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SUPPLY CHAIN MANAGEMENT PROCESS IN ENTERPRISES OF THE AGRI-FOOD INDUSTRY IN PODKARPACIE

One of the elements of creating a competitive advantage of modern enterprises is the development of supply chains, in which logistic processes are essential. Managing such a supply chain allows the integration of key business processes from the end user through suppliers delivering products, services and information, which provides added value for customers and other stakeholders.

The main purpose of the study is to assess the degree of implementation of logistic business processes within the supply chain in enterprises operating in the agri-food industry. The source material on the basis of which the analysis was carried out and conclusions were formulated were surveys conducted among agribusiness entrepreneurs from Podkarpacie.

The conducted research shows that the level of advancement of logistics processes in supply chains depends on the type of industry in which a specific company operates and its size. Larger economic entities, due to the possibilities and capital they have, use advanced and integrated IT systems supporting production planning, supply, distribution and sales. The implementation of such tools allows for the standardization of many business processes within the network of connections of entities participating in a common supply chain.

Keywords: supply chain management, partnership in the supply chain, business process integration, agribusiness.

1. INTRODUCTION

One of the characteristic features of modern economies lies in the numerous transfers of goods and information. The subject literature indicates two basic types of flows of goods and information – between the entities acting and competing in the same industry, as well as between the related entities, in which one of them acts as a supplier, and the other one acts as a recipient of goods and services. The great importance in this case belongs to the

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flow of goods and services between the subsidiaries. It is de facto a classic example of the simplest supply chain (Kiełbasa, 2015). The supply chain is a long-term and continuous contractual relationship established by enterprises with independent decision-making power to achieve strategic goals (Gu, Yu, 2022).

The network of logistic connections is not only focused on transfers within a single chain, but it also includes a network of complex flows resulting from the implementation of different customer orders and the need of their simultaneous processing. Within these complex flows, the activity of a specific entity may focus only on a specific segment or link in the supply chain. An example of this connection is a downstream supply chain – the companies are positioned in this system as customers of their customers. On the other hand, in the upstream supply chain – they are perceived as suppliers of their suppliers (Ciesielski, 2011).

The supply chain management process, as one of the critical components of logistics, focuses on ensuring the source of raw materials, organizing suppliers, shaping the policy and rules for purchasing, as well as on collection and transportation of raw materials within the enterprise; this process also includes warehousing and storage of final products, as well as distribution, storage and transportation to distribution centers (Piocha, Dyczkowska, 2012). Taking into account the above components of the logistics process, the supply chain can be described as an „activity focused on optimal provision of services and products flow, starting from the raw components to final products in which the goods and services produced are purchased and consumed by the final recipient. In this context, logistics allows for the integration and comprehensive management of such areas of a company as: planning and proper production, financial accounting or sales and distribution (Polak, Tokarski, 1996). The aim of any agri-food supply chain is to achieve a full and effective flow of goods, services and information, transferring capital to create and provide maximum customer value. (Dinu, 2016).

The food processing and supply chain is characterized by a wide variety of entities involved in it. It includes not only producers, suppliers, transport companies, but it also includes wholesalers and retailers, producer and consumer organizations. Due to connections and relations with the suppliers, these entrepreneurs create a network of organizations involved in various processes and activities; they create value in the form of products and services which are provided to the final consumers.

Focusing on supply chains development by many companies is conducive to increase in the efficiency of customer service, decrease in operating costs and provision of permanent access to the strategic raw materials (Christopher, 2000). Proper organizing and optimization of key areas supply chain management constitute nowadays an indispensable element of the developed and implemented corporate strategies. Properly configured supply chain with particular reference to the specificity of the company's production is an important factor in gaining and maintaining a competitive advantage in business environment by influencing costs, quality, strategic inventory level, delivery method and the bid (Witkowski, 1998). The competitive advantage is favored by the very structure of the supply chain, in the light of which the individual organizational units of connections network are not individually responsible for the competitiveness of their products and services, but this responsibility lie with the supply chain as a whole. The aim of the research is to assess the level of advancement in the implementation of supply chains in logistics processes in selected enterprises operating in the agri-food industry.

2. THE SPECIFICITY OF AGRI-FOOD PROCESSING SECTOR

One of the essential areas of broadly understood agribusiness is precisely the agri-food sector. The main task of this sector of food economy is proper protection or processing of perishable plant and animal raw materials into products that are more shelf-stable or that are ready for immediate consumption. Agricultural supply chain management is becoming a very important area of research due to the challenges of changing seasonality, supply and demand peaks and delivery fulfillment (Wicaksono, Bálint Illés, 2022). The relationship between the agri-food sector and agriculture is one of the basic criteria for assessing the level of development and modernity of agribusiness (Urban, 1998). Depending on the applied technological processes and processing industries, the products of this sector may be pre-processed goods or final goods which are ready for direct consumption (Szczepanowski, 2020).

Due to significant technical disproportions, spatial diversification of agriculture and historical events, the national agri-food sector is highly diversified at the regional level. The development of agriculture, the amount of yields obtained from this sector of economy is determined by natural conditions, as well as by organizational and economic factors. These dependencies have a significant influence on the level of the resources usage, competitiveness of agriculture and its place in the economy of a certain voivodeship.

The agri-food industry itself concentrates several key economic areas that deal with various activities at the crossways of agriculture, processing and food distribution. It is indicated in the subject literature that this sector includes three constituent areas: a primary area – covering agricultural production, food processing and trade, as well as food consumption; the auxiliary and service areas (Kiełbasa, 2015).

The dynamic changes in Polish agriculture resulted in its significant modernization, due to which the agri-food industry has become one of the leading and rapidly growing sectors of the national economy. Due to significant funding streams to the agri-food sector, it was possible to increase its modernity and competitiveness. Organizational and technical changes have significantly impacted production capabilities. As a result, export of agri-food products and foreign trade balance have increased. Within a few years, Poland has become a leading European producer and exporter of high-quality food products. Further development of agri-food industry is closely connected and dependent on the environment, use of potential opportunities and ability to implement new technologies. The above mentioned factors have a significant influence on further development of this sector, maintaining a competitive environment, both on the national and international market (Świadek, 2013).

The main factor in the formation of the supply chain in agri-food industry is a need to reduce the costs of its operation. However, this reduction does not concern, as in the case of other industries, costs of transport or forwarding, or limiting the amount of stored reserve stocks. The specificity of agri-food processing obliges their participants to adjust their infrastructure in such a way that they could effectively participate in the flow of goods.

3. RESEARCH AND METHODOLOGY

The main source of research material was individual survey research. The main research method used under the research project was the quantitative method of one-time diagnostic survey method. The choice of this method was caused first of all, by nature of the research environment and the specificity of the agri-food processing industry. However, in order to

obtain interesting empirical material, the survey research technique was used. The research tool enabling the implementation of the adopted technique is a survey questionnaire.

The survey questionnaire consisted of two parts. The first part contained questions relating to the size of the enterprise, place of operation (company seat) and the legal form of the enterprise. The second part included questions with regard to the formulated research objective. The survey questionnaire included 10 questions in electronic form which were sent to the entities agreeing to participate in the survey. The research was carried out from 4 to 30 April, 2022 among the entrepreneurs of the town located in the Podkarpackie Province. The research was carried out regardless of the size of enterprise and its legal form. The criteria for assessing the size of the enterprise were the guidelines and recommendations of the European Commission of May 6, 2003 concerning the definition of micro, small and medium-sized enterprises (Journal of Laws UE L 124 of May 20, 2003, p. 36).

The entities participating in the study got 270 survey links with the access to the survey questionnaire, and it was received back 178 links which constituted 65.9% of all business entities selected for the study. During the selection, it was observed that all the participants of the research completed correctly the questionnaire. The research results were then analyzed, discussed and presented graphically.

The most numerous group of entities participating in the study were representatives of small business sector (69.3%), as well as representatives of micro-enterprises, who constituted 17% of the research. Subsequently, the mid-sized enterprises (15.3%) and large-sized enterprises (4%) were involved in the research. In the course of the analysis, it was found that the vast majority of entities participating in the study (74) were the entrepreneurs involved in meat slaughtering and processing. The second group included the entrepreneurs operating in the milk and grain processing industry (35 and 27 respectively). The last group was represented by the entrepreneurs whose main activity profile was fruit and vegetable processing (42).

4. RESEARCH RESULTS

Each entity operating in the processing is linked by dependencies and relations with the closer and more distant business environment. Most agri-food players in emerging and developing economies are characterized by small and medium-sized suppliers that are heavily dependent on much larger buyers and leading companies (Glavee-Geo, Engelseth, Buvik, 2022). When organizing and managing supply chains with business partners, one should seek maximum reduction of this chain length by limiting the number of intermediaries participating in this process. The exclusion of the unnecessary entities allows for a more efficient delivery of the product to the recipient, it favors better quality of the food (reduction of repackaging and storage), the competitive price of the product and allows the producer to achieve a greater profit from the production and sale of the product (Tundys, 2015).

The achievement of the above objectives lies in the usage of such a model of supply chain management that would allow for deeper integration of business processes between partners, or for more efficient coordination of the materials flow, information and finances between the participants of the chain (Lee, 1998). Overcoming organizational barriers, adjusting strategies and accelerating flows along the supply chain allows to guarantee optimal results of cooperation between the entities involved.

The analysis of organizing and management of the supply chain of the surveyed entities was carried out in relation to seven fundamental, and at the same time, critical economic processes taking place in each production and trade company: customers and suppliers relationship management, the communication with cooperators management, as well as customer service measurement, production planning, implementation of orders and production flow management.

Customer relationship management is a process in which a business or other organization administers its interactions with customers. The recipients' identification allows you to define the key customers, a group of target customers, and divide them according to the criterion of value over time, as well as linking customers with the enterprise by offering customized products and services (Lambert, 2001). The customer structure analysis based on the industry criterion indicates that the main clients of meat processing enterprises are retail entities (small shops), while the dairy entities, as well as fruit and vegetable industries are usually food wholesalers and large-scale retail chains. In general, the most frequent clients of agribusiness enterprises, regardless of the sector, are usually wholesalers (Chart 1).

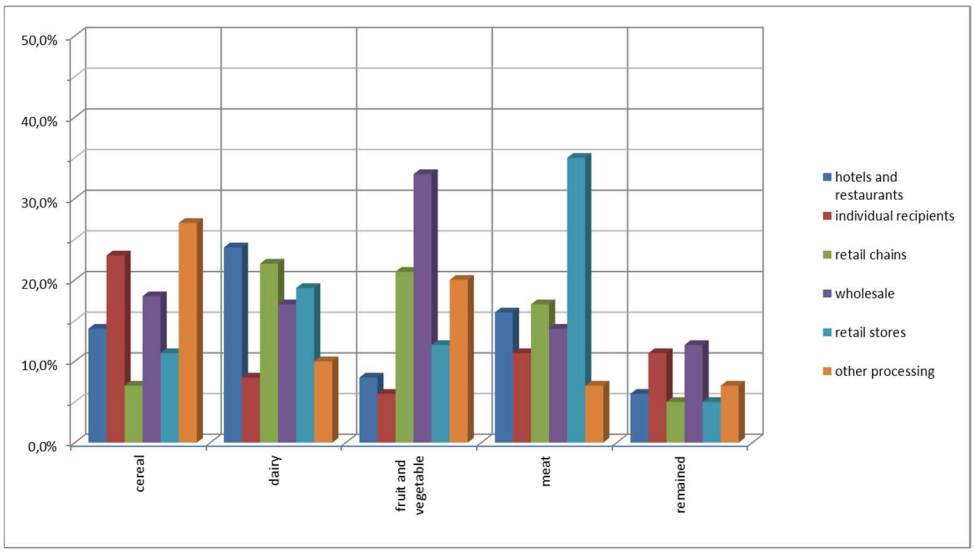

Chart 1. The structure of clients according to area of economic activity

Source: own study.

In the course of the analysis, certain regularities were found in the surveyed companies, where market penetration of supplies and sales were taken into account. The increase in the production of enterprises influence proportionally the expansion of their impact on the supply and sales markets. Small economic entities thus, usually included in the group of micro and small enterprises, try to function by supplying the local market. The geographic scope of market penetration transfers to regional markets with the increase in the size of the company, and in case of large enterprises, respectively – to national and international markets.

Within the suppliers relationship management, the activity of enterprises focuses on defining the scope of cooperation with suppliers, as well as on conducting negotiations with each key supplier with regard to products and service agreements. The developed practice of the surveyed companies indicates that the terms and principles of cooperation are not negotiated in relation to non-critical suppliers. The relations and principles of long-term cooperation are however determined on the basis of bilateral agreements, concluded between the entrepreneur and strategic supplier. Regardless of the nature of cooperation in the supply chain, the main goal of shaping the relations between the entrepreneur and the supplier is to achieve mutual business benefits. The structure of suppliers for enterprises operating in the agri-food processing sector indicates that mainly entities purchasing raw meat and dairy products are of strategic importance, and in case of the grain industry - agricultural enterprises. On the other hand, the suppliers of fruit and vegetable raw materials are usually individual farmers and purchasers (Chart 2).

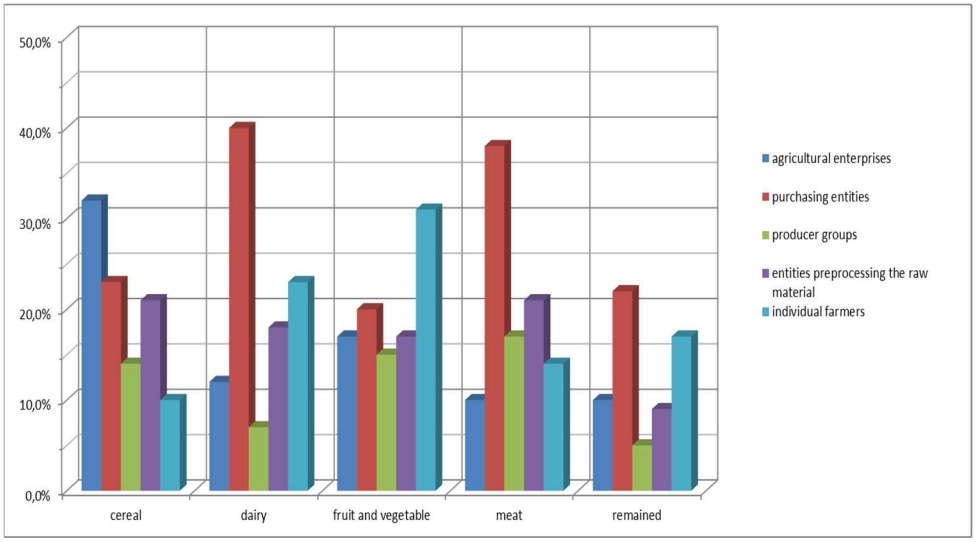

Chart 2. The structure of suppliers according to area of economic activity

Source: own study.

An important element determining the quality of relations between customers and suppliers is the information transfer. This communication is particularly important especially in food supply chains, because of the necessity for product tracking and tracing. Traceability of food origin, feeding stuffs, farm animals and food additives at all stages of production, processing and distribution is one of the elements of its subsequent certification.

Technological changes and consequently provision of market solutions with electronic communication cause that nowadays more and more companies are just beginning to get away from the traditional communication scheme. Extension of supply chains, hire of subcontractors and increasingly common outsourcing have caused the necessity to improve communication and data flow system between employees, departments of the same company, as well as between the clients and suppliers cooperating with it. These changes

concern almost all the entrepreneurs, although due to the specificity of the agribusiness sector, these processes take place relatively slowly.

According to the surveyed entrepreneurs, as a matter of principle, the flow of information with close business environment (the recipients and suppliers) is based on conventional solutions. For this purpose, telephones, e-mail and faxes are commonly used. It is noticeable that with a company development, conventional methods become more and more unreliable, ineffective and hinder the company's development. Therefore, an increasing number of entities, especially those with more capital and aspiring to expand their business impact decide to use modern electronic techniques. The research show that more and more large enterprises operating in the agri-food industry from Podkarpackie region make decisions and urge its partners to implement solutions relating to the usage of electronic platforms for the exchange of documents and transactions between companies. Electronic Data Interchange (EDI) technology enables cooperating entities to exchange business documents and send them in a standardized format which connects them within the supply chain practically all over the world. On the other hand, small enterprises, especially the ones, belonging to micro and small scale enterprises, mostly use verbal communication or paper document flow with recipients and suppliers (Chart 3).

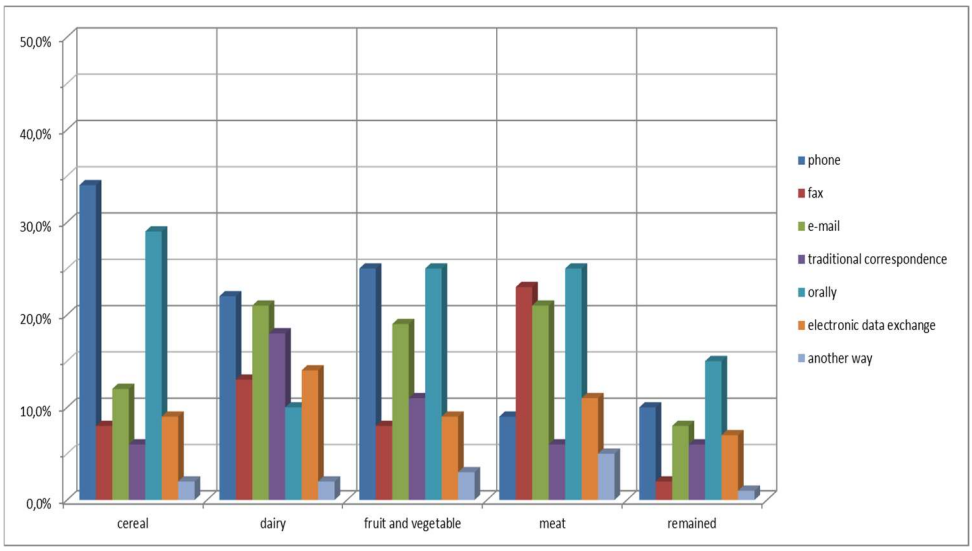

Chart 3. The way of communication with main partners

Source: own study.

One of the key elements of business operations is customer service management, which allows the companies to maintain their existing customer base and gain new customers.

Within this area, an extremely important issue is measurement of customer service effectiveness. There is no single, universal pattern of effectiveness, that is why many companies define and monitor it themselves. A well-developed supply chain metrics system can increase the chances of achieving market success. A company can achieve it by adjusting certain logistic processes within a group of cooperating entities, by directing its

activities to the most profitable sectors of the market, or by differentiating products or reducing their costs. On the other hand, an inappropriate system of measures leads to difficulties in meeting the needs and expectations of consumers, causes competition in the supply chain and the apparent optimization of the company performance (Lambert, 2008).

In order to exclude the above negative factors, it is necessary to implement the solutions regarding the development of supply chain measures, taking into account not only the prospect of increasing profits, but above all, the improvement of managing relations with customers and suppliers in every link of the supply chain. The symbiosis of these expectations can form the basis for creating a system of measures to identify opportunities for improvement of profitability and goals coordination among all actors in the existing supply chain.

For the purposes of this research, the measurement of customer service level was made on the basis of three basic criteria: timeliness of order fulfillment, availability of the ordered goods from the available stock and correctness of order fulfillment (on time and in the expected quantity, in the right place and without damage). The analysis of the research in this matter confirms that nearly 40% of the surveyed enterprises, regardless of the industry, are entities that have never measured the level of customer service. A detailed analysis of this issue showed that the enterprises with a relatively low development potential and the ones included in the sector of micro and small enterprises have a dominant share in it. The awareness of customer satisfaction importance and the level of customer service are significantly increasing in the medium and large enterprises, where more attention is paid to monitoring the level of customer service and customer satisfaction with the existing cooperation. This approach is used in the results of the research, according to which the time or correctness of order fulfillment are criteria that are appreciated by many customers (Chart 4).

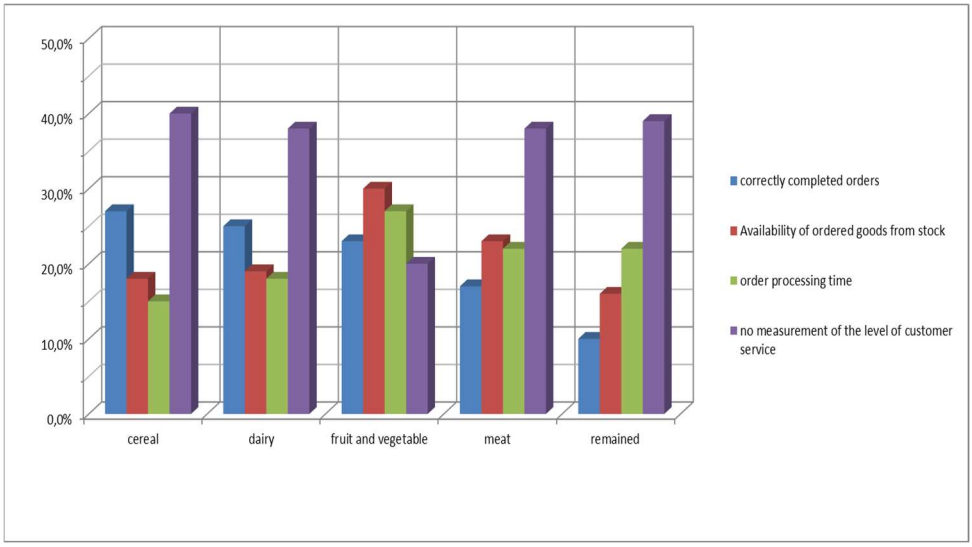

Chart 4. Criteria for measurement of customer service level

Source: own study.

Demand management is one of the elements of supply chain management, which integrates the requirements and needs of customers and suppliers with the capabilities of individual links in the supply chain. Due to control of supply volume in relation to demand volume, the company can dynamically respond to the implementation of the assumed production plans. Effective process management allows the company not only to forecast the production volume, but also enables the synchronization of supply and demand, and thus to increase appropriately the flexibility, as well as to reduce the demand volatility. In case of expected demand, a well-structured demand management process can lead to greater activity of the company and more effective responses to the unexpected changes in demand.

The production planning process of the surveyed entities is generally based on the number of incoming orders. This type of demand management usually applies to micro and small enterprises, which as a rule, avoid production of goods for stock. On the other hand, the representatives of medium and large enterprises, while determining the volume of production, take into consideration the number of incoming orders and use their own analysis based on the market forecasts, own and archival data (Chart 5).

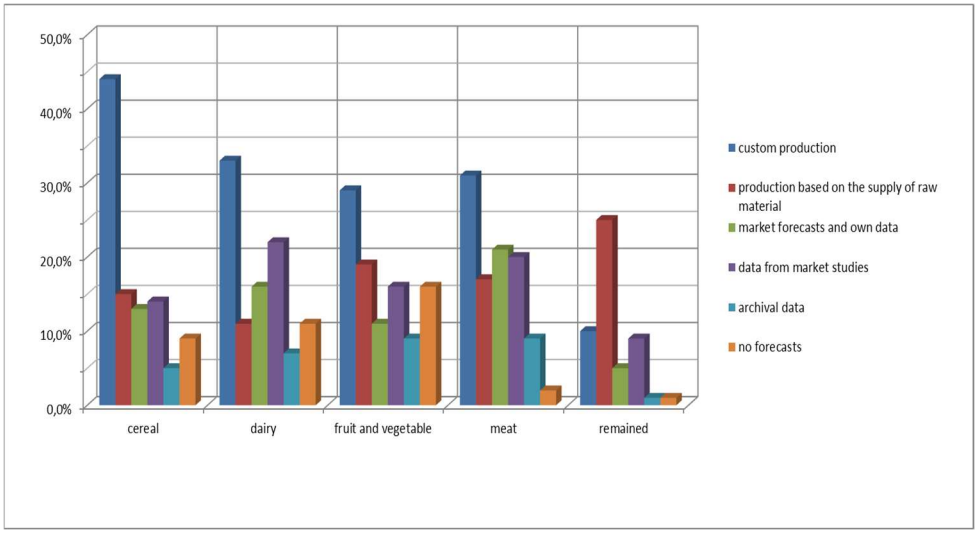

Chart 5. Data sources determining the volume of production planning

Source: own study.

The order fulfillment process is a set of activities and actions aimed at identification and assessment of customers' requirements that allow the company to meet customers' requests, whilst minimizing the total costs of delivery and order fulfillment. This process is not only the implementation of typical logistic activities, but it requires an interdisciplinary action, that is involvement of other company departments in its implementation.

The subject literature indicates four main models of materials management for customer orders service (Baran, Wysokiński, Jałowiecki, 2011):

1) customer orders fulfillment based on the available ready-made goods,
2) production of ready-made goods for the warehouse, and then their packaging and sending after customer order receiving,

3) maintaining a constant level of semi-finished products and start of production upon receipt of customer orders,
4) purchase of production materials and start of production upon receipt of customer orders.

The analysis of the obtained research results confirms that the dominant model of order fulfillment in the surveyed enterprises is the customer orders processing from available warehouse stocks. The compilation of empirical data confirms that a large part of entrepreneurs also practice the "production to stock" model, and the final packaging of goods is upon receipt of customer order. The operation specificity of some agribusiness enterprises demands implementation of another method of order fulfillment – starting production on an ongoing basis with the use of production materials upon receipt of customer orders. This model is characteristic mainly of enterprises operating in the grain and dairy industries (Chart 6).

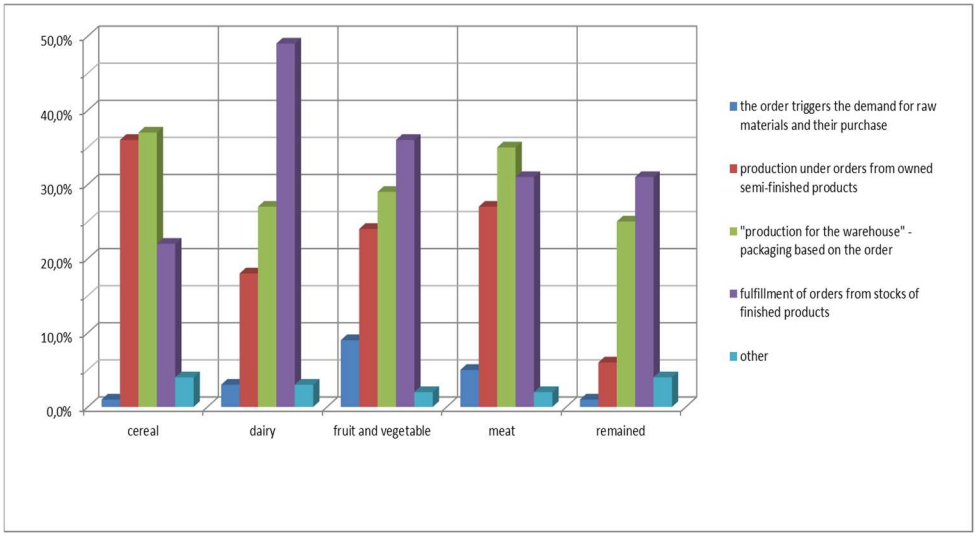

Chart 6. Methods of customer orders fulfilment

Source: own study.

It should be noted, however, that the company itself does not decide on the choice of order fulfillment. An important determinant defining its implementation is the specificity of production or the availability of agricultural raw materials. This problem concerns particularly dairy processing enterprises, which are not always freely decide on the amount of purchased raw material, because it is produced on an ongoing basis and its acceptance must be maintained in the same way. This problem is also encountered by enterprises dealing with fruit, vegetables and grain processing. In this case, decisions on shaping the amount of stocks are limited by their availability only in strictly defined periods of the year. The situation is different for those enterprises which production is based on partially processed raw materials (semi-finished products) and for the ones, which are at the end of the supply chain, that is wholesale and retail trade companies (Michalczyk, 2018).

Production flow management is a process in the supply chain management that concentrates all the activities concerning movement of products in the production process phase. This issue is connected with production flexibility in the supply chain, and thus, the ability of enterprises to produce a wide range of products at the right time and at the lowest possible costs. A certain level of flexibility requires the stages of production planning and implementation to be supported by IT systems that integrate the basic processes of the company operation (Klepacki, Wicki, 2015).

The research results indicate that all surveyed entrepreneurs use financial and accounting programs with various levels of technical advancement. As a rule, simple and distributed systems are used in micro and small enterprises, and their degree of economic events complexity is low. The enterprises, especially the ones relating to the medium-sized enterprises, and regardless of industry, use more advanced IT tools in their activities. The most frequently used in this sector of entrepreneurship include such IT tools as Comarch ERP Optima or Enova356, SAP Business One or Microsoft Dynamics 365 Business Central. The functionality of these programs allows for material and production resources management (MRP planning) and support in the enterprise resource management (ERP systems).

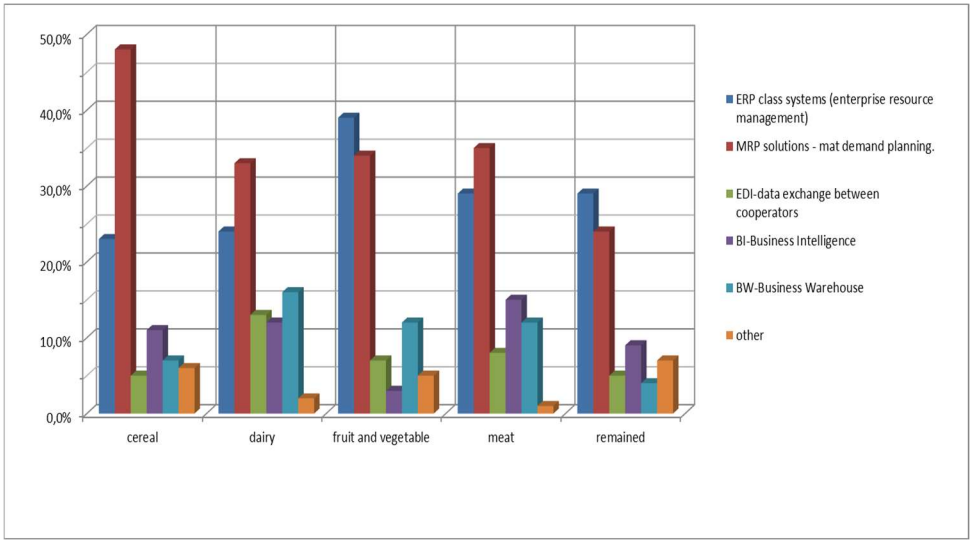

Chart 7. IT systems supporting the course of production processes

Source: own study.

A completely different production management strategy is inherent in large and some medium-sized enterprises. Most of them are based on the advanced IT systems that enable enterprise resource planning, supporting various departments of the enterprise (e.g. finance, production, human resources, supply chain, service or purchase departments) in the implementation of main processes within integrated system. The degree of production, logistics and supply management processes requires the use of more advanced IT solutions, such as SAP Business ByDesign, SAP ERP 6.0 or SAP S/4HANA. A relatively small

number of business entities under study, operating mainly in the meat and dairy industry have declared the use of decision support systems, that is IT tools that allow to conduct the advanced business analytics. It goes here about Business Intelligence and Data Warehousing used for processing and storage of information for strategic and analytical purposes.

When analyzing IT systems which support enterprise management, it is worth pointing out that a lot of medium-sized and large entities operating in the dairy and meat processing industry use electronic data interchange system – EDI (Electronic Data Interchange), especially in relations between the enterprise and the customer (electronic transfer of orders and invoices), as well as between the company and the supplier.

5. SUMMARY

In the modern economy, the implementation of supply chains and information flows, which operate effectively and efficiently, seems to be indispensable factors of cooperation between enterprises, both at a national and international level. The specificity of the agri-food industry requires the modern supply chains to be as simple as possible and withdraw from the market all intermediate links. The reflection of such requirements is the concept of short supply chains. The food supply chain which operates effectively and efficiently is an essential condition for its participants to be adapted to changing market conditions. The strategic importance of the delivery time of products results from the necessity to meet the needs and expectations of customers with regard to specific groups of products. This allows for certain benefits to be achieved by producers and suppliers of these products. Thus, a well-functioning supply chain should be perceived as a whole, and it allows to react effectively and efficiently in various situations.

The implementation degree assessment with regard to organizational and technical solutions in the logistics processes of enterprises, especially the supply chain, requires a series of analyses and tests. These analyses should cover not only the company's resources, market conditions, but they should also include its direct business environment, especially cooperating entrepreneurs – recipients and suppliers, methods of communication, as well as production and customer service management. The diagnosed needs require the subject studies that allow to characterize and assess the level of supply chains advancement in the course of logistics processes in selected agribusiness enterprises. Taking into account the conducted analyses and empirical material, it was possible to formulate the following conclusions:

1) The possibilities and resources of large agribusiness enterprises favour investment in the development of logistics processes, their integration with key recipients and suppliers, as well as implementation of modern IT tools supporting company management at all levels of its functioning. Micro and small enterprises have a limited potential in this respect, the scope of their operation usually covers the local market which rarely goes beyond the area of the Podkarpackie Voivodeship. Local market activity is also determined by the size of cooperators base, lack of perspective for investment in expensive tools supporting warehouse management, production planning or other logistic activities.
2) The advancement degree of economic processes and events in large and medium-sized agribusiness enterprises determines the need to invest in implementation of modern logistics management tools, and sometimes even in IT solutions that

integrate all departments of the company: production planning, procurement, materials management, sales and distribution, human resources management, as well as accounting and finances. Large entities competing on the national and international market usually have comprehensive and often standardized IT solutions that allow to integrate their logistics processes with an expanding base of cooperators.

3) Enterprises are constantly seeking ways of gaining, sustaining and increasing the competitive advantage. In this process, the concept of short supply chains plays an important role. It is significant in shaping and development of agri-food sector. The strategic importance is attributed to short time of the product delivery from its place of production (the primary link of the short supply chain) to the end customer (the final link in the chain). Research shows that more and more entities operating in agribusiness sector take measures to eliminate unnecessary links in the chain. It can be clearly seen from cooperation between fruit and vegetable producers and companies processing these raw materials.
4) Despite the noticeable progress in investment of tools supporting supply chain management, many agri-food companies, especially those operating in a small business sector, are forced to reduce the investment costs in order to ensure the possibility of ongoing functioning in times of energy and economic crisis.

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