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## FUNCTIONING OF THE SUPPLY CHAIN OF PORK IN POLAND\*

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**Abstract.** The supply chain is a network of suppliers and customers offering their products or services to the end consumers. The research aimed at recognizing the elements of the supply chain of pork in the area of supply, processing and distribution. The information was primarily sourced by the data storage statistics and chosen meat companies listed among the 2000 largest industries in Poland. The domestic supply chain of pork is characterized by a considerable fragmentation of production, processing and distribution. A significant number of entities and the absence of capital tie-ups between the breeders and the meat industry does not foster durable integration. In order to maintain the profitability of production, the meat establishments diversify their activities. Entities with large production volume more often cooperate with commercial networks, whereas in case of the smaller ones, these are their own distribution networks that prevail. The leaders in the industry are characterized by a wide range of goods, large-scale production, specialization and a closer integration in the supply chain.

**Key words:** supply chain, pork, sourcing, processing, distribution

### INTRODUCTION

The supply chain includes “a network of organizations that are involved, through linkages up and down the chain, in different processes and activities creating

value in the form of products and services for the end customer” (Stadtler and Kilger, 2008). M. Christopher (2000) defined supply chain as a network of suppliers and customers interrelated through a variety of processes and activities creating value in the form of products and services offered to the end customer. In terms of the process the supply chain can also be described as a process of free movement of goods, information and funds between the source place of raw material and the customer. In this sense, the basic links in the supply chain are considered to be: suppliers, producers, wholesalers, retailers and consumers (Gołomska, 1994). The account is taken of such features as: the structure, the object of movement and objectives, the scope of functioning and areas of cooperation between participating entities.

The supply chain may vary depending on the relations between the entities and their complexity. They are more or less vertically integrated. What is important at every stage is the number of participants and it varies depending on the type of supply chain. Traditional food chains are characterised by a low degree of integration which is due among other things to the economic and organisational disparities between cooperating links in the chain. These disparities are the most vivid when comparing the initial and final link of the chain, i.e. agricultural producers and trading companies. The more

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so as the the movement of agricultural products from the producer to the consumer includes the phases of agricultural materials processing, storage, handling and transfer of title (Tomczak, 2004).

The study has focused on the supply chain of pork in Poland because of its importance in the food industry. In 2012 the share of live pigs in the global production was around 11.7% and in commercial farming over 14.2%. During that time as many as 260.100 agricultural holdings were involved in breeding pigs. Whereas according to the General Veterinary Inspectorate (GVI), in early July 2012 the number of pork processing plants totalled 1482. The statistics show moreover that pork occupies a dominant position in the structure of meat consumption in Poland. In 2012 it totalled 39.2 kg per person. The research aimed at recognizing the elements of supply chain of pork in the areas of procurement, processing and distribution.

## DATA SOURCES AND RESEARCH METHODOLOGY

The data analysis was based on the reference books and the data storage statistics from the Central Statistical Office (CSO) and Eurostat. The main source of data was the elaborations of the Institute of Agricultural and Food Economics - National Research Institute (IAFE-NRI) and data of the General Veterinary Inspectorate (GVI) concerning meat industry establishments involved in the slaughter of pigs and pork processing. What is more, a detailed analysis covered selected meat companies listed among the 2000 largest industries in Poland. The research was based on the comparative analysis and case study. The results of the analyses are presented in a descriptive, graphical and tabular form.

## RESEARCH RESULTS

Within the supply chain of pork there occur multi-directional relationships between the entities determining the path of the movement of goods from the producer to the end buyer. A simplified example of such a relationship is a system consisting of a pig farm (the producer of raw meat), processor, trader and a consumer. Although these links function in all countries, the number of entities within particular phases differ considerably. Especially large differences exist between the old EU-15 MS and other EU members. In the Old Union there is a large

concentration of production growing consolidation and specialization of processing and sales are made primarily through commercial networks and in large stores. The countries that joined the EU at a later date are usually marked by fragmentation of production and processing and by prevailing retail sales.

In Poland the main characteristics of the supply chain of pork are:

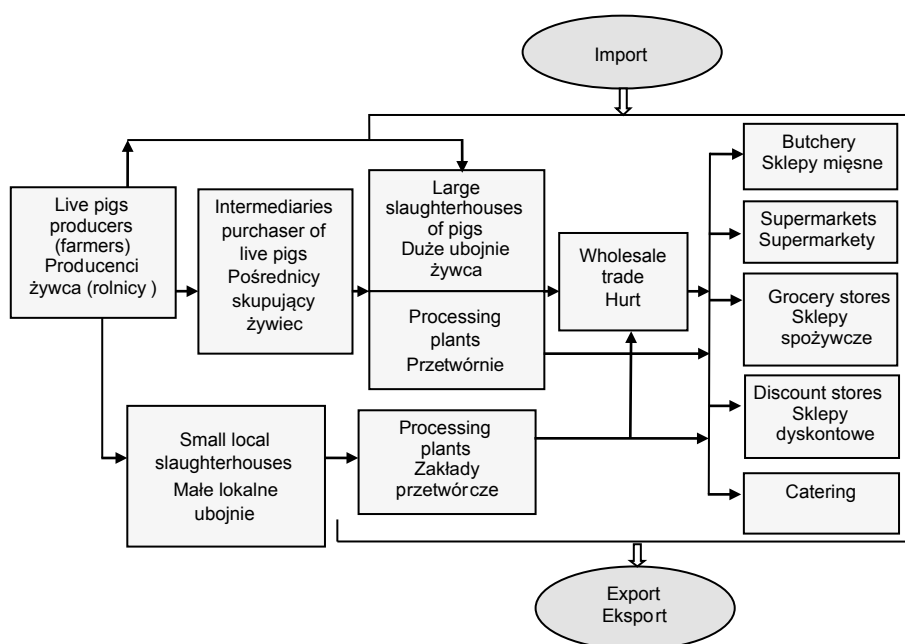
- low concentration of production - the majority of inventory are concentrated in the agricultural holdings with no more than 50 animal units,
- volatility of raw material prices,
- high internal market demand dependency.

Under these conditions connecting live pigs suppliers and construction of an adequate resource base for processing became extremely important. The concept of integration took two directions in Poland: on the one hand, there were set up horizontal producer organizations (associations, cooperatives), on the other, in vertical arrangement there appeared partnership agreements between producers and processors. However, the scale of this process had no significant effect on the technical and economic efficiency of the Polish meat market organization. The diversity and multiplicity of entities operating within the structure of the supply chain of pork processing will continue to lead to its low permeability and strong dependence on the current market situation (Kozera, 2007). Dominant relationships in Polish supply chain of pork have been shown in Figure 1.

The basic source of raw material for the meat establishments in Poland is domestic production of live pigs which results from the volume and structure of pig inventory. In the structure of farms with pigs dominate entities that hold several livestock units of this species. In 2012, their share accounted for 45.2%. The percentage of largest farms remaining above 200 pigs totalled 3.1%. In these farms were 52% of the pig population (Użytkowanie..., 2013).

In the first years after EU integration, the slaughter of this species of animals exceeded 23 million animal units (Fig. 2). The largest number of slaughters at the level of 24.7 millions of animal units was recorded in 2007, which equalled 136% of inventory. Along the reduction of domestic pig herds, the slaughter of finishers kept diminishing too. In 2013, there were slaughtered only 15.6 millions of animal units.

Small plants are mainly sourced by direct supplies from farmers who deliver their finishers to the

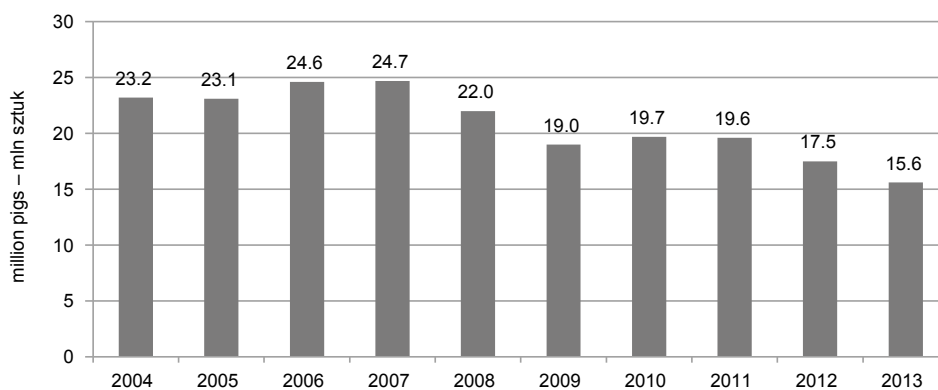


**Fig. 1.** The supply chain of pork in Poland

Source: Dybowski et al., 2006.

**Rys. 1.** Łańcuch dostaw wieprzowiny w Polsce

Źródło: Dybowski i in., 2006.



**Fig. 2.** Number of the slaughter of pigs in Poland in 2004–2013

Source: own elaboration based on (Rynek, 2014).

**Rys. 2.** Ubój trzody chlewnej w Polsce w latach 2004–2013

Źródło: opracowanie własne na podstawie (Rynek, 2014).

slaughterhouses or buying stations run by these entities. Settlement of the purchase of live pigs are made on the basis of live weight. Due to a considerable dispersion of suppliers larger establishments most often use the

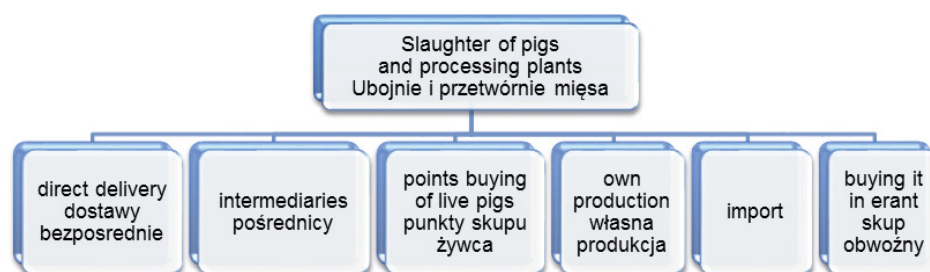
services of intermediaries. In such situations they have to share margin. Payment for a trading agent is the difference between the farm purchase price and the price of selling live pigs to the slaughter plant. In this type

of establishments settlements with suppliers are based on the cold weight of pigs while taking into account the carcass meatiness.

Plants with large production capacity are characterized by a greater diversification of the raw material sources (Fig. 3). They often have their own commodity services that play an important role in procuring live pigs to the processing plant. They receive live pigs directly from farms or from their own buying stations. These are most often large suppliers or producer groups.

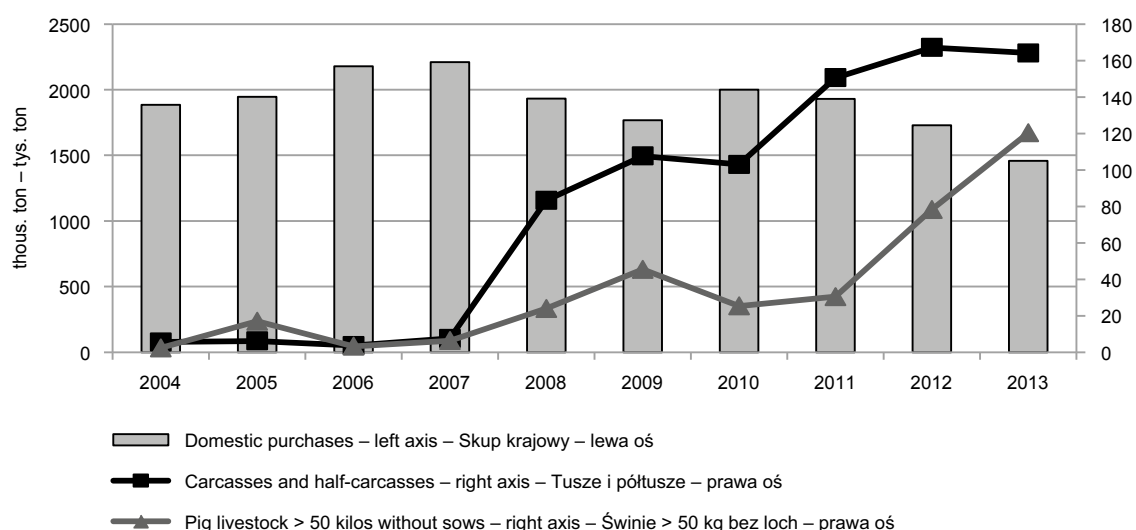
In this group a significant amount of raw material is also homebred.

In view of decreasing domestic resources of finishers the importance of raw material from imports is growing, showing an increasing trend in recent years. This is particularly true for the pork carcasses and half-car-cases. According to Eurostat data, in 2004–2011 their import increased from 5.6 thousand to 164.1 thousand tons. Whereas, imports of live pigs increased from 2.4 to 120.3 thousand tons (Fig. 4). Its level is determined by



**Fig. 3.** Sources of raw material supplies to the meat plants  
Source: own elaboration.

**Rys. 3.** Źródła dostaw surowca do zakładów mięsnych  
Źródło: opracowanie własne.



**Fig. 4.** Import of live pigs, carcasses and half carcasses against domestic purchase of pigs  
Source: own elaboration based on data from Eurostat and IERiGŻ-PIB.

**Rys. 4.** Import żywca wieprzowego oraz tusz i półtuszy wieprzowych na tle krajowego skupu trzody chlewnej  
Źródło: opracowanie własne na podstawie danych Eurostatu oraz IERiGŻ-PIB.

the level of price relationships. An important factor in this respect is also the situation in the currency markets.

There are several factors that determine the source of raw material for the meat plants, the most important being:

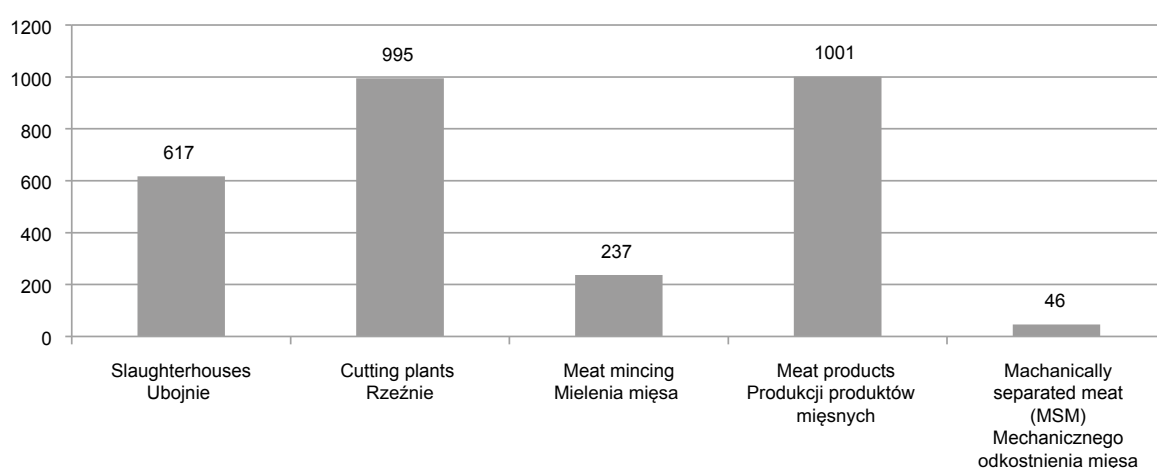
- production volume (the plant position on the market),
- policies and strategy of the establishment development,
- location in relation to the raw material supply markets,
- the longevity on the market and related experience.

Pig producers and the domestic processing sector are linked by slaughter plants which are direct or indirect receivers of live pigs from the agricultural holdings. According to the General Veterinary Inspectorate (GVI) at the start of 2014 as many as 617 domestic entities were active in slaughtering pigs (Fig. 5). These were mostly small plants, operating locally and serving small, individual farmers. The majority of domestic plants deal with meat cutting and meat processing – 995 and 1001 entities respectively. Very often, however, these activities are combined within a single plant. The number of meat cutting and processing plants far exceeds the number of slaughterhouses operating in the country which means that many of them are forced to source raw materials in foreign entities. The related margin is therefore captured at an earlier stage of distribution chain (Szymańska et al., 2012).

In the post-EU integration period domestic meat industry establishments made many replacement, modernization and development investments thanks to EU subsidies, support of industry programs and their own means. All meat-processing departments expanded the offer of goods while improving the quality and commercial attractiveness of their products. There followed the implementation of new technologies, especially of the so-called highly-efficient ones, the effect of which was the extension of the range of meat products. Favourable conditions were created by the widespread use of new additives and auxiliary materials, as well as by the development of cutting and packaging of meat products. These technological changes also allowed to extend the shelf life of meat products and cooking meats. This was required first of all by the rapidly developing chain stores, with modern packaging allowing to extend the shelf life and reduce the costs of sales being prerequisites for the possibility of selling in this distribution channel (Seremak-Bulge et al., 2007).

At present the production capacities of many meat establishments are not fully used, which is due to the absence of sales markets for their products. In the first half of 2014 the biggest problem was the reduction of exports of pork to eastern markets, which was not compensated by acquiring new customers from other countries.

Another step of the supply chain is distribution of meat and meat products from the phase of processing to



**Fig. 5.** The number of domestic slaughterhouses and pork processing plants  
Source: own elaboration based on GIW data.

**Rys. 5.** Liczba zakładów uboju i przetwórstwa mięsa wieprzowego w kraju  
Źródło: opracowanie własne na podstawie danych GIW.

the end buyer. Polish meat industry most often uses the strategy of mixed distribution channels, including indirect links as well as direct deliveries to supermarkets, hypermarkets and discount stores. Directions of distribution of semi-finished and finished products manufactured by the meat plants on the domestic market include the customers of the retail market and institutional customers.

Within the structure of retail market customers there can be distinguished direct channels in which the producer deals with distribution and sale of his own products to end customers and indirect channels through external agents. From the point of view of a producers of meat and meat products, there are basic channels with a considerable contribution in the sale structure and auxiliary channels complementing the sales. They perform additional functions related to building brand image, e.g. with respect to the final and own-brand stores (Seremak-Bulge et al., 2007).

The institutional customer market covers supplies to other processing plants and to the HoReCa (Hotels – Restaurants – Catering) sector. Concurrently, along with a dynamic development of eating out, there can be observed an increased share of the meat and dairy products supply for the HoReCa sector through specialized agents providing comprehensive supply.

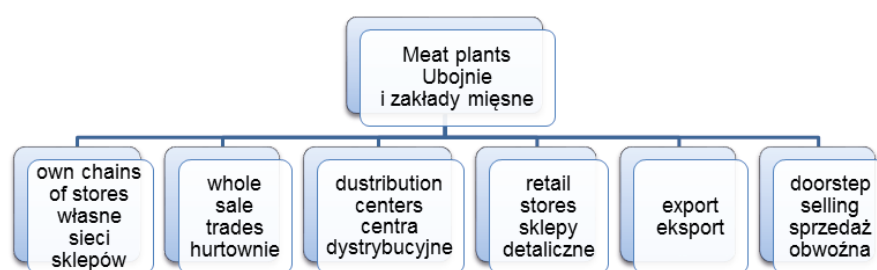
In order to satisfy the needs of the consumers the products must be available in a suitable time and place. This is done through the following links referred to as distribution channels of raw material, semi-finished products for further processing, to end with the final products delivered to the end customer. The choice of adequate distribution channels is determined by a number of factors such as the type of products or the term

of stability and by the guarantee of appropriate conditions of transport, storage or exposure. The organisation of distribution is also relative to the situation in the sector, the traders' possibility to invest in modern information technologies and to the marketing solutions, the most important being the choice of promotional and pricing strategies (Seremak-Bulge et al., 2007). The establishments participating in the meat market show high creativity and flexibility in adapting the distribution channels to the specific situation in a given place and time (Fig. 6).

The strategy adapted by large-scale production establishments is to a greater extent based on cooperation with chain stores where the meat or smoked meat producer does not have an impact on the stuff training. Whereas in the case of smaller plants their own sales networks are more important in distribution of products. Their leaders have even more than 100 network stores.

Despite a huge fragmentation of meat establishments there emerged among them a group of multi-plant companies or groups of companies with extensive operations in the country and abroad. The list of the 2000 largest Polish companies in the group of meat industry leaders includes such establishments as: Animex, Sokołów S.A. Polish company DUDA and ZRP Farmutil HS S.A. In 2008–2011, their revenues from sales increased by 1661.6 thousand PLN. The share of these enterprises in trade industry accounted for approximately 20%. In 2011, these companies employed 20,938 persons (Table 1).

Animex has 11 plants located throughout the country. At the same time it is the biggest employer in the meat industry employing 7300 persons. Since 1999 it has been incorporated in the global industrial giant



**Fig. 6.** Distribution channels of pork and meat products

Source: own elaboration.

**Rys. 6.** Kanały dystrybucji wieprzowiny i wyrobów mięsnych

Źródło: opracowanie własne.

**Table 1.** Chosen meat companies listed among the 2000 largest establishments

**Tabela 1.** Wybrane firmy mięsne notowane na liście 2000 największych przedsiębiorstw

Specification Wyszczególnienie	Revenues from the sale in 2008 Przychody ze sprzedaży w 2008 (mln PLN)	Revenues from the sale in 2011 Przychody ze sprzedaży w 2011 (mln PLN)	Share in the turnover of sector Udział w obrotach branży (%)	Employment (number of people) Zatrudnienie (liczba osób)
Animex Sp. z o.o. GK, Warszawa	3 100.0	3 615.0	7.4	7 300
Sokołów S.A. GK, Sokołów Podlaski	1 904.7	2 462.5	5.0	6 314
ZRP Farmutil HS S.A., Śmiłowo	1 406.7	1 788.6	3.7	5 674
Polish Meat Company Duda S.A. GK, Warszawa	1 463.1	1 670.0	3.4	1 650

Source: own elaboration based on Lista 500... (2012) and Lista 2000... (2009, 2012).

Źródło: opracowanie własne na podstawie Lista 500... (2012) oraz Lista 2000... (2009, 2012).

Smithfield Foods Capital Group. Being a leader in the meat market, its exports are also the highest. It sources from a sister company Agri Plus which supplies the establishment with around 1.5 million pigs a year. Agri Plus is the biggest producer of pigs in Poland and is part of a vertically integrated production system. Such a system allows to communicate the market needs to the raw material suppliers. The remaining part of finishers are bought by the establishment from hundreds of farmers from all over the country based on a long-term cooperation and trust.

Sokołów S.A. is a company having its registered office in Sokołów Podlaski. It consists of seven production plants where specialisation is of significant importance. Three branches (in Sokołów Podlaski, Robaków and Jarosław) slaughter pigs and deal with meat processing. Branches in Koło and Tarnów slaughter cattle. While branches in Czyżew and Dębica are uniquely engaged in processing meat. Sokołów S.A. is a multi-plant enterprise with a full production profile and a recognizable brand on the Polish market. The Company's branches have the license to export onto many markets, such as the USA, the EU as well as Korea, Russia and Ukraine. In respect of distribution of the products of this establishment, a key role is played by their own distribution centres, shops and own-brand stalls at large chain stores. The company currently has 42 distribution centres located in the main cities of Poland, 49 of its own shops, and

670 own-brand outlets. Besides expanding its own distribution network, the establishment cooperates closely with private distributors (external networks), constantly developing sales in that segment.

Polski Koncern Mięsny DUDA S.A. is the largest company in Poland in the red meat slaughtering, cutting up and distributing industry (pork, beef, game). The Company controls and is the most important part of the capital group now made up of about 30 companies operating in the agricultural and food sectors. The main production plant of DUDA S.A. establishment is located in Grabków and it is one of the most modern meat establishments in Europe. In 2011 its revenues from sales amounted to 1670.0 million PLN, i.e. 14.1% more than in 2008.

The activities of ZRP Farmutil HS S.A., Śmiłowo company range from the purchase and slaughter of live pigs to meat cutting and processing. The annual production of these meat plants covers more than 40 000 tons of products. A wide range of the company's products includes 200 types of goods which are delivered to many customers throughout the country. At present ZRP Farmutil HS S.A. Company cooperates with numerous recognizable customers, including large chain stores and hypermarkets (Tesco, Selgros, Leclerc). What is more, in recent years a strong emphasis has been put on the development of the establishment's own distribution network through wholesalers and retail stores in the

north-western Polish market to sell directly to the end customer.

In order to ensure continuity of supply of raw material large meat plants often conclude agricultural procurement contract with the pigs producers. In this way they reduce the risk associated with procurement and marketing, pricing, timing and providing raw material supplies for the production. Under the agricultural procurement contracts the meat establishment usually offer the breeders the following:

- pork marketing,
- the payment rewarding high meat content,
- financial support for in production and in organizing means of production (fodder, reproductive material),
- support in adapting the production to the standards of the European Union (with particular regard to the standards of hygiene, sanitary, veterinary and environmental protection, taking into account the animal welfare as well).

The basic issue in the meat sector is the absence of capital or at least cooperative tie-ups between the producers of live pigs and the meat industry. This situation first occurred after 1990, that is since the introduction of the principles of free market capital game. This is when the vast majority of currently operating private meat plants were established and since when they have gradually tightly mastered the current market of meat and smoked meat in Poland. Livestock breeders were not organized enough to take advantage of this short but determinant in terms of the balance of power phase of economic transformation of the 90ies (Barański, 2011). In view of the loss of capital ties between the breeders and the meat industry, the producers of live pigs have no means of influencing the raw material policy of the meat plants which in case of economic downturn on the market are prone to import raw material from abroad (Szymańska, 2014).

From mid-90ies onwards actions have been taken to rebuild integration relationships between the producers of raw meat with the meat plants. So far this process is too slow as for the needs of the changing market. It is induced above all by a strong fragmentation of the sector both in the sphere of production and livestock slaughter and by a high price risk accompanying production and meat processing. It hampers the implementation of opposing objectives of processors and producers. Processing plants seek primarily to stabilize the supply of the raw material of a certain quality, while minimizing

costs, while the producers of live pigs look for price guarantees (Seremak-Bulge et al., 2007). All these factors and lack of trust between the participants in the supply chain hinder integration processes.

## CONCLUSIONS

1. The supply chain of pork in Poland is characterized by a huge fragmentation of resource base, means of processing and distribution. The existing integration processes had no significant effect on the technical and economic efficiency of the Polish meat market organization, marked with a considerable raw material price volatility and a high dependence on the internal market demand.
2. A dispersed production of pigs, activities of intermediaries and the absence of capital tie-ups between the breeders and the meat industry is not conducive to sustainable integration of the supply chain. The producers of pigs have no means of influencing the raw material policies of the meat plants who in case of economic downturn on the market import raw material from abroad.
3. The establishments of the meat sector quite often diversify their activity in order to maintain an adequate level of profitability. The dominant entities are involved with cutting and processing meat. In the post-EU integration period most of them made significant investments and modernized production technologies. However, by virtue of reduced outlets, meat processing plants do not take advantage of their full production capacities.
4. The choice of adequate distribution channels is determined by the type of products and the customer's needs. It also depends on the economic situation in the sector, possibilities to invest in modern information technologies and adequate marketing solutions. In case of establishments with large production volume the strategy is mostly based on cooperation with chain stores, whereas in smaller plants their own store networks have a more important role in the product distribution.
5. In spite of a huge fragmentation of domestic meat plants, there emerged a group of multiplant establishments or capital groups of broad-based business. Among the leaders of the meat industry there are such establishments as: Animex, Sokołów S.A. Polski koncern DUDA and ZRP Farmutil HS S.A.

Their characteristics are a wide range of produced goods, a large scale of production, specialization and a closer integration in the supply chain.

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## FUNKCJONOWANIE ŁAŃCUCHA DOSTAW WIEPRZOWINY W POLSCE

**Streszczenie.** Łańcuch dostaw jest to sieć powiązanych ze sobą dostawców i odbiorców oferujących produkty lub usługi finalnym konsumentom. Celem badań było rozpoznanie elementów łańcucha dostaw wieprzowiny w obszarze zaopatrzenia, przetwórstwa oraz dystrybucji. Podstawowym źródłem informacji były dane statystyki masowej oraz wybrane firmy mięsne notowane na liście 2000 największych przedsiębiorstw w Polsce. Łańcuch dostaw wieprzowiny w kraju charakteryzuje się dużym rozdrobnieniem produkcji, przetwórstwa i dystrybucji. Duża liczba podmiotów oraz brak powiązań kapitałowych hodowców z przemysłem mięsnym nie sprzyja trwałej integracji. W celu utrzymania rentowności przedsiębiorstwa dywersyfikują swoją działalność. Podmioty o dużej skali produkcji częściej współpracują z sieciami handlowymi, natomiast w małych większą rolę odgrywają własne sieci sklepów. Liderów w branży cechuje szeroki asortyment, duża skala produkcji, specjalizacja oraz większa integracja w łańcuchu dostaw.

**Słowa kluczowe:** łańcuch dostaw, wieprzowina, zaopatrzenie, przetwórstwo, dystrybucja

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