can be encountered as the base for standardisation, based on private standards such as the IKB and the QS.

Communication systems are implemented in case of ties between more than two actors in the supply chain where the quality standards are implemented (SZYMANOWSKI 2011a).

The form of ownership of the actors in the supply chain is another factor determining integration. When cooperatives or cooperative associations are the dominating form, as is the case in Northern Europe, then the cooperative of producers take decisions at the level of slaughter (the Netherlands) or at the regional level. In Germany, 60% of relations between the grower and the slaughter as well as 30% at the level of genetic selection – growing are of cooperative contract types. This causes that the pork sector is the best-organised market in Europe. In Spain, cooperative organisations are encountered at the stage of feed supply to producers of piglets. In total, cooperatives have 20% of pork production and 10% of the sales market.

The information technology is the last factor influencing the choice of vertical relations. In Germany, the Netherlands, France and Denmark inter-organisational information systems are created concerning in particular the relation between growing and slaughter that allow determining appropriate prices for deliveries of meat and optimise their processes within a short or

long-term. Those systems are extended by information from all stages of delivery from genetic selection through feed production, growing up to slaughter (SCHULZE, PETERSEN 2004).

### **Operation areas of public and private quality management systems in pork chains**

Below, the quality management systems organisation and structure of exchange in different European countries will be presented. The quality of products leaving the processes covered by quality management systems is influenced by (WAGNUM et al. 2009):

- the ownership – whether this is a public entity or a private entity that is responsible for the product leaving the system;
- the standards that the owner of products or processes applies in the quality management systems;
- markings communicated and guaranteeing the quality of product or process to the consumer.

The markings such as logos, trademarks or names differentiating products provide information on specific characteristics of the product and process conducted according to appropriate specifications. The logo owner, which may any of the chain participant be, that is a public or private partner, does not have to participate in the transaction within the chain. Testing transaction compliance with quality standards does not have to be performed by the logo owner. It may be performed by another public organisation or a certification agency, e.g. Lloyds. Such systems facilitate monitoring compliance with quality standards. Different quality management systems are found in pork chains in different European countries. Those differences concern not only public or private system ownership but also whether the system encompasses the selected links or the entire pork chains. We may identify two types of quality management organisations: public binary systems involving two entities from the supply chain and private quality management systems covering the entire supply chains.

The binary relations in public quality management systems are widespread in countries such as Greece and Hungary. Fresh meat chains in Spain may serve as examples of regional public pork supply chains. They are based on formalised contracts in which genetic selection organisations coordinate the upper part of the supply chain (SZYMANOWSKI 2011).

Private quality management systems covering entire chains are found in the fresh pork sector in Germany where the QS systems have the character of private quality management systems. The situation is similar in the Nether-

lands where the IKB as the integrated chain control system represents a private pork trade quality management system. Agricultural cooperatives operating on the base of contracts are coordinators in the chain (SZYMANOWSKI 2011a).

Finally, there are regional systems in which private or public organisations can be the integrators. Management of regional or national chains based on private standards may take place in cases such as chains organised by agricultural cooperatives coordinating their operations by means of formalised contracts. Compliance control in those quality management systems is based on private standards (the QS system in Germany adapting horizontal quality management standards such as the GMP+ and the IFS).

In case of public quality management systems in which public quality standards are applied, the control is conducted by public inspection agencies and public veterinary service. Examples of such systems include the organic pork supply system (EKO) in the Netherlands or the regional systems in Spain such as the Protected Designation of Origin (PDO) system or the Protected Geographical Indication (PGI) system for production of regional products (6 types of ham) coordinated as concerns compliance with the European Union and domestic standards by the regional administrative authorities (SZYMANOWSKI 2011a).

## Conclusion

The paper presents analysis of pork supply chains in six European Union countries: France, Greece, The Netherlands, Spain, Germany and Hungary. Differentiation was performed into the public and the private quality management systems as well as binary quality management control systems and comprehensive quality management systems with national and regional coverage. Considering the environmental aspects in Europe, we can identify the “intensive systems” in Northern Europe, the “soft systems” in Southern Europe and the “system of low effectiveness” in Central Europe. The diversity of those systems is presented in figures 2 and 3<sup>5</sup>.

The concentration at various chain levels is the fundamental characteristic of European pork chains. Particularly in Northern Europe the slaughter stage is of major significance today and will continue to be in the future<sup>6</sup>. Consolida-

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<sup>5</sup> More in W. Szymanowski: Analysis of the European pork chains. Role of stakeholders in diversification of quality management systems, material prepared for publication, July 2011, p. 203.

<sup>6</sup> The largest European abattoir of Danish Crown integrating the Danish meat sector and Dutch-German Vion Food Group covering over 50% of pork processing sector can serve as examples.

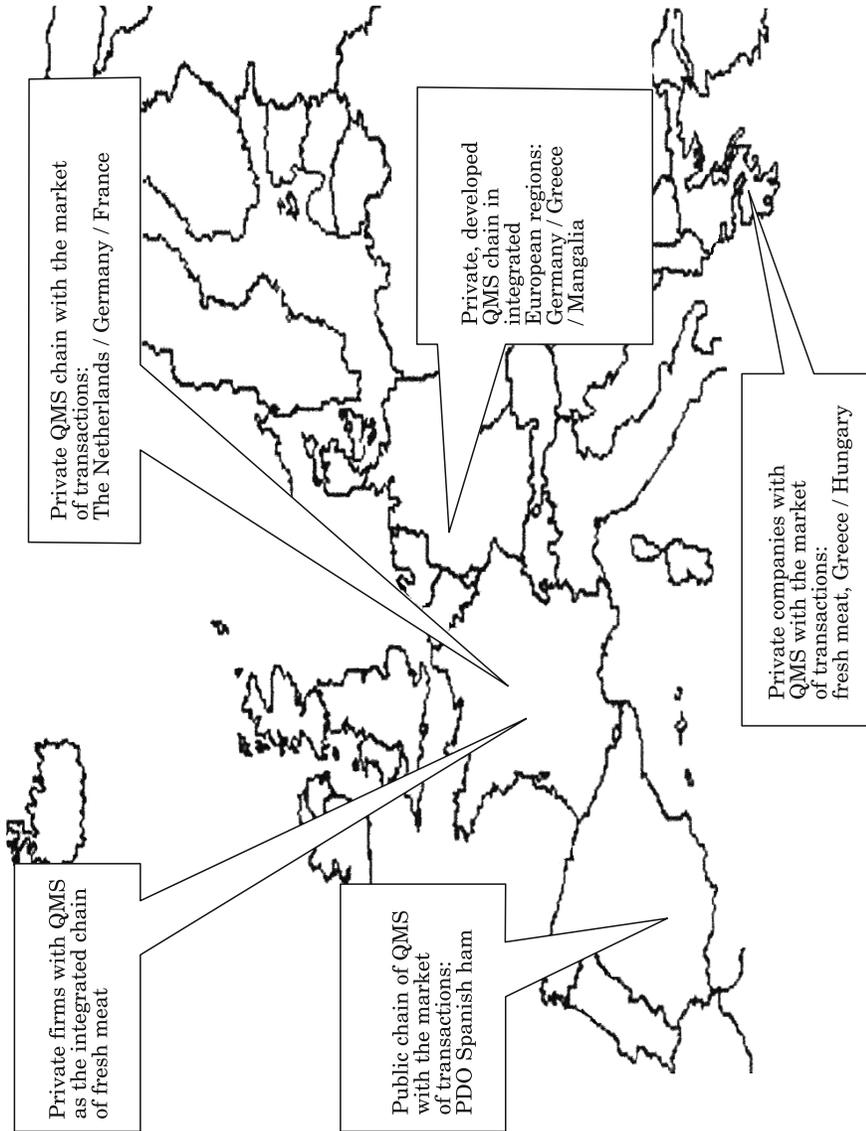


Fig. 2. Quality management systems organisation and principles of cooperation in pork supply chains in Europe  
Source: TRIENEKENS, WAHNUM 2009, p. 280.

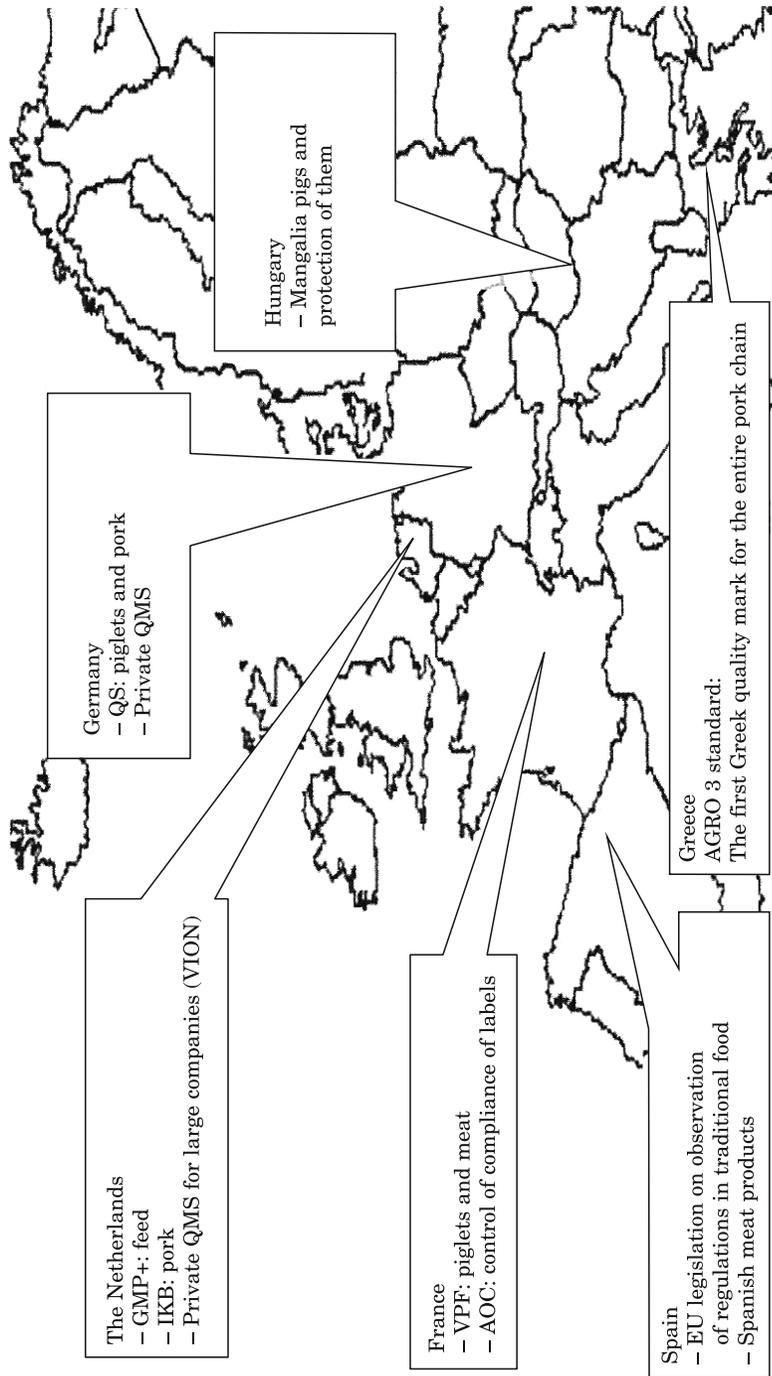


Fig. 3. Typical pork chains quality management systems in different parts of Europe  
 Source: TRIENEKENS, WAHNUM 2009, p. 281.

Table 2

SWOT analysis of the pork sector for six European Union countries

Strengths	Weaknesses
<p><b>The Netherlands:</b> use of knowledge in the sector, high productivity, IKG quality system, exports,</p> <p><b>Germany:</b> high level of technology, regional products, QS quality system, strong cooperative sector;</p> <p><b>France:</b> strong traditions, strong cooperative organisations, quality brands and special products, effective institutional activity;</p> <p><b>Spain:</b> growing sector, market flexibility, strong regional brands;</p> <p><b>Hungary:</b> traditions of regional products, good quality of feed cereals, low labour costs;</p> <p><b>Greece:</b> rapid growth in processed products, investments by government administration, personal sales;</p>	<p><b>The Netherlands:</b> focus on mass production, poor sector image, increasing production costs;</p> <p><b>Germany:</b> lack of communication within the chain, lack of systemic solutions for pollution problems, dependence on imports of piglets;</p> <p><b>France:</b> many small producers, competition from poultry, small abattoirs, image of pork as fat product;</p> <p><b>Spain:</b> poor image of pork, fragmentation of production, shortage of labour;</p> <p><b>Hungary:</b> outdated production technology, little investment, low productivity;</p> <p><b>Greece:</b> dependence on genetic material, low technological adaptation, high production costs, large black market;</p>
Opportunities	Threats
<p><b>The Netherlands:</b> sector image improvement, improvement of logistics and information exchange, foreign investments thanks to cooperation with foreign manufacturers of mass products;</p> <p><b>Germany:</b> large producers, increase of exports, development of market niches, development of network coordinators;</p> <p><b>France:</b> high production capacity, progressing concentration, raw material quality, technological progress, targeted exports;</p> <p><b>Spain:</b> development of products: health, convenience, immigration of labour (South America) development of local brands;</p> <p><b>Hungary:</b> development of product niches (Mangalia), government administration support, technology improvement, exports to Croatia and Greece;</p> <p><b>Greece:</b> improvement of the sector image, new product development, consumer preferences concerning domestic meat.</p>	<p><b>The Netherlands:</b> decrease in acceptance for industrial forms of production, lack of solutions for environment pollution, production costs increase;</p> <p><b>Germany:</b> high numbers of small producers, federal system of taking decisions, unstable relations within the chain;</p> <p><b>France:</b> lack of leadership balance in the chain, absence of large companies at the EU level, domination of domestic legislation over the EU legislation, competition in the EU markets, competition from poultry, high process of raw materials;</p> <p><b>Spain:</b> increase of production costs (feed), increase of internal consumption, increase of institutional costs;</p> <p><b>Hungary:</b> poor image, illegal slaughter, high fluctuation of prices, absence of sectoral strategy;</p> <p><b>Greece:</b> competition of environmental tourism for pork production, high costs competing to competitors, decreased acceptance for industrial production.</p>

Source: TRIENEKENS, WOGNUM 2009, p. 266.

tion, however, does not mean integration of the chain, which is exemplified by independent abattoirs in the Netherlands or the situation in Germany where the chains are integrated by implementation of appropriate quality management systems integrated with the information systems. Concentration occurs

not only at the stage of slaughter but also within the other links of pork chains in Northern and Western Europe. Pork chains of Southern and Eastern Europe are more fragmentary with fierce competition between individual stages of the chain, which represents a future challenge for those countries. Those processes started taking place in the countries of Northern Europe some 10–15 years ago.

Currently the trend of diversifying fresh pork products in Europe is weak, although there are possibilities for producing special and regional products. The PDO products from Spain or Mangalia pork from Hungary can provide the examples here. Opportunities for production of very high quality regional products for niche markets increase. This covers, for instance, production of various types of sausages, which will promote the meat sector in Northern Europe as diversified in its range of products.

Quality systems in North-Western Europe cover entire pork chains and they are supported by integrated logistics and IT systems. Those systems are developed for small and medium companies. Quality management systems are initiated by the level of abattoirs and not as is the case in other food chains by retail networks. A particular role is played by cooperatives in Germany, France and Denmark and they create implementation of quality management systems in the meat sector, which is then followed by the countries of Southern Europe. In North-Western Europe we deal with meat production in industrial form, which allows maintaining the competitive advantage in pork products trade and sale of technical knowledge on mass production to other countries. The weaknesses of such production criticised by consumers are low animal welfare and poor natural environment protection, which, among others, hinders development of tourism. The summary of the above analysis concerning the pork chains diversification status in six European countries is presented in table 2 (TRIENEKENS, WOGNUM 2009).

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