Knowledge transfer and diffusion of innovation as a source of competitiveness of food industry enterprises in Poland
KNOWLEDGE TRANSFER AND DIFFUSION OF INNOVATION AS A SOURCE OF COMPETITIVENESS OF FOOD INDUSTRY ENTERPRISES IN POLAND

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Introduction

Issues of the study come down to the attempt of the answer to a question: to what extent knowledge management and diffusion of innovation contributed to the raising level of competitiveness of food industry enterprises in Poland. Positive answer to the research problem may stem from the first years of membership of the European Union structures and transition of businesses to the next stages of development, using their strengths and all the opportunities that arise from the operation in a turbulent environment. The study covered the level of knowledge management funding in enterprises, the creation of innovative actions and results of measures of their performance and economic growth in the perspective of the company value.

The purpose of this study was to determine the impact of knowledge management and diffusion of innovation on competitiveness improvement of the food industry enterprises in Poland. The aim paved the concept and operationalization of the research towards identification of the relationship between expenditures on knowledge management and diffusion of innovation and raising of competitiveness of food industry enterprises in Poland. The study of the relationships is also apparent from the fact that in the post-accession period there has been observed a continuous development of food industry enterprises and their recapitalization that led to a higher position in the local, national and international market. The essence of the validity of these studies is underscored by the widespread thesis of the detachment of rational consumption needs, which is referred to as consumerism. J.S. Zegar writes this is a concept understood by buying things without the obvious need, or detachment from the needs of demand, as the phenomenon of triggering and driving the treadmill of capitalism\(^1\). The same author formulates the thesis that the world community is facing a new paradigm for the development of agriculture and needs to address the challenges facing the food production\(^2\).

The research work posed the following research hypothesis: knowledge transfer and diffusion of innovation in Polish enterprises of the food industry in the post-accession period had played a significant part in competitiveness of food businesses and helped to boost their investment activities.

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The proposed studies were also to contribute to the verification of the following specific hypotheses:

- knowledge and information, as well as their quality and timeliness in food businesses are reinforcing success factors, which is expressed in the increase of their competitiveness and better market position,
- the use of modern techniques in the current functioning of the food business in an organized manner helps to use the competences and skills, and to utilize their capital,
- in the food business, the position of intellectual capital and operation of corporate governance is to be highly valued;
- in building the competitiveness of food businesses the management of organizational culture and climate, and recognition of the special values of social responsibility of the organization should be considered necessary.

Previous studies on innovation to a large extent present their effects in quantitative terms, and thus evaluate the number of implemented innovations at a time. Innovative activity is characterized by the participation of sales of new and upgraded goods or share of high technology in the value of production sold. An indirect measure of the innovation economy is the dynamics of its development, although the relationship between the level of innovation and economic growth appears only in longer periods. Innovation is evaluated by using the cost incurred for research, development and the number of patents. Innovation processes in Poland lack dynamics, and most frequently cited barriers for implementation of innovative processes have financial backing, such as under-investment in research and development and the lack of effective mechanisms for the transfer of research results into the economy. Enterprises spontaneously inhibit innovation processes, which is a common effect of their poorly constructed organization system. Many economists emphasize that the weakness of our economy lies not in the causes of material nature, but in the sphere of consciousness. Even in these times innovation is not universally understood as a way to achieve success, particularly by entrepreneurs of small and medium-sized businesses, and intellectual potential of employees and their creativity are often underestimated.

The doctrine of economics emphasizes the growing importance of information and knowledge for the development of civilization. Knowledge is to contribute to the development of societies, their economies and functioning of their businesses and knowledge resources coupled with creativity, innovation and agile processes of so-called innovative culture measurably increase their competitiveness. In the first decade after the accession
to the European Union expansion of Polish companies on international markets was based on traditional cost sources of competitive advantage, and they are not permanent base of competition, which are generally considered to be education and the development of integrated collections of diverse and exceptional skills, in a decisive way affecting the value for customers. As necessary to raise the level of competitiveness should be considered taking into account inter-relationships and dependencies that occur when carrying out the processes of innovation, creating organizational aspects of management in the processes of modernization and revitalization of enterprises. The current forms of the knowledge economy increasingly need to conduct research on the basis of the social sciences, but for the most part to strengthen the activities of individual entrepreneurs.

A. Toffler believes that in the history of mankind we meet with the so-called “third wave” following the agrarian revolution and the industrial revolution – the era of information and knowledge era. S. Drucker provides for the formation of a new type of society – “knowledge society”, and within it the knowledge-based economy. However called, new emerging social macrostructures (alternatively: the network society, knowledge society, digital society, post-industrial society) and operating parallel fundamental changes in the economy, it must be emphasized that in a central location they situate the transformation of knowledge.

Knowledge is to contribute to the development of societies, their economies and operating companies. Knowledge combined with creative, innovative and agile processes of so-called innovation culture measurably increase their competitiveness. The market economy began to dictate to farmers and business operators new rules of conduct, which have become crucial economic categories such as: competition, efficiency and profit.

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Shortening the life of the products and increasing competition mean that company executives are wondering how to proceed in order to strengthen the competitive position of the company. Company management has now become more difficult because the environment is increasingly dynamic and volatile. The discipline of strategic management for more than two decades is looking for in their research and theories to answer the following questions:

1. What determines the success of the organization?
2. How company resources are organized and used?
3. How the organization responds to changes in their environment, such as technological breakthroughs?
4. What is the process of creating a strategy and the importance they have in the creativity and innovation?
5. What are the strategic implications of the biggest investment decisions on mergers, acquisitions and divestments?7

As necessary to raise the level of competitiveness should be considered taking into account inter-relationships and dependencies that occur when carrying out the processes of innovation, creating organizational aspects of management in the processes of modernization and revitalization of the operation of enterprises. The era of the “new economy” determines economic success, which is measured not only by the company’s market share, the size of their assets, customers or gained market size, but also success in knowledge management and the ability to use the intellectual capital of the company, creating its value. The use of strategic competence of entrepreneurs has a significant relationship with the intensive development of entrepreneurship that the food industry is strengthening ties between the various elements of food production and the inclusion of agriculture in the social division of labour, that is, to clarify its relationship with industry. In the business world, innovation is the key to increasing profits and expand market share, but at the same time involve costs and risks. They create competition, which according to S. Krugman is a way to increase productivity through the growth rate in one company over others. In a market economy the company alone is not able to influence the price level – it depends on the market forces of supply and demand, and can only improve the competitiveness of their products – which is created by the sum of producer and consumer surplus. A wide range of instruments used to enhance the competitiveness of the food industry helps companies in their positioning on the broad EU market that uses this information to agents useful

7 K. Obłoj, *Pasja i dyscyplina strategii, Jak z marzeń i decyzji zbudować sukces firmy*, Klasyka biznesu, New Media s.r.l., Warszawa 2010, p. 17.
in the management, taking care of intellectual capital, corporate governance and the management of organizational culture and climate\(^8\). So far in our country as the main challenges of competitiveness are considered: cost reduction, innovation of products and services, increase productivity, improve product quality, and modernize management processes and improving customer relations. It should be noted that competitiveness can affect all operators, which have cooperative ties with the company and competitive companies. According to M. Gorynia competitiveness of a company is called the ability to achieve competitive advantage\(^9\).

The food industry is one of the most important economic divisions in our country due to the fact that it is about the nutrition of the Polish nation and for international markets is a major exporter of food and drinks\(^10\). Agri-food businesses are still looking for new solutions in the area of a long-term strategic policy and research and development to ensure professional management, which in the future will result in high positioning of the company in the international arena and in the country to ensure the high efficiency of operation\(^11\).

Currently agri-food industry is trying to look for its export opportunities, win new allies, trade, create different concepts of effective foreign investment and strengthen human capital held\(^12\). Examination of the relationship occurring in the food industry has enabled the verification of the claim that competition and competitiveness should be combined, and the com-

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petitive firm can be regarded as such business which leads to an increase in long-term market value. The studies are intended to improve the functioning of enterprises and consumers, who are counting on the continuous development of the food industry, thus receiving higher quality product, providing high taste.

The aim of the study was the analysis of how knowledge resources in food businesses may affect their development, organization, how they are used in the management unit, whether it is correct to manage its resources and whether it is applied in terms of consulting. The study was established to capture the role of knowledge as the main factor affecting the development of enterprises. Also designated are other factors affecting the competitiveness and directly related to the available resources of knowledge, for which the authors found: reduced costs, increased level of innovation of products and services, increased productivity and human capital development. For an accurate picture of the starting situation of enterprises operating in the food industry an analysis of the degree of impact of the selected processes in the proximal and distal environment of enterprises of the food industry was conducted, which takes into account, inter alia, such factors as: the competition between enterprises, the threat of the emergence of new producers, the bargaining power of suppliers, the bargaining power of buyers and the threat of the emergence of substitutes, globalization, Polish membership in the EU, as well as intensifying competition.

The food industry in Poland has a diversified structure, which in the last fifteen years was subjected to multidirectional change under the influence of the reform of economic restructuring and privatization. It was proved to be extremely important to capture the impact of research knowledge and innovation in the economy and reform processes. The design was based on studies of deductive and inductive method; a detailed analysis was carried out using quantitative and qualitative methods. As a leading used procedure the cause-and-effect relationship evaluation was used. For economic analysis were used also: time series analysis (analysis of the dynamics, structure, and indicators), the statistical method of multivariate analysis – Ward cluster analysis and comparative analysis. Moreover, in the framework of the methods used, the qualitative method of literature studies (critical analysis of the scientific literature) was used.

The study determined the amount of funds spent on knowledge management and innovation, and the impact on the economic performance of companies in Poland. The object of the study was the research and development (R&D). The study focused action on global experience in the financing, creation, transmission and application of knowledge in food businesses, the wide context of conditions and social objectives pursued in such
important fields of finance for the knowledge society of the public (we are all children of the Earth and are characterized by compulsion of consumption\textsuperscript{13}, and maintaining a balance in the food market requires the development of domestic food production at a level at least self-sufficiency\textsuperscript{14}.

The study assumed that this is a very important sector for the implementation of knowledge management component, which has been trying to synthesise the scientific achievements in the area of organization of food businesses. The important was to initiate cooperation of all communities related to issues of knowledge management, understood as the creation of models of knowledge bases, creation of corporate knowledge management systems and the analysis of the processes of knowledge creation funding, powered by funding from the budget. The problem of the amount of funding for research and development in this sector was noted and enterprises that are not able to rationally consume each resource directed towards this goal.

\textsuperscript{13} Uniwersalia polityki rolnej w gospodarce rynkowej – ujęcie makro- i mikroekonomiczne, ed. A. Czyżewski, Wydawnictwo Akademii Ekonomicznej w Poznaniu, p. 8.

1. Knowledge transfer and diffusion of innovation in the economy

1.1. Knowledge management as a factor in raising the competitiveness of companies in Poland

Browsing the definitions of knowledge, the most common in the literature can be represented by the “Dictionary of Contemporary Polish”, according to which it is: total knowledge, skills in some area acquired through learning, life experience, etc., as well as a resource for news of the domain and awareness of being aware of something\(^{15}\). Otherwise, the knowledge content is fixed in the human mind, which is collected as a result of experience and learning. We can distinguish two types of knowledge:

1. Practical or utilitarian, which usually results from experience and allows us to convert reality.
2. Theoretical, or scientific, explaining the various aspects of reality\(^{16}\).

Knowledge is essential in all kinds of activities and used in all areas of social and economic life. Increasing its resources is required in the processes of economic changes, where its use is bipolar: in the first case as the information processed and used in order to take rational economic decisions, and the other are specific assets, which are treated as an economic good, the market traded\(^{17}\). In the middle of the last century, economists often treated knowledge as a resource for the company, necessary for the production of profit, which meant its use for the core business, and the company has had its own storage and owner\(^{18}\). It was only in the eighties when appeared managerial conception, later called “knowledge management”, which related directly to the organization and treated knowledge as a priority at its conceptualization and operationalization of actions. Today, knowledge has become a basic hose management refers to the operation of each market participant and no entity can be without a competitive\(^{19}\).

\(^{17}\) S. Łobesko, Systemy informacyjne w zarządzaniu wiedzą i innowacją w przedsiębiorstwie, Szkoła Główna Handlowa, Warszawa 2004, p. 33.
The definitions of the knowledge economy appeared in the literature in two contexts of macro- and microeconomy. The first case concerns a growing economy, in which the main driving force is knowledge – created, absorbed and used more efficiently by the companies, organizations, individuals and communities. In the second economy is gathering the undertakings concerned, creating and enhancing their competitive advantage based on knowledge\textsuperscript{20}. The issue of knowledge management in enterprises is widely described in the Polish and foreign literature by scientists working in the field of managing organizations and mainstream of this knowledge is widely used in the practical functioning of Polish enterprises over the past two decades. It is commonly believed that the knowledge used in key production processes, and on the products and markets should be considered by businesses as a constitutive part of the undertaking concerned and to illustrate the level of the organizational culture of the company. Companies must make their own decisions, designed for them in a strategic nature, which should be underpinned by the acquisition and exchange of knowledge, held its dimension tailored to management systems, taking into account aspects of raising competitiveness and innovative capacity. According to the Oslo Manual, knowledge management includes activities related to the acquisition, use and sharing of knowledge by the operator, and this concept is to manage both the external linkages and knowledge flows within the company, including the methods and procedures, search for external knowledge and to establish closer relationships with other companies (suppliers, competitors), customers or research institutions. In addition to the work practices associated with the acquisition of new knowledge, the scope of knowledge management includes methods for sharing and use of knowledge, including the creation of value systems governing the sharing of knowledge and practices to codify routine procedures\textsuperscript{21}.

In Poland spread the concept of companies whose activities were storing and transferring of existing knowledge resources. Operation of enterprises in the market economy is subject to possession of knowledge, which is expressed in the ability to exploit opportunities, use of resources and skills to organize them effectively. Inclusion of vision of the future on the basis of the knowledge resources is a source of strategic entrepreneurship, and shall be considered as “...a kind of marriage of entrepreneurial action with a strategic perspective and strategic entrepreneurial

\textsuperscript{20} Ibidem.

activity”22. There is no doubt that the market-oriented company, operatively apply their knowledge resources, thus becoming a more competitive and innovative. A. Glińska-Neweś points to building a culture of knowledge in the enterprise, and believes that these are not new phenomena, as previously concerned the use of the basic elements of personnel policy, corporate strategy or structural changes23. Managers of food industry companies often wonder how to manage knowledge and innovation in order to make optimal use of its capabilities, as well as create the right conditions for the development and implementation of these plans can promote the proper use of their knowledge, which will enable the identification and implementation of necessary innovation leading in the long run to stable development24. Creativity development and innovative processes raise the level of competitiveness of enterprises. As necessary to raise the level of competitiveness should be considered taking into account inter-relationships and dependencies that occur when carrying out innovative processes, creating organizational aspects of management in the processes of modernization and revitalization of the operation of enterprises, and the actions of this nature in their assumptions result in the restoration of the company’s business model, which has found its way in modern functioning market25. A. Prusek believes that in the context of globalization and growing global competitiveness, innovation, countries and operators it is a key challenge and development, and improvement of European innovation economy is the biggest challenge for society. One of the objectives of the Lisbon Strategy was to create a legal climate favourable to entrepreneurship by:

- the creation of a favourable investment law, innovation and entrepreneurship, taking into account the specific situation of small and medium-sized companies improving operating conditions, encouraging the responsible management of the company;


24 K. Firlej, Zarządzanie wiedzą warunkiem rozwoju przedsiębiorstw przemysłu spożywczego [in:] Zarządzanie organizacjami w gospodarce..., op. cit., p. 121-133.

• reducing the time and cost of establishing companies and bureaucracy by developing effective regulations on national and Community levels\textsuperscript{26}.

In turn, D. Kabat-Rudnicka notes that the pace of development of the national economy is significantly affected by the environment, i.e. all initiatives and government actions that promote education encourage entrepreneurship and innovation-friendly institutions and transparent legal framework conducive to knowledge-based economy and doing business, thus widening the scope of economic freedom\textsuperscript{27}. Poland has specially appointed bodies responsible for the formation of economic policy, which are different institutions, and their task is to spread the technology transfer between different research centres and enterprises. Such institutions in Poland are: Agency for Restructuring and Modernisation of Agriculture (ARMA), the Polish Agency for Enterprise Development (PARP), the Regional Development Agency (AMA) or the Industrial Development Agency (ARP)\textsuperscript{28}. Permanent improvement of innovation and competitiveness of the Polish economy undoubtedly has become one of its main objectives adopted in accordance with the strategy\textsuperscript{29}, which adopted the European Union by 2020, which is manifested by the increasing opportunities in the fields of research and development and innovation in all sectors of the economy and foster the creation of new jobs. Still difficult it is to determine how the economy will behave in the post-crisis period and how shaped will be a new economic order\textsuperscript{30}. The food industry in the European Union is one of the most important and the most dynamically developing branches of European industry, for which there are more than 310 thousand companies employing more than 4 million workers. Revenue generated by the food industry dates back to the level of 900 billion Euros, and its diversity is conducive to identifying

\textsuperscript{26} Konkurencyjność i innowacyjność polskiej gospodarki w Unii Europejskiej, ed. A. Pruszek, Uniwersytet Ekonomiczny w Krakowie, Kraków 2011, p. 7-16.

\textsuperscript{27} D. Kabat-Rudnicka, Konkurencyjność i innowacyjność gospodarki – znaczenie patentu [in:] Konkurencyjność i innowacyjność polskiej..., op. cit., p. 35.


it as a strong exporter of mass-producing significant quantities of finished products within the extremely competitive domestic and international markets.

EU food policy is based on three pillars: legislation in the field of food and feed safety, animal sound scientific advice as a basis for decision-making and the means to enforce the rules and control. As emphasized by A. Grzelak and S. Stepień the most important challenge for the state agriculture in the coming decades, will be to provide adequate quantities of safe and good quality food in terms of dynamic growth in demand for agricultural commodities which is due to the increase in population and wealth of developing countries. Laws concerning the production and trade of food are complex and are used both for animal feed, as well as relate to food safety.

Support among the EU member states is uneven, unfortunately, because already in the pre-accession EU countries had to deal with a much richer instrumentation for organization of agricultural markets, and thus much larger budget expenditures to subsidize agriculture in total. Businesses, implementing supported investment programs, must definitely improve the sanitary-hygienic and veterinary production, which favours the introduction of new or upgrading of existing production technology. Implementation of investment programs supports legal legislation of the European Union concerning the principles of production, trade and distribution of foodstuffs. In 2004 was issued the Regulation No. (EC) 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs, which was supported by Regulation (EC) No 853/2004 of the European Parliament and of the Council of 29 April 2004 laying down specific hygiene rules for food of animal origin (requiring,
in certain cases, some specific rules for particular microbiological criteria applicable to foodstuffs, temperature control and cold chain compliance, sampling and analysis. In addition, all food businesses (other than the carrying on of primary production) were committed to the principles of the HACCP (hazard analysis and critical control points), introduced by the Codex Alimentarius (a collection of international food standards developed in the framework of the United Nations food and agriculture organization FAO). These principles prescribe a certain number of requirements to be met during the entire cycle of production, processing and distribution in order to allow – due to the risk analysis – identification of critical points, which control is essential to ensure food security:

- identify all risks to be avoided, and which must be eliminated or reduced to an acceptable level,
- identification of critical points at which control is essential,
- introduction of the critical values beyond which must intervene,
- introduction and implementation of effective surveillance procedures critical points,
- introduction of corrective actions when it turns out that the critical point is not under control,
- establish procedures for self-monitoring to verify the effectiveness of the measures.

in order to ensure a high level of food safety and public health; Regulation (EC) No 854/2004 imposing a Community framework for official controls on products of animal origin intended for human consumption and laying down detailed rules for fresh meat, clams, milk and dairy products. Moreover, these acts supplement Community legislation on food hygiene: Regulation (EC) No 178/2002 containing general principles of food. This regulation clarifies procedures for food safety and appoints European Food Safety Authority. Food Safety Authority (EFSA) (DE) (EN) (FR); Regulation (EC) No 882/2004 reorganizing official controls on foodstuffs and animal feed in order to introduce controls at all stages of production and in all sectors; Directive 2002/99 / EC laying down the conditions for the placing on the market of products of animal origin and the restrictions imposed in the case of products coming from third country or region, reporting to general health restrictions.


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- establish registries designed to prove the effectiveness of these measures and to facilitate official controls carried out by the competent authorities.

European Union Member States indicate the need for and encourage the development of national guides to good practice to include advice on compliance with the general guidelines set out in the hygiene and HACCP principles. The purpose of constructing this kind of textbooks is to make sure that the advice and recommendations of these are possible in the practice of economic life. Furthermore, the composition of these recommendations must include the general principles and guidelines contained in the Code of food, and their implementation should always be consulted with all stakeholders. Then each of the prepared textbooks should be checked for compliance with the recommended instructions and handed over to the registration committee. It should be noted that entrepreneurs are obliged to use textbooks widely in national or Community market.

Another requirement in relation to food businesses is the need to cooperate with the competent authorities, which are obliged to register all establishments, keep a list on the basis of which the appropriate authority shall notify any subsequent changes related to direct the plant (e.g. Closure). The food industry since the start of operations should also hold an accreditation of relevant authorities in accordance with applicable national and EU legislation. Regulation (EC) No 178/2002 obliged food businesses to implement and enforce systems and procedures that enable the traceability of the various components of the foods, as well as their own and, if necessary, meat derived from animals used in food production. Moment that a serious threat to the health of the food business operator appears, arising from the manufacture or use of a food results in an immediate withdrawal from the market and the release of relevant information to the appropriate authorities and consumers.

In any case signalling danger, enterprises are particularly obliged to promptly cooperate with the competent authorities, within the framework of EU law and national law should be made official controls, setting their conduct to competent authorities.

Rules and procedures for the production of foodstuffs also apply to imported food, and exported to third countries which must be made in accordance with the applicable Community standards that apply to health within the European Union, as well as in force in the importing country.

In Poland, the most important legal acts concerning food production and functioning of enterprises in the food industry are:

- The Act of 25 August 2006 on food and nutrition safety,
The Act of 29 January 2004 on Veterinary Inspection,
Act of 6 September 2001 on packaged goods,
The Act of 21 December 2000 on the commercial quality of agricultural and food,
The Act of 20 April 2004 on the organization of the milk market and milk products,
The Act of 18 October 2006 on the manufacture of spirits and the registration and protection of geographical indications of spirit drinks,
The Act of March 2, 2001 on the manufacture of spirits, production and bottling of spirits and the manufacture of tobacco products,
Act of 26 October 1982 on Upbringing in Sobriety and Countering Alcoholism,
The Act of 12 May 2011 on the production and bottling of wine marketing of these products and the organization of the wine market.

As already mentioned, the competitiveness of the agricultural companies and the food industry is dependent, as well as inextricably linked with the state of the functioning of other departments and branches of agribusiness, as well as the degree of development and modernization of the economy\(^{38}\). As noted by J. Żmija, between the level of development of agribusiness and the structure and the level of food consumption, there are strict dependence on the one hand defining directions of its development and, second, the level of development of agribusiness determines a particular state of consumer needs to be met\(^{39}\). A study conducted in 2010 on a group of large (3) and small (6) companies in the priorities for investment and innovation in the Podkarpackie region have shown that entrepreneurs since 2007, put on their development by attracting foreign patents and innovative approach to distribution and logistics. Strategic priorities, in order of importance, are listed as follows: improving the profitability of the company, improved product quality, increased competitiveness, extending the range of products sold, adapting production to the requirements of the European Union and the requirements of environmental protection, reduced production costs, and the increase in market share\(^{40}\). The introduction of market

\(^{38}\) K. Firlej, Ocena konkurencyjności i szans rozwoju przedsiębiorstw przemysłu rolno-spółżywczego w warunkach unijnych, “Roczniki Ekonomiczne Kujawsko-Pomorskiej Szkoły Wyższej w Bydgoszczy” 2010, No. 3, Wydawnictwo KPSW w Bydgoszczy, p. 163-176.


principles in our country forced to adjust the operation of enterprises to the standards in the globalized economy of the world, which also turned out to be periodically introduced modern management methods, rationally changing the functioning of companies in the field of organizational and technical area\(^{41}\).

This is why the food industry is extremely important to ensure food security of each country, which occupies a significant place in the political and economic strategy, since food is often treated as a strategic commodity. Number of hungry people in the world exceeds one billion, and in the European Union over 40 million of poor are short of food\(^{42}\). The role of this problem will continue to grow due to the following processes: growth of the world population, including the increase in the number of hungry people; increasing competition for land; climate change; land degradation, including agriculture areas; reduction of biodiversity; high energy prices and the prospect of an energy crisis; high food prices\(^{43}\). This limits the processes of globalization, which are determined by much greater state interference in the food industry (than in other areas of the economy), which is much higher than in other sections of industry\(^{44}\). The food industry is one of the most important and fastest growing areas in the Polish economy. The development of production, integration and progressively expanding globalization are new opportunities, but risks that may assist both in growth, but also negatively shape its state. An important factor in the growth and development of the food industry was also the Polish accession to the European Union.

So discussing the role of the food industry in today’s global economy, it must be emphasized that it contributes to elimination of the risks associated with ensuring food security in the world, which increases due to the growth of population and global demand for food products. Food secu-


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Security is on the second place among the security needs in Maslow’s hierarchy and should be considered – besides economic security, social and environmental safety – one of the most important forms of security in the contemporary world. J. Źmija stresses in a recent report on the situation of the Polish countryside that most farmers are people with great knowledge who care about the food security of the country and produce a significant amount of excess food for export.45

Declining water resources, shrinking agricultural land, climate change, emerging diseases of plants and animals, food waste, alternative use of land and raw food, and wider financial engineering in food markets have increasingly adverse effects on ensuring global food security.

1.2. Innovation and diffusion of innovation in the Polish economy in theoretical and practical terms

Combining the issues of competitiveness, entrepreneurship and innovation, look at previously constructed definitions of the concept of innovation, as it is extremely difficult to define it due to the perception of innovative actions. The main reasons inspiring the implementation of innovations, also referred to their characteristics, are: benefit for the consumer, the degree of needs and expectations satisfaction, and their divisibility, communication and complexity. In “Marketing encyclopaedia” innovation (Lat. innovatio) means to renew and sets idea, procedure, or thing that is new because it is qualitatively different from the existing ones. Innovation in business means new products and services and the operation of supplying them to customers and convincing them useful. Innovations create for entrepreneurs and managers favourable opportunities to make significant changes, a new activity, new services and sourcing buyers thanks to innovative and successful innovation is a test of its success in the market.46

In the literature, the creator of the concept of innovation has been widely recognized Austrian economist J.A. Schumpeter, who at the beginning of the twentieth century defined innovation as: the introduction of a new product with which consumers have not yet had to deal with; a new species or some of the goods; introduction of new production methods that are practically proven in the field of industry; open a new market, i.e. one in which a specific type of domestic industries previously did not work, and this regardless of whether the mar-

Knowledge transfer and diffusion of innovation in the economy

ket has existed before or not; acquire new sources of raw materials or semi-finished products, regardless of whether the source already existed or had yet to be created; introduction of a new organization of some industries, for example introduction of a monopoly or a monopoly break. Constructing the definitions of innovation, Schumpeter treats it as initiating and implementing new solutions serving as a prelude to achieve success in a market economy. Triad of J. A. Schumpeter consists of: invention – that is, discovery, ingenuity and inventiveness in the area of operation; innovation – application of solutions and innovations; imitation – dissemination, imitation and diffusion of innovation. In turn, by S.R. Whitfield innovation is: a string of complex activities involving problem solving. The result is a complete and fully developed novelty. By definition, special emphasis has entered into a novelty by which a product or service is to bring some profits. Known to all S. Drucker defines innovation as: specific tool of entrepreneurs, the means by which changes make the opportunity to take up a new business or to provide new services, but also: innovation is the specific instrument of entrepreneurship – an action that gives resources new opportunities to create wealth. Without a doubt, the definition of innovation by S. Drucker has the nature of economic or social possibility, but not technical. The next of the creators of the concept Ch. Freeman believed that only the implementation of a new product, process, system or device can be called innovation. According to him, we can talk about innovation when for the first time to be the subject of trade. Specifying modern innovations, we associate it with changes, no matter what area of business, economy or region concerned. M. Wigler emphasizes that if anything has happened at one time, there would be no development, and if it all happened in one place, there would be no diversity, which determines that the development of the whole world since the dawn of history is held by a polarization and diffusion and the emergence of innovations that have been adapted by the environment.

With time outweighed was also a difference between innovative activities and the ordinary activities of companies. Each of them as operating a business – regardless of whether manufacturing or service under condi-

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50 Ibidem, p. 28.
51 Ch. Freeman, L. Soete, The Economics of Industrial Innovation, The MIT Press, 1997, p. 198.
tions of strong competition – are forced every day to make a lot of new, original and unconventional actions, enabling the company to survive in the market\textsuperscript{53}. K. Wandelt for innovation considered: \textit{utilization of invention to the specific production purposes}\textsuperscript{54}, and by W. Kotarba innovation is: \textit{the process or result of the process evaluated by a specified entity as a new and beneficial}\textsuperscript{55}. Extremely versatile definition gave Z. Pietrasiński, thinking for innovation: \textit{changes deliberately introduced by man}, which \textit{consist of replacing the existing states of affairs other positively assessed in the light of certain criteria making up a total of progress}\textsuperscript{56}. According to it, the determination of innovation deserves a change that brings progress, for example causing an increase in productivity. In turn, A. Pomykalski shared innovation because of the range of the result or process. \textit{The scope of the result is: change in production, consequently leading to new products}\textsuperscript{57}. The \textit{scope of this process is: all the creative thinking processes aimed at application and use of improved solutions in the art, technology, organization, social life}\textsuperscript{58}. According to E. Okoń-Horodyńska the sense of innovation is seen in the fact that: \textit{in addition to the fact that many require fulfilment of specific conditions – Are the first and farthest-reaching social collective effort, a cooperative process in which companies, especially small ones, are dependent on the discretion of broad social circles voters, which exemplifies through their acceptance by labour resources, suppliers, consumers, technical institutions, training organizations and so on., which always requires a long term perspective}\textsuperscript{59}. S. Niedzielski treated innovation comparably: \textit{feature of operators or economies, meaning the ability to create and implement innovations, as well as their absorption, binding to the active engaging in innovative processes and taking action in this direction and is involved in the acquisition of resources and skills necessary to participate in these processes}\textsuperscript{60}. M. Dolińska consider innovation as a process or


\textsuperscript{58} \textit{Ibidem}, p. 17.


the effect of the implementation of it\textsuperscript{61}. According to E. Stawasz innovation process is the innovation phenomena, which include not only the final result of the implementation of specific technical tasks, but also actions prior to its creation\textsuperscript{62}.

In the classical model of innovation one can extract several successive phases in chronological order. It is a linear model in which there are one-way chains of ties between science and industry, while the source of the idea of innovative activity is research. Classical linear model includes the following phases\textsuperscript{63}:

- basic research,
- applied research,
- development,
- first application,
- diffusion.

Innovation can be seen as a process or as a result of its implementation\textsuperscript{64}. The process includes the creation of an innovative idea; research and development, design; production and dissemination of it\textsuperscript{65}. Innovation can also be considered as economically successful exploitation of new ideas, which result in:

- new or significantly improved goods (or services),
- new or significantly improved processes,
- new marketing methods or new methods in business practices, workplace organization or external relations with the environment\textsuperscript{66}.

The concept of outcome refers to any good, service or idea that is perceived by the recipient as a new\textsuperscript{67}. According to the definition combining both approaches, innovation is understood as the implementation of a new or significantly improved product (good or service) or process, a new marketing method, or a new organizational method in business practice, workplace organization or external relations with the environment\textsuperscript{68}. Distinguished are


\textsuperscript{64} M. Dolińska, \textit{Innowacje…, op. cit.}


\textsuperscript{67} A. Pomykański, \textit{Zarządzanie…, op. cit.}, p. 17.

social innovations and technical innovations, depending on changes in technology\(^69\), which are divided into three groups: product, process and organizational innovations\(^70\).

The study of W. Janasz and K. Koziol-Nadolna show division of innovative products and processes to:

- new worldwide,
- new in the country or industry, and
- new only to the undertaking company\(^71\).

S. Dwojacki and J. Hlousek argue that innovative activity requires expenditures for:

- research and development,
- technology assets,
- purchase of advanced machinery, equipment, computer hardware or software, as well as land and buildings (including upgrades and repairs),
- staff training and marketing of new and improved products,
- other activities include design work, planning and testing of new products and services, production processes and methods of delivery\(^72\).

Interesting seems to be a classic and modern approach to the innovation process, where in the case of the first innovation is unpredictable process, while the second – predictable. In the classical approach, innovation is the process: individual, impossible to manage and control, and is random. The approach is a modern innovation: the group process, multidisciplinary, modification of existing solutions, as well as the process of controlled and carefully delimited\(^73\).

In companies implementing innovation and implementing innovative processes necessary to collect data should be considered in terms of the objectives and effects of innovation implemented in the selected period. It is the result of the assumption that innovative activity is undertaken for various reasons, and its effects are of concern products, markets, the quality

\(^{69}\) B. Ileczko, *Podstawy typologiczne ogólnej teorii innowacji*, “Zagadnienia Naukowoznawstwa” 1979, No. 4.


and the possibility of change. It is important to study the motivation of companies to undertake innovative activities undertaken and the types of innovation. Research must determine the relationship assumptions in relation to the results achieved by the company and additional benefits and effects resulting from their use. It should also be referred to earlier assumptions and motivations innovation. The objectives are to relate motivation to innovate, and effects to their effects. The list of factors relating to the goals and effects of the division into four types of innovation are presented in Table 1.

Table 1. Factors relating to the objectives and effects of innovation

<table>
<thead>
<tr>
<th>The impact area</th>
<th>Innovation within the product</th>
<th>Innovation within a process</th>
<th>Organizational innovations</th>
<th>Marketing innovations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competition and markets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replacement products withdrawn from the market</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extending the portfolio of products and services</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The creation of environmentally friendly natural products</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase or maintain participation in the market</td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Entering new markets</td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Increasing the visibility and exposure of products</td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Shortening the time to respond to the needs of clients</td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Production and delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improvement of the quality of products and services</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Increased flexibility of production or provision of services</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The increase in production or service</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>The reduction in unit labour costs</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Reducing consumption of materials and energy</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Lowering the cost of designing products</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Shortening the production cycle</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>The achievement of sectoral technical standards</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Lowering operating costs related to the provision of services</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>
Increasing the efficiency or rate guarantee, or the provision of goods and services  
Improving IT capacity  
Workplace organization  
Improving communication and interaction between the different divisions in the company  
Increasing the scope of the sharing or transfer of knowledge in dealing with other entities  
Increasing the ability to adapt to different requirements of customers  
Strengthen relationships with customers  
Improvement of working conditions  
Other  
Reducing environmental impact or improve the health and safety  
Fulfilment of regulatory requirements


In turn, the transfer of knowledge in the literature is referred to diffusion and can take various forms of sales of products or services, and communication engineering. Moment of diffusion of innovation is their appearance on the market and is defined as a process of spreading and absorption in the manufacturing of the invention in more than one place. According to the Oslo Manual it is a way of dissemination and implementation in any place in the world (country, region, sector) of solutions by using innovative market and non-market channels. The diffusion process is often more than just the acquisition of knowledge and technology, as companies assimilating learn and use new knowledge and technologies as the basis for further action and through the process of diffusion of innovations may change and provide feedback to the original innovator.

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75 Oslo Manual: Pomiar..., op. cit., p. 82.
solutions in an enterprise or economy, and present in the moment to assimilate the effective implementation. K. Klincewicz draws attention to innovation on the supply side as introducing new products to market, as a result of imitation and copying, and those on the buying side, dissemination of new products in the form of original and pioneering ideas and solutions.

J. Wiśniewska presented theories explaining the diffusion of innovation theory division at the heterogeneity of diffusion and the theory of epidemics. Heterogeneity of diffusion theory assumes that consumers, buying an innovative product, expect other benefits and rational purchase them manifests it in the form of a future surplus of benefits over the cost of the product purchased. The theory of epidemic assumes the same needs of consumers, the fixed cost of an innovative product and the lack of sufficient information about the product. The process of diffusion of innovations W. Janasz divided into equivalent stages, specifying: the creation of innovations subject to diffusion, the existence of communities of followers and the flow of innovation from their creators to imitators. The process of diffusion of innovation can also be seen in the spatial dimension, dividing them into intra-organizational, inter-organizational and interstate. It should also be mentioned characteristics determining the diffusion of innovation, because on the basis of established model named PZNTO, as an abbreviation of:

(P) – advantage over existing solutions,
(Z) – compliance with the needs, preferences and values of future customers,
(N) – low complexity and simplicity of innovation,
(T) – testability and the possibility of checking,
(O) – observability of the results and their applicability.

Another division proposes J. Wiśniewska, which distinguishes between single and double phase model of diffusion of innovation. Single-phase model consists of a phase of absorption, elimination and replacement of innovation and the two-phase model applies to innovation breakthrough,

when there is only absorption phase and elimination phase is only expected. Extremely important limiting factors should be considered innovative activity of enterprises, among which financial, informational, environmental and organizational factors. The organizational factors enlarges J. Baruk who divides them into the structural, procedural and decision-making information. Particular attention should be paid to factors of information and process, as it depends on them efficiency and effectiveness of decision-making and implementation of innovative processes in the enterprise.

![Diagram of innovation-related decision-making in a company](image)

**Fig. 1. Procedure of innovation-related decision-making in a company**


K. Krzakiewicz graphically illustrated the innovative decision-making process in the enterprise, which determines the logistic approach in their implementation (fig. 1).

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84 K. Krzakiewicz, *Innowacje w zarządzaniu antykryzysowym* [in:] *Zarządzanie innowacjami..., op. cit.*, p. 94.
In case of the food industry it is crucial to identify the needs and methods useful in the transfer of knowledge and technology and to understand which of them in mutual flows play the most important role. Properly conducted innovation policy allows understanding and anticipating diffusion processes, their representation and implementation, and outline the paths of connections and knowledge transfer. For example, one might ask:

1. Does the policy should focus on promoting active cooperation, and if so, what types of partners are the most important?
2. does the flow of knowledge and technology is more important when they are associated with networks and other informal agreements that do not involve active cooperation85?

As noted by M. Dierkes relationships with market depend on the nature of the business, as an incentive for innovative activity company that operates in a stable, mature industry or sector may be indicators such as the value of sales or costs used in the production of forces and means86.

It also seems very important to link innovation infrastructure, which should be treated as a kind of system, and the main features of the framework for their measurement should include:

- innovations implemented in the company,
- relationships with other companies, as well as public research institutions,
- institutional framework in which firms operate,
- study of the role of demand for innovation (Fig. 2).

Oslo Manual Guide also recommends the collection of information and data that should be collected in the three types of links, using a specially constructed list of sources. For statistical purposes, these types of innovation linkages can be defined as follows:

1. Open source information – openly available information, which does not require the purchase of technology or intellectual property rights or interaction with the source.
2. Acquisition of knowledge and technology – the purchase of external knowledge and/or expertise and technology of material forming part of capital goods (machinery, equipment, software) and services, without interaction with their source.
3. Cooperation in the field of innovation – active cooperation with other enterprises or public research institutions to the needs of in-

85 Ibidem, p. 82.
novative activities (which may include the purchase of science and technology).\footnote{Oslo Manual: Pomiar... op. cit., p. 85.}

Table 2 lists the sources of knowledge and technology transfer, among which are listed: internal sources within the company, other companies, external market and commercial sources, sources of public sector and general source of information. As shown by research analysis conducted in 2013, the main type of expenditure on technological innovation of enterprises of the food industry in the years 2008-2010 were investment in machinery, technical equipment, tools and means of transport, as well as buildings and structures and land, as their share in total expenditure fluctuated on average in 2008-2010 around 80\%\footnote{D. Żmija, Innowacje..., op. cit., p. 403-408.}.

\footnote{Oslo Manual: Pomiar... op. cit., p. 85.}
Table 2. Sources of knowledge and technology transfer

<table>
<thead>
<tr>
<th>Specification</th>
<th>Open information sources</th>
<th>Sources purchasing knowledge and technology</th>
<th>Partners cooperation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal sources within the enterprise:</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Research and development</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>production</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marketing</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>distribution</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other companies in the group of companies</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>External market and commercial sources</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>competitors</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Other leading companies in the same business</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>customers</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consultants / consulting firms</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suppliers of equipment, materials, components, software or services</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>commercial laboratories</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Sources of public sector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Universities and other higher education institutions</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>State / public research institutes</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Private, non-profit research institutes</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Specialized public / semi-public ancillary services</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>General sources of information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>disclosures of the patents</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional conferences, meetings, literature and magazines</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fairs and Exhibitions</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional associations, trade unions</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other local associations</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contacts or informal networks</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standards or standardization agencies</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public regulations (i.e. Concerning environment, safety)</td>
<td>+</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.3. Innovation and competitiveness of Polish enterprises

Taking into account all the elements of presented definition of innovation, we can discern their impact on the growth of competitiveness of the economy of the world, national and regional level through the prism of the new innovation strategy, which should also be adopted by companies in the region and contribute to improving their market position. Competitiveness of enterprises is reinforced by the processes of concentration and modernization, on the corporate agri-food industry, which in the era of global recovery from the crisis should take particular care to its value and the export potential of agri-food products\(^89\). Positioning companies in agri-food industry is a vital part of the game market in the era of the dual model of the development of agriculture, where the concentration of capital, discounting the benefits of scale and competition takes place between operators of still lower transaction costs\(^90\). As noted by B. Czyżewski transaction costs in the food industry grew during the economic recovery, for example in 1993-1996 and 2004-2007, and falling phases of stagnation, for example in 1996-2001 and after 2008\(^91\). In this aspect of competitiveness is a reflection of the company to compete for position on the market, and according to the OECD: *...the ability of companies, industries, regions, nations and multinational regional associations to generate a relatively high and stable income and employment levels in terms of world market*\(^92\). Optimization of innovative actions can increase the competitiveness of enterprises, which is determined by internal and external factors\(^93\). Very important seems to be the pace and scope of creating and implementing innovations that determine the competitive advantage, as pointed out by M. Porter, giving them a key role in building competitive strategy of enterprises\(^94\).

During the transformation of the Polish economy has been the transformation of almost all sectors of the economy, which was significantly affected by privatization and restructuring of enterprises, implying in them modern innovation processes\(^95\). In pursuing indications and recommenda-

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Knowledge transfer and diffusion of innovation in the economy

In our country, since the accession interest in business issues and opportunities for innovation of its implementation in practice of economic life increased. Managers of companies increasingly point to the innovations that are seen as part of the market game, which is implemented through the implementation of modern projects and increasing from year to year the number of registered inventions. As noted by J. Hausner decomposition rate of innovation potential indicates that the only dimensions in which Poland does not invest in the end positions orderings among the countries of the European Union, are the quality of human capital (education), and – a bit lower – investment companies, and in all other dimensions (quality of the research, 96 Ibidem.
research funding, entrepreneurship and relationships, intellectual resources, economic effects) Poland is at the end, and the lowest in the category of “innovators” (penultimate place in front of Latvia)\textsuperscript{100}. Unfortunately, still waiting for a referral to the positive side of the act of strengthening the cooperation between science and business, which in the early years, the company applied the Western European and nowadays achieve the benefits of this title.

Less than a decade after the accession of Poland to the European Union in Poland becomes noticeable to promote the idea of innovation, which is to ensure the emergence of a new economic order based on the restructured economy and modernized enterprises. More than twenty years the life of the Polish economy in market conditions proved to be too short for the poor of the country, in many cases, the backward sectors of the economy, transform it into a modern operating system with the highest world standards. Polish economy still catch up the developed countries of the world, which probably very helpful could be a significant growth in the development of innovative processes, introduction of modern technological solutions, taking care of the absorption of technical innovations and implementation of modern management systems.

Published in 2013, the global ranking of innovation showed distant 49th place in our country in which the member states of the European Union ahead of only Greece\textsuperscript{101} (fig. 3).

It is well known that Polish products compete in international markets producing lower price than competitors, which does not bring the intended benefits of the producers. Unfortunately, we do not belong to the countries that could boast of significant technical advances, modern infrastructure or properly created institutional conditions. Advantage in this respect will be lost over time and should therefore be permanently seek other ways to compete; they are innovative products with high uniqueness, usefulness or quality. The market should be introduced with modern products whose appearance and quality may vary from the current trends, constantly improved and manufactured using innovative methods.


Each country involved in trade should take care of the popularization of industries with a high share of R & D, as the country competing on price and low production costs will certainly arrive. In the current financial situation of Polish economy, where it is possible to catch up in many economic activities with the use of EU funds, you can implement a system for monitoring the Europe 2020 Strategy, which paves the directions of innovation policy in the European Union. It is prepared with a list of indicators that make up the total innovation index (SII), in the context of published annually under the aegis of the European Commission’s Innovation Union Scoreboard rankings, where in the last edition (IUS 2013) value for the Polish SII was calculated at 0.270, which placed our country at the 24th place among the 27 EU countries, and in relation to the previous year, a decrease of two positions on the list for Slovakia and Lithuania (Fig. 4)\textsuperscript{102}. 

Still predominant in Polish enterprises in the application of the model “diffusion imitative”, but the premise is moving towards the use of the model “diffusion creative”. Unfortunately, this is typical behaviour for developing countries and new countries of Central and Eastern Europe, and at this stage we should imitate actions practiced in developed EU countries. The level of investment in research and development (R & D), and their share in relation to GDP is showing very low positions of Poland in the European innovation rankings, because we have one of the last locations in the countries of the European Union. Expenditures on R & D for two decades did not exceed one percent in 2010 amounted to 0.74%, and ten years earlier 0.64%. Still too low to be seen is the behaviour of small and medium-sized enterprises in the field of innovation.

Still too low to be seen is the behaviour of small and medium-sized enterprises in the field of innovation.

Analyzing indicator of the amount of developed innovative solutions in this group of companies in the last decade, we note that still execute them at half the EU average, and few of these entities has concluded an agreement on cooperation with other innovative companies or institutions. Positively, however, should be seen increasing levels of education, performance and quality and efficiency of the financial market institutions negatively while the low uptake of the technology, the so-called technological readiness and continued low quality infrastructure structure. In 2008, less than one fifth of SMEs companies implemented the product and process innovations developed alone or with other companies, which accounted for about half
lower the number than in the European Union. Not much different situation occurred in the case of entities implementing organizational and marketing innovation. Positive action should be assessed on Polish exports, which is characterized by a relatively high level of R & D intensity, as over 51% of Polish exports are products of medium and high technology (called medium and high technology, 108% of the EU average), in the case of export port services with high knowledge intensity – post and telecommunications, computer science, the science – their share in Polish exports in 2008 amounted to more than 30%, which accounted for 62% of the average for the countries UE\textsuperscript{103}. However, it should be noted that among the exporting firms are mostly actors with the participation of foreign capital, and their main headquarters and R & D departments are located in other countries.

\textsuperscript{103} Ibidem, p. 38.
2. The food industry as an innovative sector and implementing elements of knowledge management in the years 2007-2012

2.1. The evolution of the food industry in Poland

History and development of the business occurring in the food industry are inextricably linked to the functioning of the entire agribusiness sector. Agribusiness as a subsystem of the national economy shapes the Polish state, the degree of modernization and equipment of the business in the food industry, from the farms producing for their needs by buying units, storage, wholesale and distribution of agricultural products, agricultural processing companies, and ending with the trade retail. In order to achieve the main objective was to develop examined the history of changes of organizational units of Polish agri-business, which contributed to shaping the present form of food businesses.

The food industry is a sector of the economy, which is engaged in the manufacture of products and semi-finished products intended for human consumption, such as meat and dairy products, bakery products, confectionery items, alcoholic and soft drinks and many others. In the food industry the most competitive industries include: meat, dairy, fruit and vegetables, confectionery, secondary processing of cereals and production of tobacco products. Multiple analytical and empirical studies have shown that in the last decade, the competitiveness of Polish enterprises of food is determined in the market of EU and global manufacturers as significant. According to J. Seremak-Bulge, the situation on the world market will have a decisive influence on the Polish food market and accelerate the economic development of developing countries and population growth in the next decade will be of the most important factors increasing demand for food in the world.\(^\text{104}\)

In most cases, the source of competitive advantage is the use of the company’s cost-price strategy. In our country, this is possible due to lower prices of agricultural products, lower labour costs (salaries of employees of the food industry are below the average wage in the economy for the production of foodstuffs and above for manufacture of tobacco products) and other factors of production and lower processing margins. It is worth noting that as the conduct of processes of convergence of the Polish economy in the context of the importance of the EU market advantage, which gives the application a cost-pricing strategy will fall. It will be important to use

innovative strategies to gain competitive advantage. Proper formulation of strategy, in terms of the use of new financial resources from the EU budget for 2014-2020 will be a major challenge for economists and practitioners dealing with the food industry. The functioning of this industry in the post-accession period showed that it has significant potential for development, because our country in 2012 was the sixth producer of food in the European Union, with the overall participation in its production ratio of 7.4% and about 30 percent export\textsuperscript{105}. In terms of the number of entities producing groceries Poland it gained in 2010 to fifth place in the EU, and the share of value of production in total manufacturing output was 16%. However, production efficiency, measured for example gross value added per employee, was relatively low and placed the Polish food industry only in 17th place in the EU (excluding Greece and Luxembourg)\textsuperscript{106}. In 2011, the value of investment in the sector was 7.6 billion PLN and it was only about 0.5 billion PLN lower than the record level of 2008, and in 2012 capital expenditures exceeded 6.7 billion PLN\textsuperscript{107}.

One third of the food companies produce food for export and Polish participation in food production in 2012 amounted to 7.4%. Food producers in most hold required quality certificates, which Polish products enjoy a high reputation and recognition around the world.

Development of the agri-food sector has strengthened Polish membership in the European Union, as from the moment of accession, there was a significant inflow of funds through which we launched a large-scale modernization of companies. Bearing in mind the ambient turbulence and the changes in the food industry enterprises, one must assume that they can adapt to the changes taking place and to create new strategies. It seems necessary to examine selected targets for businesses of which should be considered such as: economic or optimizing costs and improving economic performance; market – improving the competitive position and increase the scale of operations, new markets entry, strategy – increasing flexibility, concentration on selected strategic areas of the company, increase operational efficiency, access to external know-how; operating – improving the quality of processes operating; organizational – to simplify organizational structures; incentive – easy to compare the results of the effectiveness of staff.

Managers of food businesses should have to answer a lot of questions, such as, for example: what are the strengths and weaknesses of the company, what circumstances apply to the company’s competitive advantage and

\textsuperscript{107} Ibidem.
that this situation is unsustainable? You should also carry out an analysis of the competitive environment, the assessment of business models of competition; examine five forces that influence the attractiveness of the industry (Porter’s model), the probable action and contractions of rivals. It is important to expose factors that create value for the industry and to determine what are the main factors that contribute to the costs and sources of product differentiation. Particular attention to the issue of the cost of food production in the era of globalization returns S. Kowalczyk, who emphasizes that the search for the company of their reduction leads to the phenomenon of reducing the quality of the product, which in turn carries health risks, and in extreme cases, and the lives of consumers. Examine the macroeconomic environment should indicate the opportunities and threats it forces flowing through the prism of economic, social, technological, demographic and political areas. Should also be taken into consideration complementary assets and audited and evaluated through: brand, production capacity, marketing functions, distribution channels, reputation, range of products, relationships with customers and suppliers, and a complementary technology. The food industry in Poland has a diversified structure, which in the last fifteen years was subject to multidirectional changes made under the influence of economic reform, restructuring and privatization. Earlier in the centrally planned economy food processing was dominated by units of the socialized economy as a leading cause and have a monopoly state-owned enterprises. Apart from them, many small and medium-sized enterprises functioned on cooperative principles that were associated in Dairy Cooperatives, Cooperative Associations Gardening-Beekeeping, Agricultural Production Cooperatives, Municipal Cooperatives “Peasant Self-Help” Consumers Cooperatives, Cooperative Labour and Cooperatives Invalids, and in state the Field Industry. Many state farms (PGR) were involved in food processing, this also was one of the main objects of their actions. As noted by R. Urban in 1988 economic structure of food processing was very fragmented, because among the 26,000 firms in the industry, up nearly 60% were craft, and only 3.2% of industrial enterprises – state and cooperative.

Allowing greater participation in the European market was crucial for Polish producers, as hitherto this market, numbering nearly 0.5 billion consumers, more than double the wealth than in Poland, was protected systems, customs and non-tariff. The result of the inclusion of Polish agriculture to the Common Agricultural Policy of the European Union was largely increase in the number of streams of public funds earmarked for agriculture,

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109 Ibidem, p. 68.
which had a significant impact on improving the income situation of agriculture in general and for particular groups of farms. Accession to the European Union contributed to the increase in agricultural income, as the years 2004-2010 were on average annually more than twice before accession, and the same subsidies make up more than 50% of farmers’ income\textsuperscript{110}.

The common agricultural policy over several decades has been subject to constant evolution, since the changing internal and external conditions required by the European Union following adjustments in this area and in the following years led to the occurrence of disparities in the development of European regions\textsuperscript{111}. The current shape of the common agricultural policy is the result of successive reforms, which were held in conditions that change the tasks and challenges facing agriculture\textsuperscript{112}. The result of these actions was to improve the quality of life of people from agricultural and rural areas\textsuperscript{113}. According to J. Wilkin what is happening in rural areas, which occupy 93% of the territory and the lives of almost 40% of the population, it is extremely important for the functioning of key areas of our country.

This is important, of course, for agriculture, for the foundation of food security of the country, for the environment, because most of the natural environment, national culture, the state of political moods and attitudes is located there\textsuperscript{114}.

Membership in the European Union was a measurable factor in the development of the sector, as it was more than three times faster in the first years of membership (2004-2008) than in the years of stagnation, the period 1999-2002, and twice faster than in the past decade\textsuperscript{115}. Level of economic development of our country has contributed to the increase in absorption of the domestic market, as well as food. The CSO data shows that the average nutritional value of the food ration during the period 2003-2009 has not


\textsuperscript{113} Ibidem, p. 69.


\textsuperscript{115} R. Urban, Przyspieszenie..., op. cit., p. 29.
changed, but significantly improved its structure. Evidenced by the approximately 13% increase in the consumption of meat and fish, fats, and the relevantly high because of greater than 20% increase in the consumption of beverages, desserts, snacks and other highly processed products116. At the time of accession to the European Union food industry was one of the most important sectors of the Polish national economy and was second in the electric machinery industry in terms of value of production sold117. The share of food industry sales value of the industry in 2004 was about 24%. Its employment accounted for almost 5% of total employment in the national economy and more than 19% of employees in industry, and produced by the food industry gross value added accounted for approx. 6% of GDP118. The Polish food industry is to function when a large number of small and geographically scattered plants whose function was dependent on the existing resource base, which in the case of selected production was a fundamental condition of the business. Many companies were forced to adapt to local demand, and their functioning depends on both the resource base and the local market. There are many small plants closely related to the resource base, unfortunately, often processing raw materials unstable and consuming high levels of quantity of raw material per unit of product. The location of food establishments near large markets was beneficial because plants could produce food products that are not suitable for long transport and storage119.

During the first years of the Polish food industry after accession of our country to the European Union should be viewed positively, which was the result of its membership, but also the proper implementation and effect of a common agricultural policy in the field of economy and trade. Recommendation of the European Union was to adapt the mechanisms functioning of Polish food to the general of the adopted and in force in the rest of the requirements of the common market of the Community. Permanent introduction of the recommended instruments of the common agricultural policy, trade policy monitoring and industrial activity, proper dividing and use of financial pre-accession funds from the PHARE and SAPARD, supported the 2004 market of 450 million consumers, have a beneficial effect on the state and development of all branches of Polish agribusiness, food processing industry, inclusive. In the first years of membership Polish economy is still subject to

119 I. Fierli, Geografia..., op. cit., p. 131-132.
the modernization process, and this process has been significantly accelerated with the use of EU and national funds, which modernized food economy, strengthen its competitiveness, but also affect the quality and safety of food. Food economy in 2004-2007 was reinforced more than EUR 62 billion, which undoubtedly contributed to the increase in sales of food on the international market, the Community market and their export to third countries. It should be emphasized that the overall balance of membership in the early years was definitely positive, although appearance of many adverse effects of economic development was noticed, such as increased barriers to entry and artificial limitation of production and exports, which had a measurable effect production quotas; increase in the cost of administration management and control systems in agricultural markets; weakening of economic accounting transparency by favouring those using public assistance.120

In the season 2007/2008 a sharp increase in agricultural prices and strong fall were noticed. Phenomenon that took place in this period was the global financial crisis, on which the economy and food sector proved to be relatively resistant, especially in Poland.121 Using a comprehensive set of financial instruments made these companies more competitive and enabled their favourable positioning on the EU market.122 In 2009, the economy of our country, the only country in the European Union, noted the economic growth, in particular, has been well received in the course of massive downturn in the international arena and strengthened prosperous industries, including the food. Functioning in the EU structures resulted in the internationalization of the Polish economy and its dependence on the processes of a global nature. Companies highlighted in the food sector WIG-Food on the Stock Exchange in Warsaw received one of the leading economic performances in the country, which in turn gave rise to recognition as one of the most competitive in the whole agribusiness sector.124

In 2009, the stabilized level of exports, while the decrease level of imports, so that the increased balance of foreign trade in agri-food. Polish agri-social nutritionally markets gained following EU countries, but also

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121 R. Urban, Polski..., op. cit., p. 69-70.
123 K. Firlej, Globalizacja..., op. cit., p. 23.
were exported to the selected CIS countries, although they encountered of all kinds constraints of sanitary-epidemiological service. These actions were not conducive to periodically emerging information on the occurrence of zoonoses and the effects of post-crisis. Although the value of exports was reduced, it should be emphasized that the reconstruction in these markets took place through the use of EU funds. The use of export subsidies is not allowed positioning of the Polish food market on an equal footing with other EU entrepreneurs, so it was competitively priced. Unfortunately, in 2009 we still felt the effects of the crisis, the consequence was a reduction in exports to CIS countries by 8%, while the total reduction amounted to only 1.74%. In 2007-2009, the competitive position of Polish companies underwent an ongoing deterioration, we were losing comparative advantage, and kept covered large groups of unsupported goods so characteristic for the European Union. In 2009, the growing level of trade with the EU, which was the result of free access to the markets of high quality Polish food meets the sanitary and veterinary standards, as well as the possibility of using competitive prices. Sorry, decreased the overall level of Polish exports and imports, as well as the foreign trade balance. The effects of the crisis were also felt in the investment process in the food industry, as investment activity was halted in 2009-2010, but was still higher than before the accession. In 2009, still followed the processes of concentration of production, increase the share of large firms, and decreased other groups of companies, which resulted in their rearranged structure to the generally applicable in the European Union. Followed by improvement in labour productivity measured both the value of sold production and value added, but although it was a universal phenomenon, in the various branches of the food industry was very different. Also labour productivity improved, which allowed shortening the distance to the most developed EU countries, and the branch structure also showed similarity to the EU. In 2010, economic indicators have improved Polish food industry, increased sales, the share of food and groceries in industrial production sold in total, as well as the growing import and export agri-food products, as well as their balance. Despite the difficult period to be considered for this year again, producers were to undertake investment activities and modernize their plants. The increasing importance of non-price determinants of perceived competitiveness indicated and was felt downturn or cyclical phenomena occurring in post-crisis period. Also contributed to the volatility and differences in exchange rates, large amplitude fluctuations in world of market prices and announced liberaliza-

tion of world trade. As noted by I. Szczepaniak, during the economic crisis in 2009, the Polish agri-food exports significantly increased the importance of an effective strategy to compete a lower price; in 2010, the role of this strategy decreased, while an effective strategy to compete again increased quality. In 2010, the production of the food industry slowed down, as production of food and beverages decreased by 1.1% and tobacco by 12.8%. However, the overall increase in production when compared to the previous year amounted to 2.9%. In 2011, the growing rate of growth of production sold in the food industry, especially in the production of food and beverages (3.9%), but unfortunately fell in the manufacture of tobacco products (-2.8%). The overall increase in the production of the food industry amounted to 3.8%. Further increase in recorded exports, imports and balance of foreign trade in agri-food products was seen. Dynamics of the main directions of the industrial processing of agricultural and food products in the field of pre-processing, proper and secondary and production of drugs and for other purposes is growing. Clearly, the value of sold production of the food industry at basic prices – in nominal and real gross value added, at a relative stabilization of economic surplus. In 2007-2011, the financial results of the food industry have been determined by the level and structure of producer prices of food, changes in raw material prices, the cost of materials and capital barriers to changing demand and prices of factors of production.

2.2. Factual material of the food industry in the agribusiness sector, economic, organizational and financial analysis

Agri-food industry is the cornerstone of agribusiness, which in the food chain is the final recipient of farms commodities. Companies within the food industry integrated agribusiness cells, because the raw materials are contracted and bought from farmers and then processed and refined into food products. Subsequently, they are sold on the internal market and for export. Very crucial are processing plants operating in the industry, which have the function of food production and processing. The modernly organized plants are processing perishable vegetable and animal raw materials for their consumption at a later date or their processing. Nowadays, many products

have a long shelf life for several months and therefore require proper packaging and use in their production of complex technical methods and analytical control. Already in the last decade of the twentieth century growth of investment and ownership transformation improved the state of the process equipment and contributed to broadening of assortment in Polish food industry.\(^{128}\)

Nowadays, when food industry plants must strictly follow the guidelines of the HACCP system – durability, quality, hygienic, nutritional and flavour of food products is very high. Agri-food industry is treated in the agribusiness sector as a set of processes forming one of the most important cells and involved three basic terms of impact areas: \(^{129}\)

1. Narrowest range only covers processing of agricultural raw materials, which is the content of its branches.
2. Mid-range, which starts at the “farm gate” and ends at “the plate of the consumer” includes in addition to the processing and storage of the issues of buying raw materials, marketing of food and technology, health and cooking.
3. Widest range covers many of the issues of agricultural production (e.g. varieties, seed, crop protection, especially in relation to the possibility of chemical contamination of food), and nutritional problems, with its physiological, hygienic and economic aspects of.

Currently, the food industry is next to the primary department of agriculture agribusiness sector in our country and one of the fastest growing, and its growth rate is dependent on the rate of economic growth.\(^{130}\) Nine years of our country in the EU structures was reflected in the views of political and economic development. The structure of the economy has changed, as occurred subsequent transformation of privatization, modernized the predominant part of companies, which significantly affected the activation of market-oriented behaviour of Polish companies, as well as maintaining the high position of the national economy on the international stage.\(^{131}\)

Changing political and economic conditions was the result of ongoing eco-

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nomic phenomena, both directly and indirectly conditioned processes of European integration, which included:

- opening for Polish producers large and prosperous European market and the Polish market for products manufactured in other countries of the European Union,
- coverage of Polish agriculture in the Common Agricultural Policy,
- Polish accelerated economic development,
- internationalization of the Polish economy, increasing its sensitivity to the phenomena of a global nature.

Agri-food industry is divided into the following sections (according to the European Classification of Activities introduced for use in 1991):

- production, processing and preserving of meat and meat products,
- processing and preserving of fish and fish products,
- fruit and vegetable processing,
- production of oils and fats of vegetable or animal origin,
- the production of dairy products,
- manufacture of grain mill products, starches and starch products,
- manufacture of prepared animal feeds,
- production of other food products,
- production of beverages.

Relationship of the food industry in the agribusiness chain are shown in Fig. 5 diagram includes compounds all major spheres of interaction occurring in the manufacture of final products of food and drink for consumption. The food industry is very highly dependent on the state and trends in agriculture. Raw materials produced in agriculture, their prices and quality determine the operation of processing plants and their economic results.

In the structure of the partition Polish agribusiness in addition to the food industry and agriculture are also:

- industries producing means of production for agriculture and related services,
- industries producing means of production for the food industry and related services,
- fisheries, forestry and non-agricultural enterprises that produce raw materials for food production and related services,

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133 Klasyfikacja została opracowana na podstawie wydawnictwa Biura Statystycznego Wspólnot Europejskich Eurostat.
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- food processing industry, including food and crafts food, along with the services,
- marketing of agricultural commodities and food finished products, notably including wholesale and retail trade (marketing area),
- material services provided by other branches and departments of the national economy for the benefit of agribusiness sphere entities (in particular transport services, communications, construction, science, education, etc.)\(^{134}\).

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**Fig. 5. Schematic structure of agribusiness and its division into sections**


Goods and services for export and import from are included in the structure of agribusiness, depending on whether they are associated with food production or the means of food production, etc. For the purposes of this study were used synthetic characteristics of the state of functioning of the food industry in the years 2007-2012. In 2014 years it will be the first decade of Polish membership in the EU structures, which strongly positively assessed the func-

tioning and development by economists dealing with agribusiness, especially the food industry. Especially in recent years, there has been considerable development of trade in products produced in the agri-food industry. As noted by M. Tereszczuk throughout the period of Polish membership in the European Community, the value of exports of agri-food products has quadrupled, while imports tripled, while the balance of trade has increased seven times. Polish food industry coped well with the economic crisis, as for its effect can be only a slight slowdown in production that took place in 2008. Polish food became recognizable, and thus its competitive position increased its producers internationally. Despite the crisis, still followed the development of the food industry and increased its importance in the economy of the European Union. Enterprises shortened the distance between them in relation to the ones operating in highly developed countries of the European Union, such as Germany, the United Kingdom, France and Spain. It should be emphasized that this was a result of the overlap in Polish enterprises adjustment processes and investing activities, reinforcing in the first years of membership, their competitiveness and efficiency. The dynamic growth of trade positions the Polish food industry and recognizable among the major sectors of our economy in the international arena, which should be a precursor to the development and permanently raise its competitiveness.

In the last two decades of the Polish food industry has been incorporated into active participation in international economic exchange, which ensured its businesses to compete on a broad European market. It was a period of transformation both transformational, reinforced by the processes of globalization, as well as the phase of the accession to the EU structures and positioning of the companies in the European economic system. The changes did not avoid the food industry companies that have made this transition time of privatization, modernization and restructuring, as a result have been noticed as competitive entities with market-oriented behaviour. The organizational structure of the industry has changed, as it functions within the overall structure of the EU, was forced to apply the principles of action in accordance with the EU. Despite the fact that Polish companies have the necessary quality certificates showing production safe and wholesome food, unfortunately the European markets are still competing product price and low cost of manufacturing. According to A. Judzińska, reason for this is still higher price advantage achieved by Polish manufacturers on the market of basic agricultural prod-

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ucts in relation to producers from the EU-15\textsuperscript{137}. As shown by studies conducted by A. Grzelak and M. Gałązka in Poland in the years 2006-2009 was recorded quantitative increase in consumption of certain products, for example yoghurt, mineral water, fish, fruit and meat, which may indicate a positive trend in terms of changes in the structure of food consumption\textsuperscript{138}. In the first half of 2013 a slowdown of the Polish food industry was observed, which was the result of weakening domestic demand. Reasons for this were the economic downturn, the severity of the negative trends on the labour market and to continue the process of reducing the fiscal imbalance, which resulted in a reduction in the rate of growth in national income and private consumption in Poland\textsuperscript{139}. Studies conducted in the IERiGŻ in Warsaw by K. Świetlik showed that in 2007-2011 in Poland actually decreased expenditure on food and quantitative food consumption in households\textsuperscript{140}. J. Drożdż and R. Urban believe that the impact of this factor can weaken the growing exports of food and beverages, which helps to maintain a slight increase in the level of production in this sector. In the years 2007-2011 was noticeable slight decrease in investment activity food companies; however, despite the high prices of raw materials, the financial results of industry were at similar levels, and the financial condition of companies in most industries safe\textsuperscript{141}. Particulary noteworthy is the economic structure of the Polish food industry, which is dominated by small and medium-sized enterprises, and only in certain industries large, which contributes to the phenomenon of competitiveness.

Small and medium businesses need to take care of the increase in productivity and higher efficiency to meet the global companies that are increasingly active on the Polish market.

Data from the Central Statistical Office indicate that at the end of 2011 less than 34 thousand entities in the food industry were operating in Poland,


\textsuperscript{139} K. Świetlik, Malejąca konsumpcja żywności, “Przemysł Spożywczy” 2013, No. 12, p. 6-8.

\textsuperscript{140} Ibidem.

\textsuperscript{141} J. Drożdż, R. Urban, Przemysł spożywczy w Polsce rozwija się mimo kryzysu, “Przemysł Spożywczy” 2013, No. 8, p. 24-29.
among which the most numerous group were betting the baking industry (19%) and engaged in the production of meat and poultry (18%), and least numerous were involved in the production of margarine and similar edible fats (0.04%). According to the Central Statistical Office in 2012, 34.3 thousand food processing companies were registered. In 2011, economic activity led 6150 entities employing more than 9 people (41% of the total). Exactly 77% of total food sales were from 4% of large companies, with annual sales of more than 40 million PLN. Given the size of the companies, most accounted for the largest group of micro-enterprises employing up to 9 people (approx. 73%), followed by small firms with 10-49 employees, which accounted for 22%, medium (50-249) of 4.5% and a large 0.9%. Territorially most food companies were operating in the Mazowieckie, Silesia and Wielkopolska, and their area was then registered a total of nearly 40% of all companies. A total of seven provinces, first in terms of the number of food companies, cover less than 70% of entities operating in the market. Number of economic entities registered in the register TAX number registry (according to PKD, Section C, Chapter 10, 11, 12, as at 30.10.2012) was 34,332, including the production of food – 31,946, the beverage industry in 1643, and manufacturing of tobacco – 43 (Table. 4). This number, though subject to slight fluctuations, is shaped in the test period of approximately 33,000 units. In the total number of entities operating in Poland it is a less than 1% (Table 3).

Table 3. Number of companies in the REGON registry, according to Polish Economic Classification, Section C, Division 10, 11, 12 in the years 2007-2012

<table>
<thead>
<tr>
<th>Section C Industry</th>
<th>Number of companies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007</td>
</tr>
<tr>
<td>Division 10 Foodstuffs</td>
<td>32,328</td>
</tr>
<tr>
<td>production</td>
<td></td>
</tr>
<tr>
<td>Division 11 Drinks</td>
<td>1618</td>
</tr>
<tr>
<td>production</td>
<td></td>
</tr>
<tr>
<td>Division 12 Tobacco</td>
<td>36</td>
</tr>
<tr>
<td>products production</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>32,364</td>
</tr>
<tr>
<td>Total number of companies in Poland</td>
<td>3,685,608</td>
</tr>
</tbody>
</table>


142 Eurostat; Projekt..., op. cit., accessed: 31.01.2014.
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Assessing the selected indicators characterizing the functioning of the food industry in Poland in the years 2007-2011, the apparent stagnation in the growth of food production sold throughout the period considered can be noted (with the exception of 2008), the stagnation in 2007-2009, the decline in 2010 and a marked increase dynamics of beverages sold in 2011 and its re-stagnation in 2012 (Table 4). Financial ratios of food companies are a barometer to judge the company’s financial condition and criticisms of the past and present, as well as anticipating future of this business. Already the whole decade was a period of intensive development of production sold food industry and increased by almost three quarters of the 92.9 billion PLN to 162.3 billion PLN (base prices). Subject to large amplitude while the sales, tobacco products, which in 2008 underwent a serious collapse to stabilize in 2009-2011.

Table 4. Main food industry indices in the years 2007-2012

<table>
<thead>
<tr>
<th>Index</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food sales dynamics (in %)</td>
<td>106.6</td>
<td>100.6</td>
<td>105.7</td>
<td>104.6</td>
<td>104.1</td>
<td>104.1</td>
</tr>
<tr>
<td>Drinks sales dynamics (in %)</td>
<td>108.7</td>
<td>104.4</td>
<td>106.7</td>
<td>91.5</td>
<td>101.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Tobacco products sales dynamics (in %)</td>
<td>109.4</td>
<td>63</td>
<td>97.2</td>
<td>98.5</td>
<td>97.2</td>
<td>107.1</td>
</tr>
<tr>
<td>Food production sales prices index (in %)</td>
<td>104.5</td>
<td>101.2</td>
<td>101.7</td>
<td>99.6</td>
<td>109.5</td>
<td>104.5</td>
</tr>
<tr>
<td>Drinks production sales prices index (in %)</td>
<td>103.4</td>
<td>104.7</td>
<td>101.3</td>
<td>100.0</td>
<td>102.8</td>
<td>101.4</td>
</tr>
<tr>
<td>Tobacco products production sales prices index (in %)</td>
<td>120.7</td>
<td>107.1</td>
<td>107.1</td>
<td>104.3</td>
<td>103.7</td>
<td>104.3</td>
</tr>
<tr>
<td>Share of food in the total industry production sold (in % and in mln PLN)</td>
<td>9.2</td>
<td>9.6</td>
<td>15.1</td>
<td>14.3</td>
<td>14.1</td>
<td>15.9 (191,956)</td>
</tr>
<tr>
<td>Share of drinks in the total industry production sold (in %)</td>
<td>16.3</td>
<td>7.9</td>
<td>2.2</td>
<td>1.8</td>
<td>1.6</td>
<td>1.7</td>
</tr>
<tr>
<td>Share of tobacco products in the total industry production sold (in %)</td>
<td>-</td>
<td>-</td>
<td>0.4</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
</tbody>
</table>


Overall, this indicates a clear stabilization in demand for food and its clear increase in relation to the period from two years to beverages and tobacco products. In the period under slight fluctuations were also price indices, which in the case of food products increased by 5%, and in the case of beverages and tobacco difference was serious and amounted to 16.4%. On indices of producer prices of food and beverages affect volatile commodity prices of agri-food products, and in the case of tobacco annual growth rates of excise duty on cigarettes and other tobacco products.

An increase of 4.9% has been part of food in total industrial production sold, which was associated with increasing interest in Polish food on international markets, further modernization of enterprises and clearly appreciable effects of reorganization and adjustment of the organizational structure of the Polish food industry to the EU requirements. Participation of beverages and tobacco in total industrial production sold in 2007-2008 was exceptionally high, and in the years 2010-2012 was stable, while in the case of beverages changes did not exceed 0.2%, and in the case of tobacco, there were none. Just look at this period, the situation in the export of processed food ditch where changes ranged between 0.4%. Clearly while growing level of exports and imports of agri-food products, which in the case of exports increased by 5.1 billion euros, in the case of imports by 4.7 billion. The balance of foreign trade in agri-food products in the first two years stood at a similar level to the 2012 increase by 1.6 billion euros. According to data from the Ministry of Agriculture and Rural Development, the value of Polish food exports in 2012 amounted to 17.5 billion euros, an increase of 14.8% compared to 2011 last year. The share of agri-food products in the total value of Polish exports amounted to 12.33%, therefore, in 2012, which allowed considering this sector as one of the foundations of Polish exports\textsuperscript{146}.

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|c|c|c|c|}
\hline
\textbf{Export of food} & 4.3 & 4.4 & 5.4 & 5.2 & 5.2 & 5.6 \\
\textbf{(dynamics in %)} & & & & & & \\
\hline
\textbf{Import of food} & 2.8 & 2.7 & 3.6 & 3.4 & 6.0 & 4.0 \\
\textbf{(dynamics in %)} & & & & & & \\
\hline
\textbf{Export of agri-food products} & 10.1 & 11.7 & 11.5 & 13.5 & 15.2 & 17.5 \\
\textbf{(in mld Euro)} & & & & & & \\
\hline
\textbf{Import of agri-food products} & 7.9 & 10.1 & 9.1 & 10.9 & 12.6 & 13.3 \\
\textbf{(in mld Euro)} & & & & & & \\
\hline
\textbf{The balance of foreign trade} & 2.2 & 1.6 & 2.4 & 2.6 & 2.6 & 4.2 \\
\textbf{in agri-food products (in mld Euro)} & & & & & & \\
\hline
\end{tabular}
\caption{Export and Import of food and agricultural products.}
\end{table}

Source: own elaboration based on GUP data.

Since its accession to the EU structures, so since 2004, when exports of Polish food products amounted to little more than 5 billion, it was more than three times magnified. In turn, foreign trade surplus in 2012 compared to the previous year increased by 62%.

Additional analysis will also be required for major trading partners of Poland, which created a market for Polish products abroad (fig. 6). These were primarily the countries of the European Union, and the leader among them Germany, where the goods were sold for a total value of 3.8 billion euros, the second market was the United Kingdom (1.3 billion euros), and in third place were taken by the Czech Republic (1.1 billion). Noticeable is the dynamic development of trade with Russia, where exports grew year on year by 30%, reaching the 1.1 billion euros and to markets in Asia, the Middle and Far East. The agreed conditions of access are also of Polish food products to markets, among others, Japan, China, Vietnam, Singapore\textsuperscript{147}.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{food_export_pie.png}
\caption{Food export in Poland in 2012}
\end{figure}


Analysing the contribution of individual food products, it turns out that most of the years 2011 and 2012 were exported tobacco products (respectively for 1179 and 1327 billion), poultry meat (904 and 1017 billion), choc-

\textsuperscript{147} \textit{Ibidem.}
The food industry as an innovative sector and implementing...

olate and cocoa products (789 and 852 billion), beef (807 and 852 billion euros) and pork (585 and 760 billion euros)\textsuperscript{148}. In 2012 (at current prices) significantly increased the output of livestock, while it slightly decreased crop output, which resulted in an overall increase in global agricultural production. In 2012, the major categories of agricultural production at current prices against the background of the two preceding years were as follows:

- global agricultural production amounted to 103.1 billion PLN and was higher by 2.4\% than in 2011 (100.7 billion PLN) and 22.1\% higher than in 2010 (84.5 billion PLN),
- Final agricultural production amounted to 81.7 billion PLN and was higher by 3.3\% than in the previous year (79.1 billion PLN), and 22.8\% higher than in 2010 (66.5 billion PLN),
- commodity agricultural production amounted to 75.0 billion PLN and was higher by 5.2\% than last year (71.3 billion PLN) and 26.3\% higher than in 2010 (59.4 million PLN)\textsuperscript{149}.

Interesting on the background of the export performance is the situation concerning the size of the production of the food industry in the studied period (Table. 5). It turns out that leading in the growth in the considered and selected for comparison types of production were as follows: poultry meat, slaughtered cattle and calves, sugar, fresh cheese and curd, beer and beer obtained from malt and cigarettes of tobacco or tobacco blends. The production and slaughtering of pigs has dropped markedly, which was caused by the appearance on the market of a large quantity of raw material, as well as high production costs affecting the decline in its profitability. Although the level of production was described as a stable, but the fluctuations occur in the case of such production, as sausages, juices from fruits and vegetables, margarine and spreads, processed liquid milk, butter, and other fat spreads, wine and spirits. The size of the amplitude of fluctuations in these cases can be regarded as of little importance to their producers, because it resulted mainly from price differences occurring in different years, legislative changes and market trends shaping their economic situation. Typically, these levels return to previous values, which have been confirmed by some data covering year 2013.

\textsuperscript{148} B. Drewnowska, \textit{Eksport żywności będzie rósł, ale wolniej}, “Rzeczpospolita” 2013, No. 75.

\textsuperscript{149} \textit{Produkcja i handel zagraniczny produktami rolnymi w 2012 r.}, Główny Urząd Statystyczny, Warszawa 2013, p. 18.
Table 5. Characteristics of the production volume of products of the food industry in the years 2007-2012

<table>
<thead>
<tr>
<th>Production kind</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production and slaughter of cattle and calves</td>
<td>152</td>
<td>159</td>
<td>165</td>
<td>186</td>
<td>188</td>
<td>198</td>
</tr>
<tr>
<td>(in thous. tonnes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production and slaughter pigs</td>
<td>953</td>
<td>864</td>
<td>816</td>
<td>847</td>
<td>821</td>
<td>778</td>
</tr>
<tr>
<td>(in thous. tonnes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production of poultry meat</td>
<td>1127</td>
<td>1195</td>
<td>1217</td>
<td>1368</td>
<td>1440</td>
<td>1630</td>
</tr>
<tr>
<td>(in thous. tonnes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production of cold cuts</td>
<td>760</td>
<td>705</td>
<td>649</td>
<td>666</td>
<td>746</td>
<td>720</td>
</tr>
<tr>
<td>(in thous. tonnes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacture of fruit and vegetables</td>
<td>6109</td>
<td>6700</td>
<td>6349</td>
<td>6497</td>
<td>5895</td>
<td>6835</td>
</tr>
<tr>
<td>(in thous. hl)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production of margarines and spreads</td>
<td>345</td>
<td>337</td>
<td>344</td>
<td>375</td>
<td>380</td>
<td>404</td>
</tr>
<tr>
<td>(in thous. tonnes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production of liquid milk processed</td>
<td>2283</td>
<td>2175</td>
<td>2639</td>
<td>2588</td>
<td>2618</td>
<td>2560</td>
</tr>
<tr>
<td>(in million liters)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production of butter and other fat spreads</td>
<td>176</td>
<td>179</td>
<td>169</td>
<td>175</td>
<td>168</td>
<td>171</td>
</tr>
<tr>
<td>(in thous. tonnes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sugar production</td>
<td>1856</td>
<td>1355</td>
<td>1489</td>
<td>1615</td>
<td>1943</td>
<td>1998</td>
</tr>
<tr>
<td>(in thous. tonnes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh cheese and curd</td>
<td>324</td>
<td>318</td>
<td>334</td>
<td>360</td>
<td>368</td>
<td>377</td>
</tr>
<tr>
<td>(in thous. tonnes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production of pure vodka based on 100% (w m l)</td>
<td>92.3</td>
<td>108</td>
<td>104</td>
<td>104</td>
<td>103</td>
<td>103</td>
</tr>
<tr>
<td>Production of grape wine (million L)</td>
<td>8.7</td>
<td>8.2</td>
<td>7.9</td>
<td>7.3</td>
<td>7.5</td>
<td>5.9</td>
</tr>
<tr>
<td>Manufacture of beer obtained from malt (million hl)</td>
<td>36.7</td>
<td>36.9</td>
<td>36.0</td>
<td>36.6</td>
<td>37.9</td>
<td>39.3</td>
</tr>
<tr>
<td>Production of cigarettes of tobacco or its mixtures (billion pcs.)</td>
<td>124</td>
<td>131</td>
<td>125</td>
<td>143</td>
<td>150</td>
<td>156</td>
</tr>
</tbody>
</table>

Source: own study based on CSO data.

In assessing the economic potential of the food industry, it is worth to consider the consumption of basic products per capita, the level of which in the individual years is presented in Table 6. Included data shows that there were slight differences in the consumption of cereals, decreases were recorded in the case of the consumption of potatoes and vegetables and only in the case of fruit significant amplitude fluctuations were recorded.

Table 6. Consumption of primary products per capita in 2007-2012 (kg/person)

<table>
<thead>
<tr>
<th>Product</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals</td>
<td>114</td>
<td>112</td>
<td>111</td>
<td>108</td>
<td>108</td>
<td>108</td>
</tr>
<tr>
<td>Potatoes</td>
<td>121</td>
<td>118</td>
<td>116</td>
<td>110</td>
<td>111</td>
<td>111</td>
</tr>
<tr>
<td>Vegetables</td>
<td>115</td>
<td>115</td>
<td>116</td>
<td>106</td>
<td>104</td>
<td>103</td>
</tr>
<tr>
<td>Fruit</td>
<td>41</td>
<td>55</td>
<td>55.5</td>
<td>44</td>
<td>42</td>
<td>46</td>
</tr>
</tbody>
</table>

Also the consumption of animal products per capita in 2007-2012 shaped differently, as illustrated in Table 7.

### Table 7. Consumption of animal products per capita in 2007-2012

<table>
<thead>
<tr>
<th>Product</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meat and offal, including meat and offal intended for chilled dairy in weight (in kg)</td>
<td>77.6</td>
<td>75.3</td>
<td>75</td>
<td>73.7</td>
<td>73.4</td>
<td>71.0</td>
</tr>
<tr>
<td>Cow’s milk, including milk intended for milk, but without milk processed into butter (in liters)</td>
<td>179</td>
<td>182</td>
<td>189</td>
<td>189</td>
<td>194</td>
<td>193</td>
</tr>
<tr>
<td>Hen eggs (pcs.)</td>
<td>207</td>
<td>205</td>
<td>206</td>
<td>202</td>
<td>172</td>
<td>140</td>
</tr>
</tbody>
</table>


The presented data show that consumption of meat and offal (including meat and offal intended for chilled dairy in weight) decreased by 6.6 kg in 2012 to a period of six years ago, while consumption of cow’s milk (including milk intended for preparations, but without milk processed into butter) has increased for 14 litres, but the consumption of chicken eggs clearly decreased by 67 units which represents a change of more than 30 percent.

![Fig. 7. Direct foreign investments in food industry – inflow and outflow in the years 2003-2011 (in mln Euro)](source)


According Ł. Ambroziak dynamic development of Polish agri-food exports is suggesting that domestic companies from the food sector will be more
The food industry as an innovative sector and implementing...

...willing to make investments abroad. In the beginning the inflow of foreign direct investments met at the beginning of the last decade of the twentieth century to the turn of the century witnessed the establishment of a permanent one in the food industry, and the expansion of Polish companies abroad was evident in the first years after accession (Fig. 7). As the host country we implement a lot more of this kind of action than we do them abroad. Our main foreign investors in the food industry are: Germany, France, Denmark, the Netherlands, the USA, and the main directions of the expansion of our businesses include: United Kingdom, Ukraine, Czech Republic, Russia, Norway, Slovakia, Hungary, and Romania.

Considering the capabilities and needs of employment in the Polish food industry, it should be emphasized the declining trend in the examined years, due to the radical cost-cutting by companies and constant modernization, which stimulates the replacement of human capital with technology. As the data in Table 8, in the studied period employment in all occupational groups has been reduced in the food industry, i.e. manufacture of food, beverages and tobacco.

Table 8. Employment and average wages and their dynamics in the food industry in the years 2007-2012

<table>
<thead>
<tr>
<th>Employment/ Wages</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food industry employment (no. people):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– food production,</td>
<td>466,216</td>
<td>458,555</td>
<td>416,328</td>
<td>421,767</td>
<td>406,960</td>
<td>371,522</td>
</tr>
<tr>
<td>– drinks production,</td>
<td>-</td>
<td>-</td>
<td>29,843</td>
<td>26,514</td>
<td>26,605</td>
<td>23,968</td>
</tr>
<tr>
<td>– tobacco products production</td>
<td>7293</td>
<td>6844</td>
<td>6367</td>
<td>6024</td>
<td>5612</td>
<td>5581</td>
</tr>
<tr>
<td>Average food industry wage (in PLN):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– food production,</td>
<td>2467.00</td>
<td>2673.09</td>
<td>2682.99</td>
<td>2809.09</td>
<td>2950.02</td>
<td>3021.92</td>
</tr>
<tr>
<td>– tobacco products production</td>
<td>4838.81</td>
<td>4897.39</td>
<td>5209.47</td>
<td>5287.61</td>
<td>5730.29</td>
<td>5830.01</td>
</tr>
</tbody>
</table>


Positive trend occurs in the case of the formation of the average wage in the food industry, which since 2007 is steadily growing, and it affects not only employed in the manufacture of food products, but also engaged in the manufacture of tobacco products. Comparing the wages of employees in the food industry in relation to the wage rates paid in other economic sectors, we note that they are higher by about 12% over the period, which indicates a preferred image of this kind of jobs.
Discussing the food industry, you should look into a listed companies belonging to the WIG-Food, calculated on the Warsaw Stock Exchange. WIG-Food is the index of the sector, and consists of companies listed on the main index WIG and at the same time are classified as index “food industry”. The date of commencement of trading, and thus the base for the index is December 31, 1998. The methodology is identical to the sub-index WIG index, it means that this is a total return index and its calculation takes into account both the prices of underlying shares and income from dividends and subscription rights. The value of this index stabilized in the period (down 2.6%), which can be regarded as a positive change due to the existing economic conditions, because at the same time the value of the WIG 20 index, so the best companies listed on the Warsaw Stock Exchange, has changed and fell by more than 49% (Fig. 8).

The index WIG-Food currently consists of 26 companies, namely: Agroton Public Limited in Lugansk (AGT), Ambra SA Warsaw (AMB), Astarta Holding NV, based in Amsterdam (AST), Belvedere SA Beaune (BVD), Polish PKM Duda SA Warsaw (DUD), Elstar Oils SA in Elblag (ELS), Graal SA Wejherowo (GRL), Industrial Milk Company SA Kiev (IMC), Indykpol SA in Olsztyn (IND), Jutrzenka Holding SA in Opatówek (JTZ), Kernel Holding SA Luxembourg (KER), Kofola SA Warsaw (KFL), KSG Agro SA Luxembourg (KSG), Zakłady Tłuszczowe Kruszwica SA

![Fig. 8. Volatility of the index WIG-Food and WIG 20 from 1 January 2007 to 31 December 2012](http://inwestycje.pl/gielda/profil/).

The index WIG-Food currently consists of 26 companies, namely: Agroton Public Limited in Lugansk (AGT), Ambra SA Warsaw (AMB), Astarta Holding NV, based in Amsterdam (AST), Belvedere SA Beaune (BVD), Polish PKM Duda SA Warsaw (DUD), Elstar Oils SA in Elblag (ELS), Graal SA Wejherowo (GRL), Industrial Milk Company SA Kiev (IMC), Indykpol SA in Olsztyn (IND), Jutrzenka Holding SA in Opatówek (JTZ), Kernel Holding SA Luxembourg (KER), Kofola SA Warsaw (KFL), KSG Agro SA Luxembourg (KSG), Zakłady Tłuszczowe Kruszwica SA

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Kruszwica (NSS), Makarony Polskie SA in Rzeszów (MAK), Mispol SA in Suwałki (MIP), Milkiland in Kiev (ICL),

Confectionery Plant Mieszko SA Warsaw (MSO), Confectionery Plant Otmuchów SA in Otmuchów (OTM), PBS Finance SA Sanok (PBF), Pamapol SA in Rusiec (PMP), Enterprise of Industry and Food PEPEES SA Lomza (PPS), Seko SA in Chojnice (SEC), Tarczyński SA in Trzebnicy (TAR), Wilbo SA Władysławowo (WLB), Wawel SA Krakow (WWL).

Components of the WIG-Food with regard to business profiles, market value and percentage of the total portfolio is provided in Table 9.

Table 9. Components of the WIG-Food with regard to business profiles, market value and percentage of the total portfolio (as at 01/03/2014)

<table>
<thead>
<tr>
<th>No.</th>
<th>Instrument</th>
<th>Package</th>
<th>Package market value (PLN)</th>
<th>Portfolio share (%)</th>
<th>Stock turnover share and session PDA (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>KERNEL</td>
<td>49,072,000</td>
<td>2,021,766,400</td>
<td>36.215</td>
<td>1.64</td>
</tr>
<tr>
<td>2.</td>
<td>WAWEL</td>
<td>717</td>
<td>896,250,000</td>
<td>16.054</td>
<td>0.17</td>
</tr>
<tr>
<td>3.</td>
<td>ASTARTA</td>
<td>9,256,000</td>
<td>629,408,000</td>
<td>11.274</td>
<td>0.08</td>
</tr>
<tr>
<td>4.</td>
<td>KOFOLA</td>
<td>13,088,000</td>
<td>483,863,360</td>
<td>8.667</td>
<td>0.01</td>
</tr>
<tr>
<td>5.</td>
<td>COLIAN</td>
<td>48,853,000</td>
<td>182,710,220</td>
<td>3.273</td>
<td>0.06</td>
</tr>
<tr>
<td>6.</td>
<td>OVOSTAR</td>
<td>1,725,000</td>
<td>165,617,250</td>
<td>2.967</td>
<td>0.04</td>
</tr>
<tr>
<td>7.</td>
<td>DUDA</td>
<td>198,411,000</td>
<td>164,681,130</td>
<td>2.950</td>
<td>0.14</td>
</tr>
<tr>
<td>8.</td>
<td>KRUSZWICA</td>
<td>2,418,000</td>
<td>150,520,500</td>
<td>2.696</td>
<td>0.01</td>
</tr>
<tr>
<td>9.</td>
<td>IMCOMPANY</td>
<td>9,809,000</td>
<td>125,162,840</td>
<td>2.242</td>
<td>0.00</td>
</tr>
<tr>
<td>10.</td>
<td>AMBRA</td>
<td>9,800,000</td>
<td>102,998,000</td>
<td>1.845</td>
<td>0.02</td>
</tr>
<tr>
<td>11.</td>
<td>TARCZYŃSKI</td>
<td>7,000,000</td>
<td>102,410,000</td>
<td>1.834</td>
<td>0.00</td>
</tr>
<tr>
<td>12.</td>
<td>MILKILAND</td>
<td>8,276,000</td>
<td>97,656,800</td>
<td>1.749</td>
<td>0.00</td>
</tr>
<tr>
<td>13.</td>
<td>KANIA</td>
<td>18,504,000</td>
<td>72,165,600</td>
<td>1.293</td>
<td>0.01</td>
</tr>
<tr>
<td>14.</td>
<td>OTMUCHOW</td>
<td>6,256,000</td>
<td>60,683,200</td>
<td>1.087</td>
<td>0.01</td>
</tr>
<tr>
<td>15.</td>
<td>MIESZKO</td>
<td>13,935,000</td>
<td>57,690,900</td>
<td>1.033</td>
<td>0.00</td>
</tr>
<tr>
<td>16.</td>
<td>KSGAGRO</td>
<td>5,093,000</td>
<td>53,985,800</td>
<td>0.967</td>
<td>0.01</td>
</tr>
<tr>
<td>17.</td>
<td>GRAAL</td>
<td>3,611,000</td>
<td>51,817,850</td>
<td>0.928</td>
<td>0.01</td>
</tr>
<tr>
<td>18.</td>
<td>INDYKPOL</td>
<td>1,165,000</td>
<td>42,242,900</td>
<td>0.757</td>
<td>0.02</td>
</tr>
<tr>
<td>19.</td>
<td>PEPEES</td>
<td>60,343,000</td>
<td>31,981,790</td>
<td>0.573</td>
<td>0.00</td>
</tr>
<tr>
<td>20.</td>
<td>PAMAPOL</td>
<td>6,642,000</td>
<td>19,926,000</td>
<td>0.357</td>
<td>0.00</td>
</tr>
<tr>
<td>21.</td>
<td>MAKARONPL</td>
<td>4,712,000</td>
<td>18,753,760</td>
<td>0.336</td>
<td>0.01</td>
</tr>
<tr>
<td>22.</td>
<td>SEKO</td>
<td>2,500,000</td>
<td>18,000,000</td>
<td>0.322</td>
<td>0.00</td>
</tr>
<tr>
<td>23.</td>
<td>PBSFINANSE</td>
<td>37,362,000</td>
<td>13,450,320</td>
<td>0.241</td>
<td>0.00</td>
</tr>
<tr>
<td>24.</td>
<td>AGROTON</td>
<td>3,353,000</td>
<td>7,276,010</td>
<td>0.130</td>
<td>0.19</td>
</tr>
<tr>
<td>25.</td>
<td>SOBIESKI</td>
<td>171</td>
<td>6,532,200</td>
<td>0.117</td>
<td>0.01</td>
</tr>
<tr>
<td>26.</td>
<td>AGROWILL</td>
<td>5,347,000</td>
<td>5,079,650</td>
<td>0.091</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Enterprises of agri-food industry quickly got to know their export opportunities, still trying to win new trade allies, creating concepts of effective foreign investment and ownership, strengthening human capital. An analysis of the operation of food businesses in 2011, which were purposely selected companies belonging to the WIG-Food, enabled us to find factors of a macro-and microeconomic characteristic determining their proper functioning and accuracy of the strategies pursued in the area of knowledge management and implemented investment processes. The participation of these companies in the capital market, forces their activities in the field of transparency of decisions, which is visible in submitting periodic financial statements and the application of corporate governance principles. In addition, companies from the index WIG-Food, as companies listed on the stock market, are forced to conduct their business on the basis of the calculated and the adopted strategy. Analysis of economic and financial results revealed that the companies of agri-food industry build upon the Polish accession to the European Union in order to increase their competitiveness and recorded a spectacular growth in export activity\textsuperscript{151}.

Please also note that the Polish food industry still uses the structural funds of the European Union, and in 2007-2013, the entrepreneurs could apply for funds from the following Operational Programmes: 5 national Operational Programmes – Infrastructure and Environment, Innovative Economy, Human Capital Development, Polish Eastern Technical Assistance; 16 Regional Operational Programmes; Programmes of European Regional Cooperation. Moreover, entrepreneurs have benefited from tax exemptions CIT (rate 19%) and the availability of the specific conditions in terms of doing business in Special Economic Zones, i.e. in selected Polish regions where economic activity is carried out on special conditions. Exemption from income tax amounts in them 30-50% of the investment or the two-year cost of hiring employees – depending on which is higher. In the analysed period, it was also possible to use the exemptions from property tax.

\section*{2.3. Implementing elements of knowledge management in enterprises of the food industry – theory and practice}

Interest in knowledge management and diffusion of innovations as factors increase the competitiveness of enterprises of the food industry has increased at the time of the accession of our country to a group of Member States of the European Union. As a pilot study, an analysis of the functioning of the companies in the food sector of the Warsaw Stock Exchange, which

form the WIG-Food, was performed. Food firms are grouped on the basis of the sectoral criterion, and its composition consisted of 20 of the 21 companies in the sector\textsuperscript{152}, because in the index have not been listed shares of Grupa Zywiec SA of Zywiec. Although the food sector companies should not be too big in terms of its capitalization, its meaning is important for the exchange. Food sector is of great interest because of the large amplitude fluctuations in food prices on the world market, and the industry is attractive in terms of both investment and speculative. In the past five years interest in the stock market food companies has increased, as with the fall economic growth entrepreneurs showed investment activity in this sector\textsuperscript{153}. The performed studies attempted to define the role of human capital in companies. It was considered too high in 16 companies (representing 80\% of the total), for an average of 3 (15\%), in the case of 1 (5\%) for the poor. Respondents emphasized that human capital along with its components is a prerequisite for the proper management of the food company. This confirmed the thesis of A. Czyzewski, that: \textit{...at the microeconomic level there is decentralization of authority and responsibility in the pursuit of entrepreneurship, which takes the dimension of the increasingly operational, thereby increasing the importance of creation of intellectual capital, conditioning business innovation}\textsuperscript{154}. Quality of management used and computerized systems used to support sustainable development determine the success of the enterprise in the market. Typically, to achieve market success, the company implements modern systems for their needs at both the tactical and operational level through coordination and synchronization of actions to increase efficiency, reduce costs associated with improvement and harmonization of accounting services in their branches and plants\textsuperscript{155}.


Respondents also said that since the beginning of the transformation phase of the Polish economy’s food industry is still subjected to computerization and digitalization processes, which proves that the actual value of these businesses depends (just as is the case with companies from the IT sector) from workers knowledge, information contained in databases, intuition and ingenuity of the men, the quantity and quality of patents available for the company – rather than on the number of machines, equipment and other physical resources at their disposal. The study also asked about the assessment of the level of use of the intellectual capital of the company. Among the respondents, 9 respondents (45%) considered it high and good, and only 2 (10%) for the average. This means that on operational performance, the future and the market value of food industry companies affect strategic competence management. Respondents noted that it is equally important in establishing the market value of companies are the other elements of human capital, such as intellect, personal predispositions and its certification of persons performing management functions. In all food businesses one can find many elements of intellectual capital, whose characteristics and value are translated at the current quality of their functioning. Respondents were also asked about the use of overt and hidden knowledge. In the case of the first found that the most common use is widely known and understandable forms of media, such as documents, data, reports, develop graphical and schemes. In the case of tacit knowledge as the most important indicated individual skills, experience, creativity and conviction. In examining the use of knowledge in enterprises of the food industry, we also asked about the management methods and the use of its components in practice. It turned out that from the beginning of the economic transformation of knowledge management concept has gained many supporters among managers, and received the title of most popular management concept that allows for the creation, dissemination and use in the organization.

Referring to the theoretical form of knowledge management, an attempt to verify their usefulness in the practical activities of the surveyed enterprises has been made. All respondents reported that their company has a high interest in an effective human capital management, as well as both managers and business owners have a relatively significant interest in enlarging and renewal of intellectual capital. Among the respondents, there were many people highlighting the importance and use of quality tools and information management support. Among the respondents to the question whether the use of knowledge management as a tool for information management support organization – 16 (80%) answered in the affirmative, and 4 (20%) that the assistance is not necessary in their companies. Unfortunately, the results are not satisfactory, because

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the companies belonging to the WIG-Food index should generally use the assisted knowledge management in current operations. During direct interviews it was found that some of the companies show interest in the development of organizational culture, which would be heavily focused on the rational management of knowledge workers, they should be shared with others, and use it in the implementation of design and cognition. Among the respondents, there is also interest in implementing modern management systems, as well as techniques for measuring the effectiveness of the use of knowledge and so-called intellectual capital, such as: Balanced Scorecard\textsuperscript{157} or Skandia Navigator\textsuperscript{158}. Positive results should be considered on the information on the application by the company IT support of knowledge management, as 15 (75\%) of the surveyed companies fully employed, 4 (20\%) does not apply, and only one (5\%) believes that it is not used in the full sense of the word. It is significant that food businesses IT support of knowledge management is considered an important source of competitive advantage because respondents emphasized that it should translate into a significant increase in market position and strengthen the company’s market value. Some respondents showed great interest in the use of advisory services of professional firms providing such services and dealing with the practical implementation of management concepts in the knowledge of one system concept development and their use\textsuperscript{159}. These interests are comprehensively discussed in scientific studies, where

\textsuperscript{157} In the literature, the authors of the Balanced Scorecard for – BSC or balanced scorecard, taken by Robert Kaplan and David Norton, who stated that they are currently applied methods of measurement of entrepreneurial activity in the predominantly are outdated and need to be transformed taking into account current market needs. In parallel, the needs have been recognized by Sveiby, who developed the BSC monitor evaluative components of intellectual capital of the company. Robert Kaplan and David Norton joined them while developing the company’s strategy, also taking into account financial factors and placed the company’s development vision. His concept relied on four main factors: the client (customer perspective), organization (internal business perspective), innovation and learning and finance (financial perspective).

\textsuperscript{158} Navigator is a competitive tool to manage intellectual capital in relation to the monitor and the BSC. It was developed in Skandia AFS and its prototypes were Konrad report and balanced card results. It is more powerful compared to its predecessors, and its indicators (approx. 150) on the majority of intellectual capital are precisely defined to meet the needs of the enterprise. It determined mainly indicators from such areas as finance, customers, processes, employees, allow pave the way for the development of enterprise development based on detailed studies of intellectual capital to help identify strategic actions.

\textsuperscript{159} In the world and in Poland, there are many specialized companies implementing information technology to support knowledge management, based on a wealth of experience that have professional skills and needed data sets and information for investigation, analysis, and seminars and teach you how to efficiently and effectively use knowledge resources in enterprises. Examples include consulting firms such as PricewaterhouseCoopers, Arthur Andersen, Ernst & Young, as well as Capgemini Ernst & Young, KPMG, Deloitte & Touche, and Anderson Consulting (now Accenture).
many authors stress that consulting firms are spreading innovative and practical ways to solve problematic issues through the creation and implementation of modern methods and techniques in the management of them\textsuperscript{160}. Businesses in the surveyed companies most often chose and apply information technology, and the most frequently mentioned pointed out: internet, intranet, extranet, groupware systems and decision support systems. Also emphasized that there are in their high potentials development of computer aided information management, which was found in 16 companies (80%), and only in 4 (20%) were considered weak. As well you should also assess the willingness of destination for entrepreneurs per cent, the amount allocated for the development of IT support company management. In the case of 9 companies (45%) was determined this amount to 3%, 7 of them (35%) want to allocate 5%, 3 (15%) allocated 10%, and only one (5%) for this purpose will not allocate any measures. The obtained results indicate, unfortunately, to the detriment of the companies, because there is virtually no interest among entrepreneurs using this type of instruments\textsuperscript{161}. Results of studies conducted in 2011, helped to formulate some conclusions, which concerned the assessment of the situation in the use of knowledge, which, although it begins to condition the development of food industry companies are often not used in them in the planned area.

It should be emphasized that knowledge management is considered by respondents for stimulant operation of enterprises in a market economy, which strengthens their competitiveness and help in modernizing the management system. Studies conducted in the companies involved in the production and distribution of food products from the WIG-Food proved that:

- knowledge, information, and their quality and timeliness are reinforcing factors for business success, which is expressed in increasing its competitiveness and better market position,
- the use of information technology in the current functioning of the company helps in a structured way to use the competences and skills and develop their capital,
- the enterprise value highly, position the intellectual capital and corporate governance activities (as its properly designed and functioning system of corporate governance can ensure the targeted prospects for capital market development, which will result in the development of the whole economy\textsuperscript{162}),

\textsuperscript{160} M.J. Stankiewicz, \textit{Zarządzanie...}, p. 376.
\textsuperscript{161} K. Firlej, \textit{Zarządzanie wiedzą...}, \textit{op. cit.}, p. 121-133.
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- in building the competitiveness of companies need to be considered for the management of organizational culture and climate, and high social responsibility role of the organization\textsuperscript{163}.

2.4. Innovation of the food industry in Poland on the basis of previous studies

Conducted research was related to the manifestations of innovation, which were also used as instruments of competitiveness of the region of Malopolska. Based on the idea that in the last two decades, in which the transformation has taken place to transform Polish command economy to a market economy, a low level of innovation was noticeable, and it covered the whole country. Unfortunately, from a dozen or so years now, the immanence of the Polish economy proved to be decisive to maintain and increase its competitiveness, and in addition a small number of innovative projects undertaken affected largely different levels of economic development between regions in Poland. Empirical studies conducted in the Malopolska province, in both 2007 and 2010 years, examined microeconomic determinants of innovation. Level of organizational and technological innovation, governance, degree of knowledge of the vision of the development of enterprises in the food industry and the opportunities and the level of implementation of the strategy may affect their competitiveness and relevance to the region\textsuperscript{164}. Among other things, these reasons were examined micro-economic conditions, which were treated as determinants of innovation in the development of the competitiveness of the agri-food branch. The main goal of the implementation of this kind of research was to present the most significant factors identified by the manufacturers of those that determine the competitiveness of agri-food industry enterprises in the domestic and European market. Included are: the need for the introduction of modern management methods, opinion on the level and quality of existing factors of production and the need for their modernization, the current socio-demographic factors and the level of infrastructure development. Due to the specific areas to be examined, it would be an abuse of drawing conclusions based on our audit for all companies, but their goal was also a secondary appointment in brief stimulant activity of enterprises, which had at that time to face the often complex socio-economic problems. The study covered 29 companies located in the province of Malopolska, divided by selected

\textsuperscript{163} K. Firlej, Zarządzanie wiedzą..., op. cit., p. 121-133.

\textsuperscript{164} K. Firlej, Aspekty innowacyjności..., op. cit., p. 40-54.
industries and agri-food studies were considered a form of confrontation to research conducted in 2007 (when 289 companies were examined\textsuperscript{165}).

When determining the need for modern management methods of study business management strategy were conducted, the degree of knowledge of the company’s vision by management and employees, asked about emerging opportunities in the field of adaptation strategies to market conditions and the level of implementation, ways to achieve business success, the share of employees company in problem solving, ongoing work on the search for new solutions to organizational, technical and technological level and trends of employment in recent months, using the services of office work and subsidized employment, the quality of qualifications, method and effectiveness of recruiting employees\textsuperscript{166}.

The first criterion considered in the studies was the way of company management in the context of its innovativeness and the level of its competitiveness (tab. 10). Unfortunately, it was a subjective assessment of the management system by the management group, which could significantly distort the accuracy of the answers. As a very good influence of company management system on its competitiveness was evaluated by 42.36% of the respondents, which was a result of the 12.3% increase compared to 2007 (30.23%), and 38.39% rated it as a good (2007 year, 59%).

Table 10. Assessment of the management of the company by the management group in terms of its innovation and growth in the level of competitiveness

<table>
<thead>
<tr>
<th>Influence of company management system on its competitiveness</th>
<th>Cereal branch</th>
<th>Confectionery branch</th>
<th>Dairy branch</th>
<th>Fruit and vegetable branch</th>
<th>Meat branch</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answers %</td>
<td>Answers %</td>
<td>Answers %</td>
<td>Answers %</td>
<td>Answers %</td>
<td>Answers %</td>
<td>%</td>
</tr>
<tr>
<td>Very good</td>
<td>12 41.38</td>
<td>14 48.28</td>
<td>10 34.48</td>
<td>14 48.28</td>
<td>11 37.93</td>
<td>42.36</td>
</tr>
<tr>
<td>Good</td>
<td>11 37.93</td>
<td>12 41.37</td>
<td>9 31.04</td>
<td>11 37.93</td>
<td>14 48.28</td>
<td>38.39</td>
</tr>
<tr>
<td>Moderate</td>
<td>5 17.24</td>
<td>3 10.35</td>
<td>8 27.59</td>
<td>4 13.79</td>
<td>4 13.79</td>
<td>16.67</td>
</tr>
<tr>
<td>Weak</td>
<td>1 3.45</td>
<td>-</td>
<td>2 6.89</td>
<td>-</td>
<td>-</td>
<td>2.08</td>
</tr>
<tr>
<td>TOTAL</td>
<td>29 100</td>
<td>29 100</td>
<td>29 100</td>
<td>29 100</td>
<td>29 100</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: own elaboration based on questionnaire study, K. Firlej, \textit{Aspekty innowacyjności...}, \textit{op. cit.}, p. 40-54.


\textsuperscript{166} K. Firlej, \textit{Aspekty innowacyjności...}, \textit{op. cit.}, p. 40-54.
Average score was obtained for 16.67% of the companies, and weak in 2.08%. Comparing the results of sector impact the management of the company on its competitiveness, it should be noted that two of the best results at the same level received industries: confectionery and fruit and vegetables (48.28%), and in the case of companies rated as good best fared was meat industry (48, 28%). The weakest was the dairy industry (6.89%). Despite a clear differentiation in the perception of the management of the company, as well as the impact of innovation on competitiveness, the apparent upward trend was noted in terms of the need for the introduction of modern management methods and high interest of companies in emerging innovations in this area. Unfortunately, the respondents again badly evaluated their firms’ public relations.

The next question concerned the assessment of existing factors of production and the scope of modernization of the machinery park made in recent years. Respondents evaluated the plans of companies related to the modernization of the machinery park in strategic terms (Tab. 11). This time positively answered 56.55%, which is much better result than in 2007 (only 43.44%). A negative answer was obtained in 43.45% (2007: 56.66%), which continues to be translated to the high costs of carrying out this type of modernization in relation to the needs. Again, the most important needs in this area were identified by respondents in the purchase of modern machinery or a thorough modernization of the whole machine park, which is usually associated with incurring very high investment, which most of the surveyed companies could not afford. In most of the plants thorough modernization was carried out over the last two decades, which was associated with the transformation phase of the Polish economy and full membership in the European Union. We also asked whether the company plans to expand its business, with positive answers by only 17.25% of respondents (2007: 23.72%) and 82.75% that it did not plan this kind of action (2007: 76.28%).

167 Public relations is a management function, aiming to assess public attitudes towards the organization, reconciliation policies and activities of the organization with the public interest and to conduct activities aimed at gaining public understanding and acceptance. A. Mazurkiewicz, Współpraca służb public relations z mediami [in:] M. Adamowicz, Efektywność zarządzania marketingowego, Wydawnictwo SGGW, Warszawa 2005, p. 334-342
168 K. Firlej, Aspekty innowacyjności..., op. cit., p. 40-54.
169 Ibidem.
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Table 11. Does the modernization of machinery influenced and affected the construction of competitive advantage

<table>
<thead>
<tr>
<th>Modernization and the competitive advantage of the enterprise – impact</th>
<th>Cereal branch</th>
<th>Confectionery branch</th>
<th>Dairy branch</th>
<th>Fruit and vegetable branch</th>
<th>Meat branch</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>16</td>
<td>60.00</td>
<td>15</td>
<td>51.72</td>
<td>19</td>
<td>65.52</td>
</tr>
<tr>
<td>No</td>
<td>13</td>
<td>40.00</td>
<td>14</td>
<td>48.28</td>
<td>10</td>
<td>34.48</td>
</tr>
<tr>
<td>TOTAL</td>
<td>29</td>
<td>100</td>
<td>29</td>
<td>100</td>
<td>29</td>
<td>100</td>
</tr>
</tbody>
</table>


The next question concerned the concepts and plans of the companies, related to the introduction on the market during the next 12 months of new products or services. Managers of firms in most cases proved vivid interest in this kind of ideas.

The study clearly documented that the introduction of new products is seriously subject to the possessed funds. Respondents with a high firmness formulated their opinion on the coercive introduction of new products or services in a near future (preferably within the next 12 months). New products were intended to be introduced in 59.31% companies, which is the result of almost twice higher than in 2007 (in 2007 this objective was declared by 33.55% of respondents), and 27.59% did not plan activities in this area (in 2007 34.98%). Decreased was the number of companies to the level of 13.10% (2007: 31.52%), which did not yet decided to undertake such activities (Tab. 12)\(^\text{170}\).

Table 12. The intentions of the companies related to the introduction in the market in the next 12 months of new products or services

<table>
<thead>
<tr>
<th>Introduction of new products in the market</th>
<th>Cereal branch</th>
<th>Confectionery branch</th>
<th>Dairy branch</th>
<th>Fruit and vegetable branch</th>
<th>Meat branch</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>15</td>
<td>51.72</td>
<td>20</td>
<td>68.97</td>
<td>19</td>
<td>65.52</td>
</tr>
<tr>
<td>No</td>
<td>12</td>
<td>41.38</td>
<td>5</td>
<td>17.24</td>
<td>7</td>
<td>24.14</td>
</tr>
<tr>
<td>Undecided</td>
<td>2</td>
<td>6.90</td>
<td>4</td>
<td>13.79</td>
<td>3</td>
<td>10.34</td>
</tr>
<tr>
<td>TOTAL</td>
<td>29</td>
<td>100</td>
<td>29</td>
<td>100</td>
<td>29</td>
<td>100</td>
</tr>
</tbody>
</table>


\(^{170}\) Ibidem.
Presented results of studies that have been made in both 2007 and 2010, and conclusions established on the basis of them proved that the conditions of companies are as interesting as are microeconomic determinants of innovation in the development of the competitiveness of the agri-food enterprises in the Malopolska province. Level of organizational and technological enterprises, system, and method of their management, the degree of orientation in the vision of the company, as well as the ability to implement the calculated strategy can determine their positioning and role in the region. Declarations of respondents are optimistic about the level of knowledge possessed by them in terms of self-management, firm planning its successes, the active participation of employees in the search for and creation of new organizational, technical and technological areas.

This potential should be considered significant and predictive of hope to succeed in the future171.

Another study took place in 2010 and was the part of the extended research in companies operating in the Podkarpackie province, and activities were related and carried out in them concerning restructuring and modernization in the post-accession period. Group of surveyed enterprises was determined intentionally and deliberately for 3 large enterprises of meat industry, namely: Meat Plant Dobrowolscy limited liability company Górne Wadowice, Herman SA Meat Processing Plant in Hermanowa, Meat Processing Plant Taurus limited liability company Pilsen, and 6 medium-sized enterprises of the group: Meat Processing Plant Kabanos limited liability company in Przecław, Meat Plant Taste-Górno limited liability company in Górno, Butchers Radymno SJ in Radymno, Meat Processing Plant B. Jablonski s.j in Krosno, Plant Butchers Trio s.c. from Jaslo and Meat Plant Nowy Żmigród s.j. Nowy Żmigród. The aim of the intentionally prepared study was visualization of capabilities and implementation of innovative projects in selected companies. Critically evaluated were the dynamics and structure of the investment of large and medium-sized enterprises and their performance in the area of investment activity in the years 2007-2009. The evaluation performed, except using the method surveys and direct interviews, used also the statistical information material of financial statements and presentation of results of completed actions172.

In order to present the area of study, it should be emphasized that the Podkarpackie province is an agricultural-industrial region in which particularly significant role in the economic development plays an agri-food industry. Generally Podkarpackie region is classified on a Polish map

171 Ibidem.
of competitiveness as underdeveloped. In the province of Podkarpackie operate 144,263 businesses, both large and belong to the sector of small and medium-sized enterprises. The region has got significant production potential, and the structure is dominated by micro-enterprises employing up to 9 workers\textsuperscript{173}, has a 3.8% share in the GDP of the country and ranks as one of the last places in the share of GDP per capita (67.5%)\textsuperscript{174}. The share of industry in GDP of the region is 30% and 5% of the national employment and provides 3.4% of the total value of industrial output. In the Podkarpackie Province 58% of the national average of investments are made in individual regions (7883.1 million PLN, with the national average 13,578.7 million PLN\textsuperscript{175}). In terms of foreign investment Podkarpackie Province excels against Polish macro-region in Eastern Europe. The meat industry in the Podkarpackie region includes 208 processing plants (large – 3, medium – 12, small – 42, micro – 151)\textsuperscript{176}, which used one hundred percent pre-accession grants so that the meat industry is one of the few industries in the Podkarpackie, which has used such a high degree of EU funds\textsuperscript{177}.

Results of this study showed that the tested plants slowly implement not only product innovations but also process and organizational innovations. Among the most important activities in this area were: the purchase of modern production technologies, new production lines and upgrade existing ones, the introduction of modern management systems, the use of the Internet in business management, the introduction of modern quality management system and the integrated production management, accounting, sales, distribution and supplies\textsuperscript{178}. The investment activities of large firms in meat industry of Podkarpackie province in 2007-2009 proved to be a key element of the implemented quality management system, computerized production management system that is fully integrated with accounting, field sales, distribution and supply. The effect was to raise the level of production capacity and the development of the sales network. The initiators of changes taking place in enterprises were members of the board, managers, and owners, as a source of innovation process was the transfer of knowledge from the outside, most often manifesting itself in the purchase of new production

\textsuperscript{175} Rocznik statystyczny województwa podkarpackiego – 2007, 2008, 2009 r.
\textsuperscript{177} K. Firlej, A. Makarska, Priorytety..., op. cit., p. 32-40.
\textsuperscript{178} K. Firlej, A. Makarska, Działania..., op. cit., p. 37-46.
technologies. It is significant that the vast majority of stakeholders considered traditional recipes for the manufacture sufficient.\footnote{K. Firlej, A. Makarska, \textit{Priorytety...}, \textit{op. cit.}, p. 32-40.}

Table 13. Expenditures and the results of large investment activities of meat industry companies in Podkarpackie voivodship in the years 2007-2009 in thousand PLN

<table>
<thead>
<tr>
<th>Company name</th>
<th>Years</th>
<th>The value of fixed assets [th. PLN]</th>
<th>Equity [th. PLN]</th>
<th>Revenue [th. PLN]</th>
<th>Profit/loss [th. PLN]</th>
<th>Investments [th. PLN]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zaklady Mięsne Dobrowolscy spółka z o.o.</td>
<td>2007</td>
<td>68,837</td>
<td>52,615</td>
<td>141,411</td>
<td>3156</td>
<td>2973.7</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>77,362</td>
<td>53,575</td>
<td>198,508</td>
<td>1183</td>
<td>8766.5</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>71,522</td>
<td>57,682</td>
<td>211,766</td>
<td>5416</td>
<td>689.6</td>
</tr>
<tr>
<td></td>
<td>2009/07 [%]</td>
<td>104</td>
<td>110</td>
<td>150</td>
<td>172</td>
<td>23.0</td>
</tr>
<tr>
<td>Przedsiębiorstwo Przemysłu Mięsnego Taurus sp. z o.o.</td>
<td>2007</td>
<td>18,277</td>
<td>13,977</td>
<td>75,757</td>
<td>3302</td>
<td>2138.8</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>21,390</td>
<td>16,800</td>
<td>90,715</td>
<td>3676</td>
<td>3450.9</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>23,305</td>
<td>19,525</td>
<td>100,955</td>
<td>3544</td>
<td>2182.7</td>
</tr>
<tr>
<td></td>
<td>2009/07 [%]</td>
<td>128</td>
<td>140</td>
<td>133</td>
<td>107</td>
<td>102.0</td>
</tr>
<tr>
<td>Zaklady Mięsne Herman S.A.</td>
<td>2007</td>
<td>21,313</td>
<td>14,248</td>
<td>65,307</td>
<td>963</td>
<td>146.0</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>18,268</td>
<td>12,914</td>
<td>64,047</td>
<td>-2828</td>
<td>211.4</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>16,750</td>
<td>10,300</td>
<td>61,441</td>
<td>-2670</td>
<td>43.3</td>
</tr>
<tr>
<td></td>
<td>2009/07 [%]</td>
<td>79</td>
<td>72</td>
<td>94</td>
<td>-277</td>
<td>29.0</td>
</tr>
</tbody>
</table>


The analysed results showed that in the group of large enterprises the best results from operations reached Dobrowolscy Meat Company, as increased sales revenue by 50% in 2009 compared to 2007, and a 72% gain in the same period (Tab. 13). Positive results were the result of an increase of 4% of the value of fixed assets, primarily investment amounting to 12,428 thousand PLN. In the period under consideration, Taurus Meat Industry Company acquired a 33% increase in sales revenue and a 7% increase in profit, and worked out the results of the company were due to the increase in value of fixed assets by 28% in 2009 compared to 2007, and capital expenditures during the period amounting to 7770 thousand PLN. The weakest performer was Meat Plant Herman S.A., because their assets have decreased by 21%, sales by 6%, and the company suffered losses amounting to 5498 thousand PLN. It is worth emphasizing that the company assets are financed with equity: the Meat Plant Herman S.A. in 66%, in the Enterprise Meat Industry Taurus LLC in 79.6% and in the Meat Plant Dobrowolscy LLC in 75%.\footnote{K. Firlej, A. Makarska, \textit{Priorytety...}, \textit{op. cit.}, p. 32-40.} Tables 14 and 15 show the structure and dynamics of expenditures on inno-
vation activities in the period, as well as set their structure. In the structure of investments process innovations were predominant (about 70% of total investment expenditures). The source of their financing was a significant part of own funds and external funds – loans and leases.

Table 14. Expenditures and results of operations of the investment in medium meat industry companies Podkarpackie voivodship in the years 2007-2009 (in ths. PLN)

<table>
<thead>
<tr>
<th>Company name</th>
<th>Years</th>
<th>The value of fixed assets [th. PLN]</th>
<th>Equity [th. PLN]</th>
<th>Revenue [th. PLN]</th>
<th>Profit/loss [th. PLN]</th>
<th>Investments [th. PLN]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zakład Przetwórstwa Mięsnego Kabanos spółka z o.o.</td>
<td>2007</td>
<td>1625</td>
<td>260</td>
<td>9716</td>
<td>6</td>
<td>6432.2</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>3175</td>
<td>1011</td>
<td>13,591</td>
<td>829</td>
<td>1550.4</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>5009</td>
<td>1094</td>
<td>18,768</td>
<td>183</td>
<td>1834.5</td>
</tr>
<tr>
<td></td>
<td>2009/07[%]</td>
<td>308</td>
<td>421</td>
<td>193</td>
<td>3050</td>
<td>29.0</td>
</tr>
<tr>
<td>Zakład Mięsny Smak-Górno spółka z o.o.</td>
<td>2007</td>
<td>14,044</td>
<td>9854</td>
<td>27,086</td>
<td>1960</td>
<td>581.6</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>14,601</td>
<td>10,118</td>
<td>30,439</td>
<td>1528</td>
<td>679.4</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>13,663</td>
<td>11,722</td>
<td>31,785</td>
<td>2145</td>
<td>51.3</td>
</tr>
<tr>
<td></td>
<td>2009/07[%]</td>
<td>97</td>
<td>119</td>
<td>117</td>
<td>109</td>
<td>9.0</td>
</tr>
<tr>
<td>Masarnia Radymno spółka jawna</td>
<td>2007</td>
<td>847</td>
<td>256</td>
<td>16,751</td>
<td>213</td>
<td>132.4</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>2116</td>
<td>1490</td>
<td>14,259</td>
<td>11</td>
<td>1379.6</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>2002</td>
<td>1487</td>
<td>15,184</td>
<td>50</td>
<td>110.2</td>
</tr>
<tr>
<td></td>
<td>2009/07[%]</td>
<td>236</td>
<td>579</td>
<td>91</td>
<td>23</td>
<td>83.0</td>
</tr>
<tr>
<td>Zakład Przetwórstwa Mięsnego B. Jabłoński spółka jawna</td>
<td>2007</td>
<td>1921</td>
<td>1441</td>
<td>17,895</td>
<td>205</td>
<td>15.4</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>1707</td>
<td>1361</td>
<td>20,867</td>
<td>125</td>
<td>46.3</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>1465</td>
<td>1514</td>
<td>23,867</td>
<td>278</td>
<td>46.2</td>
</tr>
<tr>
<td></td>
<td>2009/07[%]</td>
<td>76</td>
<td>105</td>
<td>133</td>
<td>136</td>
<td>300.0</td>
</tr>
<tr>
<td>Zakład Masarski s.c. Trio w Jaśle</td>
<td>2007</td>
<td>3247</td>
<td>714</td>
<td>25,530</td>
<td>766</td>
<td>82.3</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>2939</td>
<td>521</td>
<td>25,180</td>
<td>40</td>
<td>68.2</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>3057</td>
<td>525</td>
<td>25,704</td>
<td>48</td>
<td>118.1</td>
</tr>
<tr>
<td></td>
<td>2009/07[%]</td>
<td>94</td>
<td>74</td>
<td>101</td>
<td>6</td>
<td>143.0</td>
</tr>
<tr>
<td>Zakłady Mięsne Nowy Żmigród spółka jawna</td>
<td>2007</td>
<td>2748</td>
<td>3840</td>
<td>15,352</td>
<td>-176</td>
<td>267.4</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>2658</td>
<td>2988</td>
<td>7164</td>
<td>8</td>
<td>150.9</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>2594</td>
<td>3746</td>
<td>8274</td>
<td>14</td>
<td>168.5</td>
</tr>
<tr>
<td></td>
<td>2008/07[%]</td>
<td>94</td>
<td>98</td>
<td>54</td>
<td>233</td>
<td>63.0</td>
</tr>
</tbody>
</table>


As a measure of the efficiency of capital expenditure was the value of sales of innovative products in absolute terms. The Meat Plant Dobrowolscy LLC reached a size of more than 70 million PLN, while the Enterprise Meat Industry Taurus LLC – More than 25 million PLN, and the Meat Plant Herman S.A. decreased sales by 6%.
Table 15. Structure and dynamics of investment in years 2007-2009 in medium-sized enterprises

<table>
<thead>
<tr>
<th>Specification</th>
<th>Structure and dynamics of investments in the years 2007-2009 [in th. PLN]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007</td>
</tr>
<tr>
<td><strong>Investments in total (including):</strong></td>
<td></td>
</tr>
<tr>
<td>“Kabanos”</td>
<td>6432.2</td>
</tr>
<tr>
<td>– expenditures on product innovations</td>
<td>771.8</td>
</tr>
<tr>
<td>– expenditures on process innovations</td>
<td>4566.8</td>
</tr>
<tr>
<td>– expenditures on organizational innovations</td>
<td>1093.6</td>
</tr>
<tr>
<td>“Smak”</td>
<td>581.6</td>
</tr>
<tr>
<td>– expenditures on product innovations</td>
<td>127.9</td>
</tr>
<tr>
<td>– expenditures on process innovations</td>
<td>378.0</td>
</tr>
<tr>
<td>– expenditures on organizational innovations</td>
<td>75.7</td>
</tr>
<tr>
<td>“Radymno”</td>
<td>132.4</td>
</tr>
<tr>
<td>– expenditures on product innovations</td>
<td>33.1</td>
</tr>
<tr>
<td>– expenditures on process innovations</td>
<td>76.7</td>
</tr>
<tr>
<td>– expenditures on organizational innovations</td>
<td>22.6</td>
</tr>
<tr>
<td>“Jabłoński”</td>
<td>15.4</td>
</tr>
<tr>
<td>– expenditures on product innovations</td>
<td>0.6</td>
</tr>
<tr>
<td>– expenditures on process innovations</td>
<td>12.4</td>
</tr>
<tr>
<td>– expenditures on organizational innovations</td>
<td>2.4</td>
</tr>
<tr>
<td>“Trio”</td>
<td>82.3</td>
</tr>
<tr>
<td>– expenditures on product innovations</td>
<td>11.5</td>
</tr>
<tr>
<td>– expenditures on process innovations</td>
<td>53.4</td>
</tr>
<tr>
<td>– expenditures on organizational innovations</td>
<td>17.4</td>
</tr>
<tr>
<td>“Nowy Żmigród”</td>
<td>267.4</td>
</tr>
<tr>
<td>– expenditures on product innovations</td>
<td>48.1</td>
</tr>
<tr>
<td>– expenditures on process innovations</td>
<td>181.8</td>
</tr>
<tr>
<td>– expenditures on organizational innovations</td>
<td>37.5</td>
</tr>
</tbody>
</table>


Among surveyed medium-sized companies greatest potential was identified at the Zakład Mięsny Smak-Górno limited liability company, which in this period spent on innovation activities with equity on average more than 14 million PLN, and was financing the investment at 75%. Equity of the plant and revenues in this period gradually increased (19% and 17%), and profit by 9%. In second place in terms of the size of the innovation potential was Meat Processing Kabanos limited liability company, which, in this period, a 3-fold increased value of assets and reached their average
value at 3.2 million PLN. Increased were also: equity (4-fold increase), income from sales (2-fold growth) and profit (30-fold increase)\textsuperscript{181}.

Polish literature contains many studies in the field of competitiveness and innovation in the food industry in Poland. Interesting research was conducted B. Grzybowska, who examined the innovation of the food industry in Poland by region, where the main aim of the study was to diagnose and assess the level of innovation of the food industry in particular provinces in the country. Implementation of the cognitive aspect of the study was to determine the regional diversity of this phenomenon and to identify the factors that implied that diversity. The author focused on the study of the active cooperation of enterprises with the environment, analysis of export activities and information in the population as a leading polarization and subsequent implementation of innovations\textsuperscript{182}. In other studies performed with M. Juchniewicz authors admit that the financing of innovation activities in enterprises of the food industry took place in most cases from their own funds, which are supplemented by loans and bank loans. Often they are supported with financial instruments, contributing to the implementation of the innovation policy of the state. These were financial aid from the national budget provided in the form of interest rate subsidies and guarantees and sureties. Support from the European Union was to implement a number of programs, including the Rural Development Programme, OP Innovative Economy and the Polish companies are often supported by the European Union rather than use the national aid\textsuperscript{183}. M. Juchniewicz has also done research on the level of organizational and marketing innovations of food industry companies, in which have been identified different types of non-technological innovation. Their results confirmed that food manufacturers more often introduced marketing innovations than organizational ones, and the dominant type of marketing innovation in the food industry have been significant changes in the project, design or packaging of the product. The most common organizational change was the use of new methods and principles of operation\textsuperscript{184}. Studies of B. Grzybowska and A. Rutkowska-Ziarko, concerning export diagnosis activity and the sale of product innovation enterprises of the food

\textsuperscript{181} Ibidem.


industry in particular provinces in Poland, showed that food manufacturers recognize the importance of innovation as one of the most important tools to compete and gain competitive advantage. Typically, they construct its product range, adapting it to meet the expectations of consumers, but in most cases they are not innovative proposals.

An attempt to quantify the innovative activity has been taken by M. Nieć, who in the study measures innovation of food businesses using the method of determining the Szalkiewicz and Skonieczka dynamic innovation index. Of the 288 units pre-qualified for a research sample of PKD 2007, unfortunately, only 8 were selected whose application forms met the requirements of the formal and substantive when applying for funding from the project and measure 4.4 “Investments with a high innovative potential” in the framework of the Operational Programme Innovative Economy. The innovation of enterprises was determined by dynamic innovation index, calculated by comparing the change in the productivity of factors of production (dP) to change the size of intellectual capital (dIC) in the period considered, namely:

\[
dynamic\ innovation\ index\ (i) = \frac{\text{change in productivity factor}}{\text{change in intellectual capital} \ dIC}
\]

where:

\[
Productivity\ (P) = \frac{Sales\ revenue\ (S)}{sales\ cost\ (C)}
\]

Intellectual Capital (IC) has been calculated as the sum of physical capital efficiency (CEE), human capital efficiency (HCE) and structural capital efficiency (SCE):

\[
IC = VAIC = CEE + HCE + SCE
\]

---


188 Ibidem.
And added value of the company as:

\[ VA = OP + HC + A \]

where:
- \( OP \) – operational profit,
- \( HC \) – employment cost (salaries, employee benefits),
- \( A \) – depreciation,
- \( CE \) – physical capital of the company,
- \( CEE \) – physical capital efficiency index \((CEE = VA/CE)\),
- \( HCE \) – human capital efficiency index \((HCE = VA/HC)\),
- \( SCE \) – structural capital efficiency index \((SCE = SC/VA)\),
- \( SC = [VA - HC]/VA \).

Results of this study indicated that the sample rate demonstrated its utility, and its design should be assessed as suitable for the evaluation of enterprise innovation industry. Generally, the group of companies surveyed was defined as an active innovation in the period, and the two companies were included into the group of innovative companies. Unfortunately, the sample size did not allow unambiguously determine whether business innovation affects its size or legal form.

Interesting look at the utilization of the factors of innovation in small and medium-sized enterprises on the example of agri-food sector has presented in her dissertation A. Zych\(^{189}\). The study focused on a group of small and medium-sized enterprises agri-food sector in the Podkarpackie region and can provide a starting point for broader observations, e.g. in the whole country and search for other variables that have an impact on innovation activities. A broad range of research authorized the author to derive some interesting theses, among which can be highlighted the one saying that …although the range of possible effects on innovation activities varies depending on the external conditions, however, activity in this respect is to a large extent determined by factors dependent on the companies that create and shape the immediate innovators’ environment, facilitating and stimulating its attitude to the introduction of innovative solutions.

S. Dzikowski, writing about the innovative activities of enterprises of the food industry in western Poland in 2009-2012, states that the most common effects of innovation in these enterprises are increasing the product range

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and quality improvement. Innovative effects are usually achieved through the implementation of modern technological processes and investment in new fixed assets, of which the most important are machinery and equipment. As important sets of expenditure on R & D, which occurred for effects such as improved quality, increased production flexibility and production capacity, reduced unit labour costs and reduced the unit material and/or energy intensity of production. Working with suppliers support effects such as: increased range, enter new markets, improve quality and increase production flexibility. Cooperation with customers support while effects such as entering new markets, increasing production flexibility, increase production capacity, reduce unit material and/or energy intensity of production. Unfortunately, the surveyed companies did not conduct any cooperation with units of sciences, and foreign universities or research and development units190.

Interesting research on technological innovation in the Polish poultry industry were conducted by M. Kosicka-Gębska, A. Tul-Krzyszczuk and J. Gębski, dealing with the opinions of consumers with respect to their acceptance and respect to the proposed changes, associated with increasing innovativeness of the product. The study determined the level of acceptance of innovative activities on poultry meat and involving the addition or reduction of the content of selected substances in meat, e.g.: vitamins, minerals, salt, fat, fibre, water, sugar. The test results indicated that most consumers would accept action by the addition of minerals and vitamins and the lowering of the fat content191.

Research on innovation of enterprises of the food industry on the example of selected Polish eastern provinces conducted A. Zakrzewska, which resulted in the thesis that there is considerable variation in innovation activity of enterprises of the food industry in particular provinces. The most innovative turned out Podlaskie, which is dominated by the food industry or, as the highest efficiency of expenditures on innovation activities of enterprises was recorded from the provinces of Warmia and Mazury and Lublin. The worst on the background of the analysed regions was Podkarpackie Province192.

A. Wasilewska, examining the product and process innovations in the food industry enterprises, notes that most often they introduce changes in the products. Activities in this field were conducted primarily by companies involved in meat processing and the manufacture of dairy products. While process innovations related to new methods for the production of products, and the most common were introduced in enterprises engaged in the processing of fruits and vegetables. The grain processing enterprises equally focused on change of new products and changes in systems supporting manufacturing processes\(^\text{193}\).

Research conducted by M. Chadrzyński on the economic aspects of the innovative activity of enterprises of the food industry have shown that: in terms of the art food processing industry is among those with a low level, in enterprises downward trend was observed concerning expenditures on innovative activities in the years 2004-2011, the structure of which may indicate imitative innovation occurred, variations of innovating firms in the analysed period also were observed, as well as the degree of renewal in the period showed a decreasing trend (a decrease of more than 50%), which may indicate that declared innovative activity of entrepreneurs is not reflected in the economic results\(^\text{194}\).


3. Empirical verification of knowledge transfer and innovation implementation in the Polish food industry enterprises

3.1. The range and methodology of study

Determination of the extent to which knowledge management and diffusion of innovations affect raising the competitiveness of enterprises of the food industry in Poland is a difficult task due to the limited amount of available material on this source. Answers to the questions posed in the work thus obtained were largely carried out in the course of the survey, which allowed the collection of detailed information on the topics studied. In the course of studies it was attempted to determine:

- processes taking place in the economy and business proximal environment affecting test subjects, the most important challenges facing them and their sources of competitive advantage,
- sources of information used by the company and its relevance,
- activities that support the acquisition and transfer of knowledge pursued by the surveyed companies,
- systems and tools for storing information and internal communication,
- activities undertaken in connection with the management knowledge and financial resources spent on this purpose,
- types of innovations implemented and expenses spent on this purpose,
- research and development projects and expenses spent on this purpose,
- institutions and entities cooperating with enterprises of the food industry,
- institutions and entities cooperating with enterprises of the food industry,
- the effects of the implementation of the innovation, in particular in relation to the profit and goodwill.

A survey based on a representative sample can produce many data showing the economic state and economic processes. Theoretical basis of the method used in this study have been widely described in the literature\(^{195}\). The basic requirement of the sample is its representativeness, which

consists of describing the structure of the population with established accuracy. The representativeness of the sample is significantly affected by two factors: the method for sample selection and its abundance. The criterion that the conclusions formulated based on the research can be generalized to the entire population is required the random nature of the sample, which is retained when the criterion of selection of units is independent of the variables tested and the individual distributions are identical and identical to the density distribution for the entire population. In view of the above considerations, in practice, to ensure total randomness of the selected sample is an extremely difficult task.

As already mentioned, the study was based on questionnaire studies, which are a way of collecting primary data, as a result of the collection of pre-prepared answers to questions posed to selected individuals. The basic problem of research using a questionnaire is to achieve compliance of test speech with respondents’ views and evaluations. Hence, structure of the questionnaire used is extremely important in the survey, the form of questions, as well as their sequence.

When designing the questionnaire we sought to obtain detailed information on the topics of research. Questions included in the initial part of the questionnaire related to the characteristics of the company. These questions concern, inter alia, the period of operation of the company in the market, its size, area of operation, ownership structure, legal form and the industry in which it operates. Questions belonging to the so-called specifications of the respondent were of great importance for the analysis of entities covered by the survey. They allowed the classification of the respondent’s surveyed population according to established criteria. Other questions were related to the main objectives and the subject of research (factual questions). To achieve the objective of the research crucial questions were contained in Parts I to IV of the survey. The first point was to characterize the test environment of the company. In this section we attempted to determine the extent to which the processes occurring in the economy and closer business environment affect the investigated company, what challenges are facing the company and what are the most important sources of competitive advantage. In the second part of the questionnaire types of knowledge sources were examined, which are used in enterprises which activities to support the acquisition and transfer of knowledge were carried out by them in the last five years and what systems and tools have been used for this purpose. The subject of the next part of the survey was to manage knowledge.

Empirical verification of knowledge transfer... and therefore of processes that enable the creation, dissemination and use of knowledge to achieve organizational objectives. The questions in this part of the survey helped to determine whether the company has a development strategy, and if so, whether within it, there are issues related to knowledge management. In addition, it was examined whether in the last five years investments associated with the elements of the implementation of knowledge management were realized and the effects which brings the knowledge management in the enterprise. Determined what level of funding has been spent on this purpose in the past five years, and whether knowledge management contributed to the improvement of economic performance, growth of sales, revenue growth and increase markets range in surveyed companies. The fourth part of the questionnaire addressed innovation as a factor in the competitiveness of the enterprises of the food industry. This part of the survey included questions regarding, inter alia, the types of innovations that were implemented by the companies of the food industry and the effects that they have brought. Further questions concerned the company conducted research and development and whether the implemented innovations have helped to improve economic performance and growth of the company. Such verification and evaluation of the surveyed enterprises is a task of daunting, it is not always conclusive. The use of financial analysis research that is carried out to assess the financial condition of the company, as well as for the evaluation of investment and financial decisions, not always result in the correct evaluation of it.

It should be emphasized that the questionnaire used all sorts of questions: closed and open and questions-scales. The closed questions were provided in advance of some answers that were designed so that respondents indeed hit the presented categories of expressions. Open questions left respondents entirely free to comment on the topic. Question-scales were used determine the intensity of attitudes, evaluations and views of the respondent.

The survey targeted at the food industry, with a considerable area of study, which is why we used different methods of contacting respondents. Where possible, we interviewed directly, questions were asked by interviewers on the basis of the questionnaire. This method, compared with other methods of contacting respondents, has got a number of advantages, which include: a greater chance to generate the respondent’s interest in survey, respondents were given more opportunities to clarify important questions, more accurate responses, a better understanding of the interviewer of the importance of answers given by the respondent, the higher efficiency in obtaining informa-

Empirical verification of knowledge transfer...

The respondents were contacted by telephone, through the Internet, using e-mail, and by sending out questionnaires at selected addresses.

In this study the general population was food industry in Poland. As random sampling, which is a complete list of the study population, we assumed the company is listed in the REGON register as at 30.10.2012, which according to the Polish Classification of Economic Activities (NACE 2007) have been included in Section C Manufacturing, Division 10 Manufacture of food products, Division 11 Manufacture of beverages and Division 12 Manufacture of tobacco products (Tab. 16).

Table 16. Number of companies registered in REGON, according to Polish Economic Classification, Section C, Division 10, 11, 12, as for 30.10.2012

<table>
<thead>
<tr>
<th>Section C Food industry</th>
<th>Number of companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Division 10 Food production</td>
<td>31,946</td>
</tr>
<tr>
<td>Division 11 Drinks production</td>
<td>1673</td>
</tr>
<tr>
<td>Division 12 Tobacco products production</td>
<td>43</td>
</tr>
<tr>
<td>Total</td>
<td>33,662</td>
</tr>
</tbody>
</table>

Source: own elaboration based on REGON registry.

In order to obtain a representative sample of population units we used a probabilistic (random) sample selection technique, and as a research tool survey questionnaires were used. In the context of random sampling techniques we performed simple individual dependent (non-refundable) random. Scheme random used and sufficiently large sample size was to ensure its representativeness. Therefore, the conclusions drawn on the basis thereof can be applied to the entire population.

The minimum sample size to draw conclusions was determined using the formula (1.1):

\[ n = \frac{z_{\alpha/2}^2 \cdot \hat{p} \cdot (1 - \hat{p}) \cdot N}{z_{\alpha/2}^2 \cdot \hat{p} \cdot (1 - \hat{p}) + (N - 1) \cdot d^2} \]  

(1.1)

where:

- \( z_{\alpha/2} \) – the value of the random variable \( Z \) with normal standarized distribution, for which \( P(|Z| \leq z_{\alpha/2}) = 1 - \alpha \),
- \( \hat{p} \) – fraction from the sample,
- \( p \) – unknown, estimated fraction in population,
- \( N \) – the size of the population concerned,
- \( d \) – statistical error.

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199 M. Szreder, Metody i techniki sondażowych badań opinii, PWE, Warszawa 2004, p. 120.
In determining the minimum sample size we resigned from the initial sampling and adopted for $\hat{p}$ such value, that is maximizing the formula: 
$$\hat{p} \cdot (1 - \hat{p}).$$
This move ensures that regardless of the actual value of the estimated fraction of the population, the calculated sample size $n$ will be sufficient in order to satisfy a condition that the assessment of $\hat{p}$ will not be different from $p$ by more than $\pm d$. In view of the fact that the maximum ratio in the interval $[0,1]$ is 0.5, the formula (1.1) will have the form:

$$n = \frac{0.25 \cdot z_{\alpha/2}^2 \cdot N}{0.25 \cdot z_{\alpha/2}^2 + (N - 1) \cdot d^2}$$

(1.2)

The study assumed that the maximum statistical error of results, which may amount to $\pm 5\%$ will be calculated at a confidence level of 0.9.

Applying the formula (1.2), therefore set the minimum size necessary sample (with a population of 33,662 operators) in the number of 267 companies. Based on the calculations made, examinations covered 330 enterprises of the food industry, which were selected using probability sampling techniques. In the course of studies we collected 267 correctly completed questionnaires, hence the findings are based on 267 forms.

### 3.2. Characteristics of the surveyed food companies

Surveys were conducted in the period from 1 November 2012 to 31 March 2013. Among the surveyed enterprises of the food industry most (30.7%) indicated that they are operating for at least 20 years or more, and the least of them pointed to the period of operation in the market for 5 years. 20.2% of respondents reported that the period of operation of their companies on the market is in the range of 11-15 years. The same indicated the interval 16-20 years. Slightly more than 16% of companies were operating in the market more than 6 years and less than 10 years (Fig. 9).
The study shows that for a little over 65% of enterprises place of business is the city, and for almost 35% of the village (Fig. 10). The majority of companies (40.1%) study population works in towns of less than 5 thousand inhabitants, while the smallest of the respondents (3.0%) – in towns with a population of over 50 thousand and less than 100 thousand population (Fig. 11).

A relatively large proportion of surveyed companies were operating in towns with a population ranging from 5,000 to 9,999 people (nearly 14%) and in towns with a population of at least 100 thousand population (nearly 24%).
Empirical verification of knowledge transfer...

Analyzing the response of companies about their area of operations (a market), which are presented in Fig. 12, it is clear that most of them indicated as a market area of the province (near 29%) or the area of the entire Poland (22.1%). The municipality and the poviat are market for more than 35% of the surveyed companies, and 13.9% of them indicated that sells its products on the international market.

Considering the ownership structure of the companies investigated (Fig. 13), it should be noted that most of the companies belong to the private sector, including domestic private sector – 87.6%, while the foreign private
sector – 7.5%. The smallest percentage were treasury companies (0.7%). Other forms of property is owned by the city or town or other.

![Fig. 13. Ownership structure in the surveyed companies](image)

Source: own study.

From the point of view of organizational-legal form (Fig. 14) the most numerous group of companies were registered as partnerships (22.5%) or a limited liability company (22.5%). The least popular form of organizational-legal is a limited partnership – in the form of works only 0.7% of the surveyed companies. 15% of companies indicated that their legal form of a public company, and 13.1% indicated a general partnership. Only 5.6% of respondents operate as a cooperative, and more than 20% in another form, which is not indicated.

![Fig. 14. Organizational-legal form of the company](image)

Source: own study.
Taking into account the size criterion of the company, 88% of companies surveyed were a medium-sized enterprises, i.e. those which employ on average fewer than 250 employees in FTE and an annual turnover not exceeding EUR 50 million or annual balance sheet total not exceeding 43 million EUR. Other companies indicated that they employ on average more than 250 employees in FTE and an annual turnover in excess of EUR 50 million or annual balance sheet total exceeding 43 million, which qualifies them as large enterprises (Fig. 15).

Fig. 15. The surveyed companies by size
Source: own study.

The study involved companies included in many sectors of the food industry (Fig. 16). Most of them come from the fruit and vegetable industry (nearly 24.0%), followed by confectionery (20.2%), meat (19.1%), dairy (9.7%), bakery (almost 6.0%) and bread (4.1%). Single respondents pointed to other industries, for example tobacco, fish, coffee and tea processing, spirit, the milling and feed industries. Nearly 14.0% of respondents did not report the industry in which the company operates, selecting the answer “other”.
All companies operate in an environment that to a greater or lesser extent affects their activities, including their effectiveness. Environment of the company can be divided into: further environment (macro-environment) and the closer environment (microenvironment). Macro-environment for enterprises is an important element that affects both the current business situation and the situation of the future. The company is not able to change the conditions of activity inherent in the macro-environment, and therefore must be able to anticipate and adapt to it and adjust strategy to it.

The study attempts to identify the processes taking place in the economy that affect food business (Fig. 17).

In the opinion of the surveyed companies, the process that was mentioned most often as influencing the activities of the company was the increasing competition in the market, which was indicated by 91.1% of respondents. Subsequently, the company indicated an emphasis on the implementation of the innovation (60.3%) and Polish membership in the European Union (55.1%). In contrast, most respondents indicated that globalization (36.3%) and the progressive development of IT technology (33.6%) did not interact or have had rather no impact on their business.

The study also determined that the processes occurring in areas close to the company interact with its activity (Fig. 18). Most respondents pointed to the rivalry between the companies (85.8%), the bargaining power of buyers (76.8%) and the bargaining power of suppliers (73.8%). Most respondents indicated, however, that the threat of substitutes (39%) and the threat of emergence of new producers (18.5%) does not affect or hardly affect their business.
Empirical verification of knowledge transfer...

Fig. 17. The degree of the impact of economic processes on the studied food companies

Source: own study.
Fig. 18. The degree of impact processes in the closer environment to the surveyed enterprises of the food industry

Source: own study.
The study identified the challenges facing enterprises of the food industry (Fig. 19). Defined as the degree of their validity, we were using the scale from 1 to 8, where 1 is the most important challenge, and 8 least important and challenging. Most of the surveyed companies indicated that the most important challenge for the company is entering a new market with its products. This was the opinion of 30.2% of respondents. Further positions were improved quality of products and services, recognized as the greatest challenge by 24.8% of respondents, and cost reduction, which is a major challenge for 16.1% of the respondents. In contrast, the least important challenge for the largest part of the respondents was the acquisition or collaboration with another company (33.2%), and reorganization of enterprises (25.1%). The weight of each factor was characterized on a scale from 1 to 8. Taking into account the average ratings of all respondents, the most important challenges it was entering the new market with its products (average score 3.4), and improving the quality of products and services (average rating 3.7). The least significant challenges identified were the reorganization of the company (mean score 5.5), and the acquisition or collaboration with another company (average rating 5.4).

The study also indicated superiority of food industry companies over the competition and the degree of their significance, using a rating scale from 1 to 8, with 1 being the most important advantage, and 8 the least important advantage. The results of the responses are presented in Figure 20.

Most of the surveyed companies indicated that their companies’ most important advantage over the competition is the product (37.1%) and brand (33%). In contrast to the least important sources of innovation advantages subjects passed (19.4%) and favourable relationships with suppliers (16.5%). With average ratings of all respondents indicate that the most important competitive advantages is the product of the surveyed companies (mean score 3.0) and brand (average score 3.2). The least important for building a competitive advantage are, however, the efficiency of internal processes and innovation (average score 5.1).
Fig. 19. The challenges facing the studied food industry enterprises

Source: own study.
Fig. 20. Sources of advantages of the surveyed enterprises of the food industry over the competition

Source: own study.
3.3. **Knowledge management and innovation introduction in food industry companies**

Knowledge is a critical resource used in the management of the company. Knowledge combined with the creativity, the innovation and skilful workers forming so-called innovative culture are important to the growth of innovative competitiveness of enterprises. The study identified the sources of knowledge used by the food business, and assesses their suitability on the basis of responses using the data source of knowledge. Adopted scale was from 0 to 3, where 0 – means disused source, 1 – source of little use, 2 – a useful source, 3 – very useful resource. Sources of information used by the surveyed enterprises of the food industry and the extent of their usefulness are presented in Figure 21.

Surveyed companies among answers given in the questionnaire on sources of knowledge most often indicated partnership with customers and suppliers, as well as external training. Least likely knowledge came from the acquired businesses and the cooperation with universities or research centres. According to the respondents, useful or very useful source of knowledge is to work with customers – so considers 95.9% of the respondents, and cooperation with suppliers – so thinks 94.4% of respondents. For 75.7% of respondents useful or very useful are the external trainings, and for 69.7% of such sources of knowledge is a market research. For the less useful sources of knowledge were considered cooperation with universities or research centres – such opinion have 65.2% of respondents, and cooperation with consulting companies that 56.6% of respondents considered a source of little use. The average ratings of the surveyed companies regarding the suitability of the different sources of knowledge are presented in Figure 22 (the higher the average the higher the usefulness of the source of knowledge).
Empirical verification of knowledge transfer...

Fig. 21. Sources of information used by the surveyed enterprises of the food industry

Source: own study.
On average, the best evaluated sources of knowledge, used by the surveyed enterprises of the food industry are: cooperation with customers and suppliers (average score 2.7), market research (mean score 2.1) and external training (average score 2.0). In contrast, the worst rated was collaboration with universities or research centres (average score 1.2), or with consulting companies (mean score 1.4), and the knowledge derived from acquired businesses (average rating 1.4).

The study also determined what actions support the acquisition and transfer of knowledge, which were carried out by the companies of the food industry in 2007-2011. The degree of usefulness of these measures for the purpose of acquisition and transfer of knowledge was also assessed. The results are presented in Figure 23.

Fig. 22. The rating the usefulness of sources of knowledge in the opinion of companies that have used them in 2007-2011
Source: own study.
Empirical verification of knowledge transfer...

Fig. 23. Measures to support the acquisition and transfer of knowledge realized by the surveyed enterprises of the food industry in 2007-2011

Source: own study.
Among the listed activities that support the acquisition and transfer of knowledge enterprises usually pursue activities related to internal training, supervision of experienced employees on career development junior staff (mentoring) and a system of rotation of employees in positions. The least frequent activities consisted of the issuance of a newspaper/newsletter and the creation of working groups of employees from different levels and departments. According to the respondents useful or very useful measure supporting the acquisition and transfer of knowledge are trainings – such answer was given by 85.8% of respondents using this source. Next place is taken care of experienced staff on career development of junior staff (mentoring), as assessed by 77.2% of respondents, and practices in different departments or branch offices (66.7% of respondents). Most respondents considered little useful the issuance of a newspaper/newsletter by the company (52.8% rating) and organizing the informal workers meetings (e.g. joint trips) – (42.7% rating). The average assessment of the usefulness of the indicated activities that support the acquisition and transfer of knowledge is presented in Figure 24.

![Diagram](image)

**Fig. 24. The assessment of activities that support the acquisition and transfer of knowledge in the opinion of enterprises implementing these activities in 2007-2011**

Source: own study.

On average, most respondents highly evaluated internal trainings for the acquisition and transfer of knowledge in the surveyed enterprises (mean
score 2.4) and the care of experienced staff on the development of lower-level employees career (average score 2.3). Considered to be the least useful was issuing newspapers/newsletters (average rating 1.4).

The surveyed companies used different types of systems and tools for storing information and internal communication (Fig. 25). Most businesses, as much as 91%, use the Internet and electronic mail (e-mail) – 82%. The next most commonly used systems are workflow system (47%) and data warehousing (23%). The least frequently used means of communication are Intranet (8%) and video conferencing (5%).

Fig. 25. The systems and tools used by the surveyed enterprises of the food industry

Source: own study.

Another part of the study concerned the knowledge management in the surveyed enterprises, which is defined as a collection of processes that enable the creation, dissemination and use of knowledge to achieve the objectives of the company. The activities carried out by enterprises of the food industry in 2007-2011 were associated with the elements of the implementation of knowledge management are presented in Figure 26.
In 2007-2011, about 36% of the enterprises of the food industry had not been fulfilling any of the listed in the survey activities related to the elements of the implementation of knowledge management. Of those companies that have implemented this type of projects, most (33.3%) indicated that they organized training on knowledge management, and 21.0% have joined knowledge management system to motivate employees. In addition, 19.9% of respondents said they used the counselling/consulting in the implementation of knowledge management, and 13.1% indicated that their company has established a unit or created a job for the person responsible for the management of knowledge.

The next stage of the research was to identify the level of innovation of enterprises. Implementation of innovation is an essential element that allows the company to adapt to the changing environment in which it operates. Innovation determines the pace and direction of development, plays a key role in launching new products and services that meet the needs, desires and requirements of the customers. With innovation is an increase in the efficiency of the company. For innovation recognizes the implementation of a new or significantly improved product (good or service) or process, a new marketing method or organizational business practice, workplace organization or external relations. The minimum requirement for an innovation is that the product, process, marketing method or organizational meth-
methods were new or significantly improved for the company. Innovations are, therefore, products, processes and methods that a company has developed as the first, and those that have been absorbed by other companies or entities\textsuperscript{200}. Given the nature of innovation activities, it is considered that they have an effect on the growth of competitiveness of the economy, including the food industry on a global, national and regional level\textsuperscript{201}.

In international studies of innovative enterprises the most widely used model is the one developed by the OECD and Eurostat (i.e. The Oslo Manual). This pattern is also used in Poland in studies of innovative activity of enterprises of the food industry. According to the innovation activities, it includes activities of a scientific, technical, organizational, financial and commercial area, aimed at introducing new or significantly improved products to the market, or the application of new or improved production processes, with the proviso that these products and processes are new, at least for companies that are incorporated. In this perspective, technological innovations are classified as product innovations and process innovations. In 2005, the Oslo Manual Guide also introduced the concept of the so-called “non-technological innovation”, including changes in the sphere of organization (organizational innovation) and marketing (marketing innovation)\textsuperscript{202}. Among the surveyed enterprises of the food industry for almost 70% believe that it is an innovative enterprise (Fig. 27).


Nearly 62% of respondents declared that in recent years has changed its machinery, but only about a third of them introduced to their businesses modern management systems or sophisticated systems of quality. Among the companies that have put in the studied years quality systems, as many as 80%, introduced a system of ISO 9001 and HACCP – 12%.

The study indicates that in the period 2007-2011, slightly more than 53% of the enterprises of the food industry employed workers who are engaged in R&D work, and nearly 23% had purchased a license. Almost 14% of companies said they received utility models and concluded a contract of know-how, and only slightly more than 12% of companies have patents. Selected characteristics related to R&D activities in the surveyed enterprises are presented in Figure 28.

In 2007-2011, the average number of employees dealing with the R&D in the enterprises, which declared that employ such workers, was 10.8 people, while in companies that declared a patent, they obtained an average of 39.5 per enterprise. Companies that declared obtain utility patents, gained their average of 6.1 per one company. In contrast, taking into account the company, which declared the purchase of licenses or agreements of know-how, it should be noted that per one company an average of 6.6 license agreements and 4.6 of know-how agreements.
Fig. 28. Selected characteristics of R&D activity in the surveyed enterprises of the food industry (average value for the companies that have declared such an activity)

Source: own study.

Table 17 presents the summary of the number of projects in the field of product innovation and the expenditure incurred on them by the surveyed enterprises of the food industry in the period 2006-2011. In the analysed period, a total of 247 completed projects related to the implementation of product innovations were conducted in 138 companies, i.e. in 51.7% of subjects. The vast majority of these concerned the innovations implemented at the company level – 137, i.e. 55.47% of the total projects. Second, the company implemented the project on innovation in local or regional scale (31, i.e. 12.55% of all projects). Among them, 26 projects were related to innovation in the country, and 11 – on an international scale. Only 6 projects were associated with innovation on a national and international level. In 36 cases, the scale range of product innovation was not specified.
Table 17. The number of product innovations and the expenses incurred on them by food companies in the years 2006-2011

<table>
<thead>
<tr>
<th>Implemented:</th>
<th>Implementation level:</th>
<th>companies</th>
<th>local/ regional</th>
<th>national</th>
<th>international</th>
<th>national and international</th>
<th>No data</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No.</td>
<td>value</td>
<td>No.</td>
<td>value</td>
<td>No.</td>
<td>value</td>
<td>No.</td>
</tr>
<tr>
<td>Purchase of land</td>
<td></td>
<td>9</td>
<td>1,467,500</td>
<td>2</td>
<td>100,000</td>
<td>1</td>
<td>800,000</td>
<td>16</td>
</tr>
<tr>
<td>Purchase of buildings</td>
<td></td>
<td>3</td>
<td>1,795,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Purchase of transport means</td>
<td></td>
<td>29</td>
<td>4,653,000</td>
<td>7</td>
<td>1,387,500</td>
<td>4</td>
<td>2,340,000</td>
<td>50</td>
</tr>
<tr>
<td>Purchase of machinery</td>
<td></td>
<td>44</td>
<td>26,992,000</td>
<td>5</td>
<td>941,700</td>
<td>4</td>
<td>520,000</td>
<td>73</td>
</tr>
<tr>
<td>Purchase of building, machinery and transport</td>
<td></td>
<td>1</td>
<td>100,000</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>100,000</td>
</tr>
<tr>
<td>Purchase of equipment</td>
<td></td>
<td>4</td>
<td>6,500,000</td>
<td>1</td>
<td>20,000</td>
<td></td>
<td>52,000</td>
<td>8</td>
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<tr>
<td>Purchase of license</td>
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<td>5</td>
<td>42,800</td>
<td></td>
<td></td>
<td></td>
<td>120,000</td>
<td>12</td>
</tr>
<tr>
<td>Building modernization</td>
<td></td>
<td>20</td>
<td>2,415,000</td>
<td>3</td>
<td>74,000</td>
<td></td>
<td>650,000</td>
<td>26</td>
</tr>
<tr>
<td>Machinery modernization</td>
<td></td>
<td>7</td>
<td>432,000</td>
<td></td>
<td></td>
<td>1</td>
<td>3,000,000</td>
<td>10</td>
</tr>
<tr>
<td>Construction of a building</td>
<td></td>
<td>3</td>
<td>15,930,000</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>12</td>
<td>348,500</td>
<td>4</td>
<td>136,000</td>
<td>5</td>
<td>4,350,000</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>137</td>
<td>60,675,800</td>
<td>31</td>
<td>2,293,700</td>
<td>11</td>
<td>7,610,000</td>
<td>36</td>
</tr>
</tbody>
</table>

Source: own study.
Expenditure on product innovations most often included the purchase of equipment (73 projects) and the purchase of transport equipment (50 projects). To a lesser extent, it encompassed modernization of buildings, land purchase and modernization of machines. In individual cases included the purchase of licenses, new equipment, the construction or purchase of a building or other activities. In 36 cases, scale range of product innovation was not specified.

Total spending on product innovations in the surveyed enterprises in the period 2006-2011 amounted to 109,637,000 PLN, which per company means expenditures in the amount of 794,471 PLN and 443,874 PLN per one project in the field of product innovation. Innovation at the firm level was allocated 60,675,800 PLN, for innovation in national and international scale, respectively 7,447,500 PLN and 7,610,000 PLN. For product innovation at national and international received a total of 3,520,000 PLN. Despite the relatively large number of projects relating to innovation at local or regional level, allocates only 2,293,700 PLN. From the point of view of most of the outlays earmarked funds for the purchase of equipment and construction of buildings – respectively 59,207,700 PLN and 16,130,000 PLN. Third, the companies they spent the money on the purchase of transport (9,030,500 PLN). Relatively large item of the purchase is the new equipment (6,572,000 PLN).

Another type of innovation is organizational innovation. Comparison of the number of projects in the field of organizational innovation and the expenditure incurred on them by the surveyed enterprises of the food industry in the years 2006-2011 are presented in Table 18.

In the analysed period, 65 companies of the food industry (24.3% of all surveyed companies) implemented the organizational innovation. 65 projects were implemented, aimed at the implementation of this type of innovation, with more than half of them concerned on the new developments at the company level. Less than 1/3 of the projects referred to the innovation of local or regional level, while 11 were national in scope. Not solution which would be a new organizational solution internationally was implemented. Frequently the company introduced new procedures for the operation and changing the way organizations work. Quite often were also introduced new methods of cooperation with customers or suppliers, or a new organization of work. In five cases the change was made to the payroll system. Overall organizational innovations was allocated 2,117,380 PLN. As per the company, this means expenditures in the amount of 32,575 PLN.
Table 18. Number of organizational innovations and expenses incurred on them by food companies in the years 2006-2011

<table>
<thead>
<tr>
<th>Implemented:</th>
<th>Implementation level:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>companies</td>
</tr>
<tr>
<td>New organizational structure</td>
<td>1</td>
</tr>
<tr>
<td>New cooperation methods with stakeholders</td>
<td>1</td>
</tr>
<tr>
<td>New procedures</td>
<td>6</td>
</tr>
<tr>
<td>New processes increasing creativeness</td>
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</tr>
<tr>
<td>New posts organization</td>
<td>5</td>
</tr>
<tr>
<td>Change in work organization</td>
<td>9</td>
</tr>
<tr>
<td>Change in wages system</td>
<td>4</td>
</tr>
<tr>
<td>Implementation and maintenance of analysis system</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
</tr>
</tbody>
</table>

Source: own study.
Most of the funds allocated to innovation on a national scale, in the further innovation of local or regional level, and the least on forming a new solution innovation at the firm level. From the above data one can conclude that with increasing range of organizational innovation, increase the expenditure incurred on them.

The third type of innovation is marketing innovation. Comparison of the number of projects in the field of innovation and marketing expenses incurred on them by the surveyed enterprises of the food industry in the years 2006-2011 are presented in Table 19. The research shows that marketing innovations were implemented by the 130 enterprises of the food industry (i.e. 48.7% of respondents). The total number of implementations of new marketing solutions in the surveyed companies was 134. Most companies implemented a marketing innovation in the local/regional market scale (44 projects) and at the level of their company (40 projects). Subsequently, it covered the domestic market (34 projects) and international market (7 projects). In 9 cases, the company did not reply to the scope of implementation. Total expenditures on marketing innovations in the surveyed enterprises in the period 2006-2011 amounted to 3,404,968 PLN, which per company means expenditures in the amount of 26,192 PLN and 25,410 PLN per one innovation in enterprise marketing. Innovation at the firm level was allocated 365,508 PLN, and at national and international level – only 13,000 PLN. Most funds have been allocated for marketing innovations across the country – 2,228,810 PLN, i.e. 65.46% of the total expenditure on this type of innovation. The average value of expenditures on marketing innovations implemented at the national level was the highest and amounted to an average of 65,553 PLN for one innovative solution. From the point of view of most types of outlays measures implemented within the framework of marketing innovations expended to change the appearance of the product – 1,728,000 PLN, i.e. 50.75% of all funds. For the new ways to promote company was spent 980,800 PLN, i.e. 28.80%, and for the new packaging 531,210 PLN, i.e. 15.60% of the funds. Much less money was spent on changes in the field of distribution and prices.
Table 19. Number of marketing innovations and expenses incurred on them in food companies in the years 2006-2011

<table>
<thead>
<tr>
<th>Implemented:</th>
<th>Implementation level:</th>
<th></th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>companies</td>
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<td></td>
<td>No.</td>
<td>value</td>
<td>No.</td>
<td>value</td>
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<td>value</td>
<td>No.</td>
</tr>
<tr>
<td>Change in the product design</td>
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<td>74,500</td>
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<td>253,500</td>
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<td>1,400,000</td>
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<td>Change in distribution</td>
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<td>Change in the price policy</td>
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<td>2558</td>
<td>5</td>
<td></td>
<td>4</td>
<td>12,000</td>
<td>1</td>
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<tr>
<td>Change in the price policy and distribution</td>
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<td>60,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New packages</td>
<td>13</td>
<td>149,250</td>
<td>13</td>
<td>250,950</td>
<td>11</td>
<td>114,310</td>
<td>4</td>
</tr>
<tr>
<td>New marketing method</td>
<td>1</td>
<td>2</td>
<td>5000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New promotion</td>
<td>11</td>
<td>60,000</td>
<td>15</td>
<td>194,300</td>
<td>12</td>
<td>696,500</td>
<td>2</td>
</tr>
<tr>
<td>No data</td>
<td>2</td>
<td>55,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>365,508</strong></td>
<td><strong>44</strong></td>
<td><strong>763,750</strong></td>
<td><strong>34</strong></td>
<td><strong>2,228,810</strong></td>
<td><strong>7</strong></td>
</tr>
</tbody>
</table>

Source: own study.
In the analyzed period in 76 enterprises of the food industry a total of 78 projects were realized in the innovation process (Tab. 20). The vast majority of these concerned the innovations implemented at the company level – 36 projects (i.e. 46.15%). Second, companies implement innovation at the local/regional level. Innovation on this scale were established in 13 companies, i.e. 16.67% of all companies that have implemented the innovation process. In 11 cases, implemented projects related to innovation in the country, and 2 – on an international scale. Only 3 of the projects were associated with innovation in national and international market. In 13 cases, the scale did not specified the innovation process. These solutions frequently included changes in the technology of production (30 projects), the purchase of equipment (10 projects) and changes in the software (9 projects). To a lesser extent, the scope of the changes concerned the technology services, purchases of computer equipment, new production processes and staff training.

Total expenditure on process innovations in the surveyed enterprises in the period 2006-2011 amounted to 6,862,300 PLN, which per company means expenditures in the amount of 90,293 PLN and 87,978 PLN per one project related to the implementation of process innovation. Innovation at the firm level allocated 2,708,800 PLN, on innovation at national and international – 2,900,000 PLN. Process innovation on a national scale was allocated a total of 680,000 PLN, and those of local/regional level – 270,000 PLN. From the point of view of most types of outlays earmarked funds to changes in production technology – 3,799,700 PLN (i.e. 55.37%), as well as to changes in the software and the purchase of equipment – respectively 1,245,000 PLN (i.e. 18.14 %) and 1,133,600 PLN (i.e. 15.52%). Further resources spent on process innovations, among other things were to change technology services, the introduction of new production processes and purchase of computer equipment.
Table 20. Number of process innovations and expenses incurred on them by food companies in the years 2006-2011

<table>
<thead>
<tr>
<th>Implemented:</th>
<th>No.</th>
<th>value</th>
<th>No.</th>
<th>value</th>
<th>No.</th>
<th>value</th>
<th>No.</th>
<th>value</th>
<th>No.</th>
<th>value</th>
<th>No.</th>
<th>value</th>
<th>No.</th>
<th>value</th>
<th>No.</th>
<th>value</th>
<th>No.</th>
<th>value</th>
<th>No.</th>
<th>value</th>
<th>No.</th>
<th>value</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production changes</td>
<td>13</td>
<td>1,361,700</td>
<td>4</td>
<td>150,000</td>
<td>3</td>
<td>260,000</td>
<td>1</td>
<td>10,000</td>
<td>2</td>
<td>1,900,000</td>
<td>7</td>
<td>118,000</td>
<td>30</td>
<td>3,799,700</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changes in services provision</td>
<td>2</td>
<td>4000</td>
<td>2</td>
<td>320,000</td>
<td>2</td>
<td>20,000</td>
<td>6</td>
<td>344,000</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changes in software</td>
<td>7</td>
<td>175,000</td>
<td>1</td>
<td>70,000</td>
<td>1</td>
<td>1,000,000</td>
<td>9</td>
<td>1,245,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchase of hardware</td>
<td>1</td>
<td>8000</td>
<td>1</td>
<td>10,000</td>
<td>1</td>
<td>10,000</td>
<td>2</td>
<td>18,000</td>
<td></td>
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<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Purchase of machinery</td>
<td>6</td>
<td>1,078,100</td>
<td>1</td>
<td></td>
<td>3</td>
<td>55,500</td>
<td>10</td>
<td>1,133,600</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New production process</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>100,000</td>
<td>5</td>
<td>100,000</td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Personnel trainings</td>
<td>1</td>
<td>10,000</td>
<td>1</td>
<td>2000</td>
<td>2</td>
<td>12,000</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>55,000</td>
<td>4</td>
<td>22,500</td>
<td>5</td>
<td>90,000</td>
<td>1</td>
<td>12</td>
<td>167,500</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No data</td>
<td>1</td>
<td>25,000</td>
<td>1</td>
<td>17,500</td>
<td>2</td>
<td>42,500</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>36</td>
<td>2,708,800</td>
<td>13</td>
<td>270,000</td>
<td>11</td>
<td>680,000</td>
<td>2</td>
<td>10,000</td>
<td>3</td>
<td>2,900,000</td>
<td>13</td>
<td>293,500</td>
<td>78</td>
<td>6,862,300</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: own study.
Analysing data on completed projects including all types of innovations implemented by the surveyed enterprises of the food industry in Poland in the years 2006-2011, it should be noted that the number of completed projects totalled 524 (Fig. 29).

Most completed projects were in the field of product innovation (247), followed by marketing (134), process (78) and organizational innovations (65). From the point of view of the number of companies, most of the surveyed companies implemented a product innovation, then marketing, process and organization. In total, the surveyed enterprises of the food industry have had financial expenditures on innovation activities in the amount of 122,021,648 PLN (Fig. 30).
Fig. 30. Expenditure on product innovations, organizational, marketing and processing by the surveyed enterprises of the food industry in 2006-2011
Source: own study.

Surveyed companies most expenditures allocated to product innovations – 109,637,000 PLN (i.e. 89.85% of the total), followed by process innovations – 6,862,300 PLN (i.e. 5.62% of the total), marketing – 3,404,968 PLN (i.e. 2.79% of the total), while the least for organizational innovations – 2,117,380.00 PLN (i.e. 1.74% of the total). Moreover, analysing the average expenditure on one project related to the implementation of the kind of innovation, it is clear that they were the highest for product innovation and amounted to 443,874 PLN (Fig. 31). In the case of process innovation mean value of one of the project was 87,978 PLN, and for organizational innovation and marketing inputs respectively 32,575 PLN and 25,410 PLN.
Among the surveyed enterprises of the food industry in the years 2006-2011 only slightly more than half (51.7%) implemented innovation. The remaining companies declared that they do not implement any innovation. The main reasons for this state of things give out different arguments (Fig. 32). Most companies that have not implemented during the period any innovation, explain this fact with too high costs associated with this type of project (47.3%) and lack of funds (37.2%). 27.1% of companies do not see the need to innovate due to market conditions, 24.8% of companies feared of too big economic risks associated with the introduction of innovative solutions, and 24.0% – did not see the need to implement innovations due to putting them in previous years. Relatively few companies have indicated that the causes of the lack of innovative activity was the lack of information on the implementation of innovative solutions (14.0%), lack of skilled workers (10.9%), the issue of regulations, standards and regulations (10.1%) or obsolete machinery (9.3%).
No need due to the implementation in the previous years
No need due to the market conditions
Too high economic risk of innovation implementation
Too high cost of innovation implementation
No financial resources
No qualified personnel
No information on innovations implementation
Obsolete machinery
Legal acts, norms, regulations

Fig. 32. The causes of the lack of innovations in food companies in the years 2006-2011

Source: own study.
The studies also determined the number of enterprises of the food industry, which in the years 2006-2011 pursue research and development (Tab. 21). From the information obtained it shows that only 17 companies (i.e. 6.4% of respondents) carry out this type of project. Projects were related primarily to employee training (4 projects), development methods and services (3 projects), changes in the methods of work (2 projects) or the use of TETRA PAK (2 projects). Research and development work was carried out at the same time mostly by company employees and external actors, less frequently by outside employees or external parties themselves.

Table 21. Research and development work carried out by the surveyed enterprises of the food industry in the years 2006-2011

<table>
<thead>
<tr>
<th>Project</th>
<th>No. of companies</th>
<th>No. of projects conducted by employees</th>
<th>external bodies</th>
<th>employees and external bodies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational Programme Human Capital</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Personnel trainings</td>
<td>4</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>The use of TETRA PAK system</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service methods</td>
<td>3</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>EDEN academy</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Change in work methods</td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Improved quality of storage of vegetables</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Internal cooperation</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>No data</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>In total</strong></td>
<td><strong>17</strong></td>
<td><strong>3</strong></td>
<td><strong>4</strong></td>
<td><strong>10</strong></td>
</tr>
</tbody>
</table>

Source: own study.
Table 22. The value of R&D projects and sources of financing in the surveyed enterprises of the food industry in the years 2006-2011

<table>
<thead>
<tr>
<th>Project</th>
<th>No. of companies conducting a project</th>
<th>Own resources</th>
<th>UE means</th>
<th>Own resources + UE</th>
<th>No data</th>
<th>Total value of projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational Programme Human Capital</td>
<td>2</td>
<td>25,000</td>
<td></td>
<td></td>
<td></td>
<td>25,000</td>
</tr>
<tr>
<td>Personnel trainings</td>
<td>4</td>
<td>50,000</td>
<td>10,000</td>
<td></td>
<td></td>
<td>60,000</td>
</tr>
<tr>
<td>The use of TETRA PAK system</td>
<td>2</td>
<td>14,000</td>
<td>151,200</td>
<td></td>
<td></td>
<td>165,200</td>
</tr>
<tr>
<td>Service methods</td>
<td>3</td>
<td>300,000</td>
<td></td>
<td></td>
<td></td>
<td>300,000</td>
</tr>
<tr>
<td>EDEN academy</td>
<td>1</td>
<td>300,000</td>
<td></td>
<td></td>
<td></td>
<td>300,000</td>
</tr>
<tr>
<td>Change in work methods</td>
<td>2</td>
<td>100,000</td>
<td>3,000,00</td>
<td></td>
<td></td>
<td>3,100,000</td>
</tr>
<tr>
<td>Improved quality of storage of vegetables</td>
<td>1</td>
<td>115,000</td>
<td></td>
<td></td>
<td></td>
<td>115,000</td>
</tr>
<tr>
<td>Internal cooperation</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>bd.</td>
</tr>
<tr>
<td>No data</td>
<td>1</td>
<td>6,503,000</td>
<td></td>
<td></td>
<td></td>
<td>6,503,000</td>
</tr>
<tr>
<td>In total</td>
<td>17</td>
<td>6,853,000</td>
<td>149,000</td>
<td>566,200</td>
<td>3,000,000</td>
<td>10,568,200</td>
</tr>
</tbody>
</table>

Source: own study.

Total expenditure on conducted research and development in the years 2006-2011 in the surveyed enterprises amounted to 10,568,200 PLN, so an average of 621,659 PLN per project (Tab. 22). Most companies have financed these activities from their own resources (64.85%). EU funds accounted for only 1.4% of all expenditures. In one case, sources of financing were not specified. Most of the funds allocated to the changes in the methods of work – 3,100,000 PLN, i.e. 29.33% of the total amount. Few resources were spent instead on projects financed from the Operational Programme Human Capital and staff training. In the case of one project is not given the project name.

In the course of the research it was also an attempt to determine with which institutions and actors enterprises of the food industry cooperated frequently in the period 2006-2011. The results are shown in Figure 33.
Fig. 33. The percentage of food industry companies cooperating with the authorities and third parties in the years 2006-2011

Source: own study.
From the responses indicated, the largest number of companies collaborated in recent years with labour offices (65.5%) and banks offering special credit lines (32.6%). Quite often companies cooperated well with training and counselling centres (30.7%), the Regional Development Agency (28.8%) and local government units (28.5%). Few companies cooperated with business incubators (15%), technology incubators (3.7%) or academic incubators (1.1%). Similarly, a small percentage of companies also worked with technology parks (9%), industrial parks (6%) and technology transfer centres (3%).
4. Assessment of the impact of knowledge management and innovative activities on the competitiveness increase in enterprises of the food industry

4.1. The impact of knowledge management on improving the competitiveness of the enterprises of the food industry

Research carried out on a representative group of food industry companies was to determine the impact of knowledge management on enhancing the competitiveness of the food industry enterprises. The study determined the level of financial resources to spend in 2007-2011 in enterprise of the food industry for knowledge management. An attempt to determine the impact of knowledge management to enhance the competitiveness of enterprises of the food industry was based on declarations of beneficiaries who pointed out how many percent as a result of actions taken in the field of knowledge management have changed in the following years: the profit of the company, the value of sales, turnover and the size of market for the company. Values reported as the average for all companies was calculated on the basis of the responses of companies that showed the impact of knowledge management on the tested features.

The number of companies implementing projects in the field of knowledge management in the years 2007-2011 and the value of the inputs are shown in Table 23.

Among the enterprises of the food industry, which spent money on knowledge management, most of them allocated for this purpose an amount in the range of 1 thousand PLN to 5 thousand PLN. Such companies represented in 2007 24.3% of all respondents, and in 2011 this percentage was as high as 31.1%. And the smallest group of companies surveyed allocated to the management of knowledge the amount that exceeded 50 thousand PLN, although the proportion of enterprises which incurred expenditures in this interval increased in the studied population from 0.7% in 2007 to 2.6% in 2011. Note also that in 2007-2011, the number of entities that declared transfer of funds for purposes related to the management of knowledge in a range up to 1 thousand PLN reduced, while the number of enterprises allocating for knowledge management amounts greater than 1 thousand PLN increased.
Table 23. Distribution of the level of funding for knowledge management among the surveyed enterprises of the food industry in the years 2007-2011

<table>
<thead>
<tr>
<th>Level of funding</th>
<th>No. of companies</th>
<th>% of surveyed companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>from to</td>
<td>2007 2008 2009 2010 2011</td>
<td>2007 2008 2009 2010 2011</td>
</tr>
<tr>
<td>0</td>
<td>131 125 108 100 94</td>
<td>49.1 46.8 40.4 37.5 35.2</td>
</tr>
<tr>
<td>0 500</td>
<td>5 5 5 4 4</td>
<td>1.9 1.9 1.9 1.5 1.5</td>
</tr>
<tr>
<td>500 1000</td>
<td>36 19 16 16 15</td>
<td>13.5 7.1 6.0 6.0 5.6</td>
</tr>
<tr>
<td>1000 5000</td>
<td>65 79 90 90 83</td>
<td>24.3 29.6 33.7 33.7 31.1</td>
</tr>
<tr>
<td>5000 10,000</td>
<td>16 18 18 29 40</td>
<td>6.0 6.7 6.7 10.9 15.0</td>
</tr>
<tr>
<td>10,000 20,000</td>
<td>7 8 9 13 10</td>
<td>2.6 3.0 3.4 4.9 3.7</td>
</tr>
<tr>
<td>20,000 50,000</td>
<td>5 10 17 12 14</td>
<td>1.9 3.7 6.4 4.5 5.2</td>
</tr>
<tr>
<td>50,000 and more</td>
<td>2 3 4 3 7</td>
<td>0.7 1.1 1.5 1.1 2.6</td>
</tr>
<tr>
<td>Total no. of respondents</td>
<td>267 267 267 267 267</td>
<td>100 100 100 100 100</td>
</tr>
</tbody>
</table>

Source: own study.

Analysing the average level of funding for knowledge management in 2007-2011 in companies that have allocated funds for this purpose (presented in Fig. 34), it should be noted that almost in the whole period considered the average annual expenditure for this purpose increased (beyond the year 2010). This may prove growing interest of the food industry in management activities to increase knowledge and awareness of management regarding the benefits it can bring. This phenomenon is also confirmed by the fact that in the subsequent years of the period less and less companies declared that they do not spend money on knowledge management. In 2007, these entities were 131 (49.1% of the surveyed companies), and in 2011 only 94, or 35.2% of the surveyed companies.

As it is clear from the data presented in Figure 35, among the companies surveyed in food industry, 64.4% declared that in 2007-2011 knowledge management contributed to improvement of their economic performance. As many as 63.3% of the companies indicated that these actions led to an increase in turnover. According to 59.2% of respondents, knowledge management in their company contributed to the increase in the value of sales of the company. Least of respondents agreed, however, that knowledge management has contributed to expanding markets for their companies (49.8%).
Assessment of the impact of knowledge management and innovative...

Fig. 34. The average level of funding for on knowledge management in enterprises of the food industry, which incurred expenses for this purpose in the years 2007-2011

Source: own study.

Fig. 35. Percentage of respondents declaring food industry companies increase the value or volume of selected characteristics of their operations due to financial funding for knowledge management

Source: own study.

Taking into account only companies which declared that knowledge management has boosted their profits, it should be noted that the percentage
of profit increase as a result of activities related to knowledge management raised in subsequent years. On average, the greatest increase in profits was recorded in the years 2010 and 2011, when it amounted to 9.2% and 10.4%. The increase in profits was accompanied by an increase in the sale of businesses as a result of knowledge management (Fig. 36-39). The increase in sales in the first year of the study period (2007) averaged for declaring enterprise 6.4%, followed by 7.0% (2008), 8.2% (2009), 8.7% (2010), and in 2011 10.3%. In the analysed period, through action relating to knowledge management, the increase in turnover and expanding sales markets followed steadily in subsequent years. In 2007, the average percentage of the increased turnover due to knowledge management amounted to 5.7%, and in 2011 to 9.4%. However, in case of market sales amounted to an average of 4.8% in 2007 and 8.9% in 2011.

![Graph showing the average increase in profits in companies declaring the impact of knowledge management at the level of the year](image_url)

Fig. 36. The average increase in profits in companies declaring the impact of knowledge management at the level of the year

Source: own study.
Assessment of the impact of knowledge management and innovative...

Fig. 37. The average increase in the value of sales in companies declaring the impact of knowledge management on the value in a given year
Source: own study.

Fig. 38. The average increase in the value of turnover in companies declaring the impact of knowledge management on their value in a given year
Source: own study.
Fig. 39. The mean increase in sales markets in enterprises declaring 
the impact of knowledge management on sales markets increase 
in a given year

Source: own study.

In order to determine whether there is a relationship between the amount 
of funds allocated to the management of knowledge and the percentage in-
crease in the value or volume of these features in the surveyed enterprises 
of the food industry, we calculated Spearman’s rank correlation coefficient. 
Therefore, the correlation between the sum of expenditures on knowledge 
management in 2007-2011 was counted and the average percentage increase 
in the size of these (features) as a result of knowledge management was cal-
culated for the years 2007-2011 based on the percentage growth of these fea-
tures declared by the surveyed enterprises of the food industry in the years 
of the analysed period.

Spearman’s rank correlation coefficient was determined using the fol-
lowing formula:203

$$r_s = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

where;
$di = xi - yi$ – difference of rank,
$xi, yi$ – ranks of features X and Y,
$n$ – sample elements number.

203 A. Zeliaś, B. Pawelek, S. Wanat, *Metody statystyczne. Zadania i sprawdziany*, PWE, 
Rank correlation coefficient \( r_s \) takes values from the interval \([-1, 1]\). The absolute value of \( r_s \) close to unity indicates a strong correlation between the studied features.

Table 24. The correlation between the total spending on knowledge management in 2007-2011 and the average increase in profit, the sales turnover of the company, and the average increase in the markets in percentage terms in 2007-2011 as a result of knowledge management in the surveyed enterprises of the food industry

<table>
<thead>
<tr>
<th>The correlation between the total spending on knowledge management and:</th>
<th>Rank correlation coefficient ( r_s )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in profit (average in the years 2007-2011)</td>
<td>0.1812*</td>
</tr>
<tr>
<td>Increase in sales value (average in the years 2007-2011)</td>
<td>0.3266*</td>
</tr>
<tr>
<td>Increase in turnover (average in the years 2007-2011)</td>
<td>0.2590*</td>
</tr>
<tr>
<td>Increase in sales markets (average in the years 2007-2011)</td>
<td>0.1238</td>
</tr>
</tbody>
</table>

* coefficient statistically significant at the level of \( \alpha = 0.05 \).
Source: own study.

The conducted calculations show that there is a statistically significant relationship between the sum of expenditures on knowledge management in 2007-2011 and the average income growth in percentage terms in 2007-2011 in the surveyed enterprises of the food industry as a result of activities related to knowledge management. The conducted calculations also show that there is a statistically significant relationship between the sum of expenditures on knowledge management in 2007-2011 and the average increase in the value of sales and the company’s turnover in 2007-2011. Calculations showed no statistically significant relationship between the sum of expenditures on knowledge management in the years 2007-2011 and the average percentage by which the markets of surveyed enterprises of the food industry widened (Tab. 24).

4.2. Innovation as a factor influencing the competitiveness of the food industry

Research carried out on a representative group of food industry companies were also directed to determine the impact of innovation on improving the competitiveness of enterprises of the food industry. The study attempted to determine what are the effects of the implementation of innovation in en-
terprises surveyed in sections of different types of innovation (product, organizational, marketing, process). It was also examined whether the implemented innovations have helped to improve profits and increase the value of the surveyed enterprises. Values reported as the average for all companies was calculated on the basis of the responses of companies that showed the impact of implemented innovations on the tested features.

Table 25 presents the responses concerning the effects of product innovations, organizational, marketing and process innovations that occurred in 2007-2011.

Table 25. Effects of innovation seen in 2007-2011 in the food industry enterprises

<table>
<thead>
<tr>
<th>Implementation effects</th>
<th>Percentage of answers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Cost reduction</td>
<td>8.2</td>
</tr>
<tr>
<td>Increase in innovativeness of products and services</td>
<td>9.5</td>
</tr>
<tr>
<td>Increase in products portfolio</td>
<td>9.1</td>
</tr>
<tr>
<td>New sales markets entry</td>
<td>9.9</td>
</tr>
<tr>
<td>Increase in efficiency</td>
<td>9.1</td>
</tr>
<tr>
<td>Increase in clients’ satisfaction</td>
<td>7.3</td>
</tr>
<tr>
<td>Human capital development</td>
<td>7.8</td>
</tr>
<tr>
<td>Internal processes rationalization</td>
<td>9.5</td>
</tr>
<tr>
<td>Faster adaptation to environmental changes</td>
<td>8.6</td>
</tr>
</tbody>
</table>

Source: own study.

In assessing the changes that occurred in the company as a result of the implementation of the innovation, respondents used a grading scale from 0 to 6, where 0 meant the answer “definitely not”, 1 – no, 2 – probably not, 3 – I have no opinion, 4 – rather yes, 5 – yes, 6 – definitely yes. From the answers received, the vast majority of companies that have implemented innovations note their positive effects. Taking into account the assessment of 4, 5 and 6, which are indications of a positive effect in relation to the implementation of innovations, it should be noted that most of the enterprises, as many as 70.3%, indicated that the most positive effect of the implementation of innovation in their company have: raising the level of customer satisfaction, then productivity growth (68.4%), increased range of products (59.9%), entry into new markets (57.8%) and an increase in the level of innovation of products and services (55%). Half of the respondents said that implemented innovations contributed to streamlined internal processes, and 49.8% indicated cost reduction. Least of respondents believed that innova-
Assessment of the impact of knowledge management and innovative...

ion has contributed to faster adaptation to changes in the business environment (37.5%) and the development of human capital (40.5%). A pooled analysis of response 0, 1 and 2 indicated that in the opinion of many respondents innovations did not affect the development of human capital (33.2%), cost reduction (32%) and the entry into new markets (31.1%).

The study also aimed to determine whether the innovations implemented by the food business have helped to improve their profits. Of all the surveyed companies more than half of them answered positively, stating, how much in so far as a result of these actions their profit changed in percent (Fig. 40).

![Graph showing the average increase in corporate profits of the food industry in 2007-2011 as a result of the implemented innovation](source: own study)

In the subsequent years of the analysed period, the average increase in profit a result of the innovations increased. During the whole period, the average increase of profits for all surveyed companies due to innovations implemented by the company showed a rising trend. In 2007 compared to the previous year the profits of the surveyed companies increased on average by 4.8%, and in 2011 already by 9.4% compared to the previous year. In the last years of the period, the companies declared the greatest increases in average profit.

Studies have also shown that the innovations implemented by the food business contributed to the growth of their values. As for the impact of innovation on profits of enterprises, of all companies surveyed, more than half answered to this question in the positive way, stating, how much in so
far as a result of these actions changed the value of their company in terms of percentage. From the answers we can see that introduced product innovations, organizational, marketing and process innovations contributed significantly to the increase in the value of the companies investigated (Fig. 41).

On the average, for all companies tested, the percentage of the increase in the value of the surveyed companies was increasingly higher in subsequent years of the analysed period (Fig. 41). On average, the largest percentage increase in value was recorded in 2009-2011.

![Fig. 41. The average increase in the value of the food industry enterprises in 2007-2011 as a result of the implemented innovation](image)

Source: own study.

To determine whether there is a relationship between the amount of funds allocated by the surveyed enterprises of the food industry for all types of innovative activities and the percent of increase in their income or the percentage in the increase in the value of the surveyed companies, a Spearman’s rank correlation coefficient was calculated.

Therefore the correlation between the total sum of expenditures on innovation in the period 2006-2011 and the average percentage increase in profits or value of companies as a result of the implementation of these innovations in 2007-2011 was counted (Tab. 26).
Table 26. The correlation between the total expenditure on innovation (product, organizational, marketing, process) in the period 2006-2011 and the average percentage increase in profits and the average percentage increase in goodwill as a result of their implementation in 2007-2011

<table>
<thead>
<tr>
<th>The correlation between the total spending on knowledge management and:</th>
<th>Rank correlation coefficient rs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in profit (average in the years 2007-2011)</td>
<td>0.1558</td>
</tr>
<tr>
<td>Increase in goodwill (average in the years 2007-2011)</td>
<td>0.2493*</td>
</tr>
</tbody>
</table>

* coefficient statistically significant at the level of α = 0.05.

Source: own study.

The conducted calculations show that the Spearman rank correlation coefficient is statistically significant, and therefore there is a statistically significant relationship between the sum of expenditures on innovation in the years 2006-2011 and the average rate of growth of the company. The surveyed enterprises calculations showed no statistically significant correlation between the total expenditure on innovation in the period 2006-2011 and the average percentage increase in profits of these companies as a result of their implementation.

The study also included an attempt to determine whether there is a relationship between the number of workers involved in work related to research and development in the food industry enterprises and:

- the number of completed projects in the field of product innovation, organizational, marketing and process innovations,
- the sum of expenditures on product innovations, organizational, marketing, process innovations,
- the total value of R & D projects in the enterprise.

The conducted calculations show that the Spearman rank correlation coefficient is statistically significant, so there is a relationship between the number of employees involved in R & D activities in the surveyed enterprises in 2006-2011 and the sum of expenditures on marketing innovations in the period 2006-2011. Calculations showed no statistically significant relationship between the number of employees dealing with the R & D during the analysed period and the sum of expenditures on product innovations, organizational and procedural innovations incurred in the reporting period (Tab. 27). There is also no statistically significant relationship between the number of employees involved in R & D activities in the surveyed enterprises and the number of completed in the years 2006-2011 projects in the field of product innovation, organizational, marketing and process innovations. The calculation results also showed no correlation between
the number of employees involved in R & D activities and the total value of R & D projects implemented in the surveyed companies in the years 2006-2011.

Table 27. The correlation between the number of employees involved in the surveyed enterprises R&D work and the number of completed projects in the field of innovation (product, organizational, marketing, process), the sum of expenditures on these innovations and the total value of R&D projects in these companies

<table>
<thead>
<tr>
<th>The correlation between the number of employees and:</th>
<th>Rank correlation coefficient rs</th>
</tr>
</thead>
<tbody>
<tr>
<td>the number of completed projects in the field of product innovation (sum for the years 2006-2011)</td>
<td>-0.0682</td>
</tr>
<tr>
<td>the number of completed projects in the field of organizational innovation (sum for the years 2006-2011)</td>
<td>-0.0976</td>
</tr>
<tr>
<td>the number of completed projects in the field of marketing innovation (sum for the years 2006-2011)</td>
<td>-0.01162</td>
</tr>
<tr>
<td>the number of completed projects in the field of process innovation (sum for the years 2006-2011)</td>
<td>-0.0682</td>
</tr>
<tr>
<td>the sum of expenditures on product innovations (sum for the years 2006-2011)</td>
<td>0.0895</td>
</tr>
<tr>
<td>the sum of expenditures on organizational innovations (sum for the years 2006-2011)</td>
<td>0.0385</td>
</tr>
<tr>
<td>the sum of expenditures on marketing innovations (sum for the years 2006-2011)</td>
<td>0.3692*</td>
</tr>
<tr>
<td>the sum of expenditures on process innovations (sum for the years 2006-2011)</td>
<td>0.1319</td>
</tr>
<tr>
<td>the total value of R&amp;D expenditures in the company (sum for the years 2006-2011)</td>
<td>0.1939</td>
</tr>
</tbody>
</table>

* coefficient statistically significant at the level of $\alpha = 0.05$.
Source: own study.

4.3. Financial resources for knowledge management or innovation and their selected effects

For the isolation of similar groups of surveyed enterprises of the food industry due to the selected features, a cluster analysis was used, which is one of the methods of classification of objects. The aim of cluster analysis is to group objects and create a graphical representation of their similarity in the form of a dendrite or dendrogram. The study used Ward’s method (or minimum variance) which belongs to the agglomeration methods of cluster analysis. An important feature of this method is to ensure a minimum variation inside the cluster and the maximum between clusters. Criterion here
is the variance variation. This method allows grouping of studied objects in clusters, for which the variance within each cluster is the smallest, and the variance between clusters as large as possible. Ward’s method ensures the homogeneity of objects within clusters and heterogeneity between clusters.

The first group was oriented to enterprises to extract groups of companies similar to each other in terms of financial expenditures incurred on innovative activities and the results that are achieved using them.

Using Ward’s method of clustering, the groups of companies were extracted, that made expenditures on innovation in the period 2006-2011 and declared impact of innovation activities on the profit or the value of the company. The grouping was based on the value of three of the following characteristics:

- the value of expenditures on innovation in the years 2006-2011,
- increase in profits of the enterprise as a result of the implementation of innovations in terms of percentage (average of 2007-2011),
- increase in the value of the company as a result of the implementation of innovations in terms of percentage (average of 2007-2011).

Based on the survey we received two groups of companies, which in terms of the adopted features are most similar to each other and maximally different from others. The result of Ward clustering dendrogram is presented in Figure 42. The main characteristics among the studied characteristics of enterprises in groups that were formed using agglomeration method of Ward’s clustering are presented in Table 28.
Assessment of the impact of knowledge management...

Fig. 42. Food industry by Ward clustering method innovation activities

Source: own study.
Table 28. Statistical characteristics of the studied companies’ features in groups formed by Ward clustering agglomeration

<table>
<thead>
<tr>
<th>Ward Group</th>
<th>No. of companies</th>
<th>Feature</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>95% CI</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Median</th>
<th>Lower quartile</th>
<th>Upper quartile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>83</td>
<td>Funding of innovations implemented in the years 2006-2011</td>
<td>827,524.82</td>
<td>2,337,814.30</td>
<td>317,048.85</td>
<td>1,338,000.79</td>
<td>600.00</td>
<td>15,900,000.00</td>
<td>41,500.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The increase in profits as a result of innovations (average percentage for years 2007-2011)</td>
<td>4.40</td>
<td>4.25</td>
<td>3.47</td>
<td>5.33</td>
<td>0.00</td>
<td>20.00</td>
<td>3.40</td>
<td>0.86</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The increase in goodwill as a result of innovations (average percentage for years 2007-2011)</td>
<td>5.49</td>
<td>6.86</td>
<td>3.99</td>
<td>6.99</td>
<td>0.00</td>
<td>44.00</td>
<td>4.92</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>32</td>
<td>Funding of innovations implemented in the years 2006-2011</td>
<td>1,526,831.09</td>
<td>4,558,732.64</td>
<td>-39,148.37</td>
<td>3,092,810.54</td>
<td>7,658.00</td>
<td>26,410,000.00</td>
<td>41,250.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The increase in profits as a result of innovations (average percentage for years 2007-2011)</td>
<td>4.96</td>
<td>7.23</td>
<td>2.47</td>
<td>7.44</td>
<td>0.00</td>
<td>32.00</td>
<td>2.80</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The increase in goodwill as a result of innovations (average percentage for years 2007-2011)</td>
<td>6.30</td>
<td>15.22</td>
<td>1.07</td>
<td>11.52</td>
<td>0.00</td>
<td>9.00</td>
<td>2.40</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Source: own study.
The first cluster includes 83 companies. The average value of financial expenditures incurred for the implementation of innovation in these enterprises amounts to 827,524.82 PLN, but half of the companies allocated for this purpose less than 130,000.00 PLN. As a result of the implemented innovations annual average earnings growth in 2007-2011 on average for companies in the first cluster was 4.40%, while the average annual growth of enterprises in this period was 5.49%. Among the companies forming the first cluster companies operating in the market for a longer period are dominating. Enterprises operating in the market for over 20 years constitute 27% of the companies included in this cluster. Second largest group consists of companies operating in the market for 16-20 years, with a share of 23%. As many as 59% of these companies are companies operating in the city. Companies have a dominant share of the village of fewer than 5 thousand residents and towns with population over 100 thousand residents (their share in the cluster is respectively 43% and 24%). The vast majority of these companies are privately owned national companies. Among the respondents, 22% are companies operating in the form of a partnership, 20% in the form of a limited liability company, and 19% in the form of a joint stock company. As many as 88% of them are medium-sized companies, and only 12% are large companies. These companies represent mostly fruit and vegetable industry, confectionery, meat and dairy industries.

The second cluster included 32 companies. The average value of financial expenditures incurred for the implementation of innovation in these enterprises is higher than in the first cluster and it was 1,526,831.09 PLN. Half of the companies spent on innovative activities an amount less than 261,000.00 PLN. Plants included in this cluster declared a greater impact of innovation implemented on their profits and the value of company. The average annual earnings growth of these companies in 2007-2011 as a result of the implemented innovations amounted to an average of 4.96%, while the average annual growth of enterprises in this period was 6.30%. Among the companies included in the second cluster the largest 26% share have got companies with long, more than twenty years of seniority functioning in the market. Companies operating for 15 years on the market, however, have a total of 57% of all companies belonging to the cluster. Greater share of enterprises than in the first cluster is among those operating in urban areas (69% of the total in this cluster), and from the point of view of the size of the locality in which they operate – including businesses operating in towns of less than 5 thousand population (43% in cluster). Much greater share in the group compared to the first cluster have companies owned by private foreign capital. These companies, less likely than firms in the first cluster are in the form of a capital company,
but among them the dominant legal form is a limited liability company. As many as 86% of them are medium-sized companies, and only 14% are large plants. The biggest share in the group have companies from the confectionery industry – 23%, fruit and vegetable and meat industries – 17% and dairy industry – 14%.

Figure 43 shows graphically the mean values of the sum of the expenditures incurred for the implementation of marketing innovations, organizational, process and product innovations in the years 2006-2011, for the extracted by the Ward’s method two groups of companies. Figure 44 presents the average annual profit growth in percentage terms in 2007-2011, while Figure 45 the average annual growth of the business in terms of percentage in 2007-2011 for both clusters. In addition, for each mean graph presents the standard error of the mean (box on the chart, a large rectangle) and 95% confidence interval for the mean (whiskers on the graph).

Fig. 43. The mean values of the total expenditure incurred for the implementation of marketing innovations, organizational, process and product from 2006-2011 for two separate groups of companies

Source: own study.
Fig. 44. The average profit growth in percentage terms in 2007-2011 to separate the two groups of companies
Source: own study.

Fig. 45. The average increase in value of the company in terms of percentage in 2007-2011 to separate the two groups of companies
Source: own study.
The presented data show that the first cluster is characterized by lower mean values of the examined features than the second cluster.

In the course of the study it was also an attempt to isolate groups of companies similar to each other in terms of financial expenditure incurred on knowledge management and the effects of which are thus achieved. The grouping was based on the value of the five following characteristics in 2007-2011:

- total funding for knowledge management,
- the average percentage increase in profit due to the knowledge management,
- the average percentage increase in the value of sales as a result of the knowledge management,
- the average percentage increase in the value of turnover as a result of the knowledge management,
- the average percentage by which the markets of the company have increased as a result of the knowledge management.

Based on the survey we received three groups of companies, which in terms of the adopted features are most similar to each other and maximally different from the others. The result of Ward clustering dendrogram is presented in Figure 46. The main characteristics of the studied enterprises in clusters that were formed using agglomeration method of Ward’s clustering are presented in Table 29.
Assessment of the impact of knowledge management...

Fig. 46. Food industry by Ward clustering method – knowledge management

Source: own study.
Table 29. Statistical characteristics of the studied companies’ features in groups formed by Ward clustering agglomeration

<table>
<thead>
<tr>
<th>Ward Group</th>
<th>No. of companies</th>
<th>Feature</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>95% CI</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Median</th>
<th>Lower quartile</th>
<th>Upper quartile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>79</td>
<td>The sum of funding for knowledge management in the years 2007-2011</td>
<td>18,712.04</td>
<td>23,924.45</td>
<td>13,353.25</td>
<td>24,070.82</td>
<td>1100.00</td>
<td>127,200.00</td>
<td>12,000.00</td>
<td>8000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The increase in profits as a result of knowledge management (average percentage for the years 2007-2011)</td>
<td>2.43</td>
<td>2.33</td>
<td>1.91</td>
<td>2.95</td>
<td>0.00</td>
<td>9.50</td>
<td>2.20</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The increase in sales as a result of knowledge management (average percentage for the years 2007-2011)</td>
<td>1.62</td>
<td>1.57</td>
<td>1.27</td>
<td>1.98</td>
<td>0.00</td>
<td>5.00</td>
<td>1.60</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The increase in turnover as a result of knowledge management (average percentage for the years 2007-2011)</td>
<td>1.84</td>
<td>1.73</td>
<td>1.45</td>
<td>2.22</td>
<td>0.00</td>
<td>6.40</td>
<td>1.60</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The increase in sales markets as a result of knowledge management (average percentage for the years 2007-2011)</td>
<td>1.59</td>
<td>1.84</td>
<td>1.17</td>
<td>2.00</td>
<td>0.00</td>
<td>8.00</td>
<td>1.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>52</td>
<td>The sum of funding for knowledge management in the years 2007-2011</td>
<td>48,335.96</td>
<td>60,689.11</td>
<td>31,440.01</td>
<td>65,231.92</td>
<td>1800.00</td>
<td>230,000.00</td>
<td>18,500.00</td>
<td>8000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The increase in profits as a result of knowledge management (average percentage for the years 2007-2011)</td>
<td>6.65</td>
<td>4.04</td>
<td>5.53</td>
<td>7.78</td>
<td>0.00</td>
<td>22.00</td>
<td>5.35</td>
<td>4.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The increase in sales as a result of knowledge management (average percentage for the years 2007-2011)</td>
<td>5.75</td>
<td>2.47</td>
<td>5.06</td>
<td>6.43</td>
<td>0.00</td>
<td>10.00</td>
<td>5.55</td>
<td>4.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The increase in turnover as a result of knowledge management (average percentage for the years 2007-2011)</td>
<td>6.09</td>
<td>2.64</td>
<td>5.35</td>
<td>6.82</td>
<td>0.00</td>
<td>10.40</td>
<td>6.80</td>
<td>5.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The increase in sales markets as a result of knowledge management (average percentage for the years 2007-2011)</td>
<td>4.01</td>
<td>3.64</td>
<td>3.00</td>
<td>5.03</td>
<td>0.00</td>
<td>14.00</td>
<td>3.90</td>
<td>0.00</td>
</tr>
</tbody>
</table>
The sum of funding for knowledge management in the years 2007-2011

<table>
<thead>
<tr>
<th></th>
<th>99,470.56</th>
<th>355,421.27</th>
<th>520.64</th>
<th>198,420.47</th>
<th>75.00</th>
<th>2,520,000.00</th>
<th>22,300.00</th>
<th>11,500.00</th>
<th>43,000.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>The increase in profits as a result of knowledge management (average percentage for the years 2007-2011)</td>
<td>14.11</td>
<td>10.46</td>
<td>11.19</td>
<td>17.02</td>
<td>3.00</td>
<td>70.00</td>
<td>12.00</td>
<td>8.35</td>
<td>15.83</td>
</tr>
<tr>
<td>The increase in sales as a result of knowledge management (average percentage for the years 2007-2011)</td>
<td>14.10</td>
<td>8.06</td>
<td>11.86</td>
<td>16.35</td>
<td>0.00</td>
<td>50.00</td>
<td>13.00</td>
<td>9.10</td>
<td>16.00</td>
</tr>
<tr>
<td>The increase in turnover as a result of knowledge management (average percentage for the years 2007-2011)</td>
<td>12.61</td>
<td>7.60</td>
<td>10.49</td>
<td>14.72</td>
<td>0.00</td>
<td>44.20</td>
<td>11.70</td>
<td>9.00</td>
<td>15.50</td>
</tr>
<tr>
<td>The increase in sales markets as a result of knowledge management (average percentage for the years 2007-2011)</td>
<td>7.62</td>
<td>6.33</td>
<td>5.85</td>
<td>9.38</td>
<td>0.00</td>
<td>24.00</td>
<td>7.10</td>
<td>3.60</td>
<td>10.00</td>
</tr>
</tbody>
</table>

Source: own study.
The first cluster includes 79 companies. The average value of financial expenditures incurred for knowledge management in these enterprises in 2007-2011 amounts to 18,712.04 PLN, but half of the companies allocated for this purpose less than 12,000.00 PLN. As a result of the knowledge management the profit of the enterprises in 2007-2011 increased by an average of 2.43% per annum, while the average increase in the sales of the company amounted to 1.62% per annum. In addition, as a result of activities related to knowledge management the turnover has increased of an average rate of 1.84% per annum, as well as markets of the companies increased – an average of 1.59% per annum.

Among the companies forming the first cluster companies operating in the market for 6-10 years are dominating; they represent 24.1% of the companies included in this cluster. Second largest group consists of companies with a long activity in the market (above 20 years) – 21.5%. Of these, 59.5% are companies operating in the city. Dominant shares have companies operating in towns with a population of less than 5 thousand residents. Their participation in the cluster is 44.3%. The vast majority are privately owned national companies. In total, almost half of them are companies operating in the form of a limited liability company (26.6%) or civil company (22.8%). As many as 89.9% of the companies within this cluster is mid-sized, and only 10.1% are large entities. These companies represent mostly fruit and vegetable industry (35.4% of all enterprises in cluster), confectionery industry (26.6% of all enterprises in cluster) or meat industry (13.9% of all enterprises in cluster).

The second cluster included 52 companies. The average value of financial expenditures incurred for knowledge management in these enterprises in 2007-2011 is higher than in the case of the first cluster and it was 48,335.96 PLN, but half of the companies allocated for this purpose less than 18,500.00 PLN. The average annual increase in the profit in percentage terms, as a result of activities related to knowledge management in the reporting period amounted on average 6.65% for companies in the cluster and was higher than for companies in a first cluster. The average annual increase in the sales of the company was also higher compared with the first cluster, and was 5.75% on the average. In addition, as a result of activities related to knowledge management, there has been an increase in the turnover of the companies forming the cluster, amounting to an average of 6.09% per annum, as well as market for these companies increased – by an average of 4.01% per annum.

Among the companies forming the second cluster, the largest share have companies with a long period of operation in the market, over 20 years, whose share in the total number of enterprises in the cluster is 36.5%. Greater
than in the case of the first cluster is the share of companies operating in urban areas (67.3% of all enterprises in this cluster). The largest group of companies belonging to the cluster were companies operating in towns of less than 5 thousand residents (38.5% of the companies in this cluster). The second largest shares have companies operating in cities of over 100 thousand residents (30.8% of all enterprises in the cluster). By far the greater part of this group, compared with the first cluster, are companies owned by private foreign capital (9.6% against 3.8% in the first cluster). Half of the companies belonging to the cluster operate in the form of a limited liability company or partnerships. Of the companies included in this group, 17.3% were large enterprises, which accounted for the highest share of these size businesses in three separate groups. The industrial structure of these companies shows the highest share of companies of the meat industry (21.2%), confectionery industry (17.3%) and dairy industry (15.4%).

The third cluster also includes 52 companies. The average value of the investments made on the management of knowledge in these plants in 2007-2011 was 99 PLN 470.56, with a mean of 22,300.00 PLN. The average annual increase in the profit in percentage terms, as a result of activities related to knowledge management in the reporting period in this group was an average of 14.11%. Higher than in the other two clusters was also the average annual increase in the sales of the company, which was on average 14.10%. In addition, as a result of activities related to knowledge management, there has been an increase in the turnover of the companies forming the cluster, amounting to an average of 12.61% per year, as well as market for these plants increased – an average of 7.62% per annum.

This cluster is characterized by the lowest share of enterprises with the shortest market activity shown in the intervals indicated in the market among all three separate groups of companies. Companies operating in the market for more than 10 years accounted for 77% of all companies included in the cluster. Greater than in the case of the first and second cluster among them was the share of enterprises operating in urban areas (71.2% of all enterprises in this cluster). The largest group of companies belonging to the cluster is, as in the other cluster, businesses operating in towns of less than 5 thousand residents (38.5% of all enterprises in the cluster) and companies from the cities over 100 thousand residents (30.8% of all enterprises in this cluster). At the same time, these companies are mostly owned by private domestic capital (86.5%), the second largest share are companies belonging to private foreign owners. 21.2% of the companies belonging to the cluster operates in the form of a limited liability company or partnerships. Among the companies belonging to this group 13.5% were large entities. The industrial structure of these companies shows the highest share of com-
panies in the meat industry (30.8%), fruit and vegetable industry (23.1%) and confectionery industry (15.4%).

Figure 47 shows graphically the mean values of the sum of financial resources for knowledge management in 2007-2011 for the three clusters extracted by the method of Ward. Figure 48 presents the average annual increase in profits of the enterprise in terms of percentage in 2007-2011 for the three clusters. Figure 49 presents the average annual growth of sales of the company in terms of percentage in 2007-2011. Figure 50 presents the average annual growth of turnover of the company in percentage terms in 2007-2011, a figure 51 the average percentage by which each year has increased markets of companies in 2007-2011.

The first cluster has the lowest average values of the examined features. The largest average values has the third cluster.

![Mean Total – question 11](image)

Fig. 47. The mean values of the total funds allocated to the management of knowledge in 2007-2011 for three separate groups of companies

Source: own study.
Fig. 48. Average increase in profits of companies in the period 2007-2011 for the three separate groups of companies
Source: own study.

Fig. 49. The average increase in sales of the company from 2007-2011 for three separate groups of companies
Source: own study.
Fig. 50. The average increase in the value of the company’s turnover in the period 2007-2011 for three separate groups of companies
Source: own study.

Fig. 51. The average percentage by which markets have increased over the years of 2007-2011 for three separate groups of companies
Source: own study.
Summary and conclusions

The study indicates that the functioning of the enterprises of the food industry to a large extent is affected by increasing competition in the market, Polish membership in the European Union, as well as a lot of pressure on the implementation of innovations. Among the processes occurring in areas close to the company, affecting the functioning of the tested plants, one should mention the competition between enterprises, as well as the bargaining power of buyers and suppliers of these companies. The study shows that companies perceive their biggest challenges primarily in entering new markets with their products, improve product quality and cost reduction. At the same time competitive advantage is built on the basis of the offered product and the brand. It is worth noting that, although the emphasis on the implementation of the innovation was mentioned as one of the processes strongly affecting the company, innovation is seen as a less important source of surveyed companies’ advantages over the competition.

Surveyed companies use a variety of sources of knowledge. The most common source of knowledge uses information from the cooperation with customers and suppliers, as well as external training. Least likely but knowledge is derived from the acquired businesses and the cooperation with universities or research centres. It can therefore be concluded that the company acquires knowledge primarily from direct trade relations, as well as from external entities acquiring and transferring expertise. This knowledge is also considered to be the most useful. Companies consider working with universities or research centres and working with consulting firms as less useful sources of knowledge. This may prove maladjustment of knowledge derived from these sources to practical application in enterprises or the lack of awareness of the benefits of such cooperation. The results of the research in the area of knowledge management in the surveyed enterprises of the food industry helped to construct the following conclusions:

1. More than one-third of the surveyed enterprises of the food industry did not implemented in 2007-2011 any activities related to the management of knowledge mentioned in the survey. This shows that knowledge management, so the general processes that enable the creation, dissemination and use of knowledge to achieve the objectives of the company, is not sufficiently utilized. This may result e.g. from a lack of sufficient awareness about the benefits with this type of action. Among the companies that have implemented knowledge management elements, most indicated that carries out training in this field in its implementation.
2. Among the activities that support the acquisition and transfer of knowledge, food industry most frequently implemented internal training. New knowledge was also distributed through the care of experienced staff over junior staff career development (mentoring), and by a system of staff rotation positions. In contrast, the least likely to acquire and store knowledge used action through issuance of a newspaper or newsletter, and the creation of working groups of employees from different levels and departments. For the surveyed companies practical knowledge and direct transfer of it is therefore essential on internal training (knowledge passed on by the employees of the company) or in co-operation. Surveyed companies to transfer knowledge most often use the Internet, electronic mail (e-mail), document circulation system and data warehouses.

3. The study shows that in 2007, more than half of the surveyed enterprises of the food industry have spent money on knowledge management. The percentage of firms that allocate funds for this purpose increased and in 2011 amounted to 64.8%. In subsequent years, there is, therefore, a systematic increase in the number of companies that have started to allocate funds for this type of project. The average level of funding for knowledge management in the surveyed enterprises of the food industry, which incurred expenditure for this purpose in 2007-2011, almost for the entire period studied (except for 2010) increased. Knowledge management, according to 64.4% of the respondents, contributed to improving of the economic performance of their companies, while in the opinion of 63.3% of the respondents has led to an increase in turnover. According to 59.2% of the respondents, knowledge management in their company contributed to the increase in the value of sales of the company. The smallest plants found, however, that knowledge management has contributed to expansion of their markets (49.8%).

4. The study attempted to isolate groups of companies similar to each other in terms of financial expenditure incurred on knowledge management and outcomes that are achieved thanks to it. On the basis of calculations we obtained three groups of companies. The first group included companies in which the average value of the financial expenditures incurred for knowledge management in 2007-2011 averaged for 18,712.04 PLN. As a result of the management of knowledge, profit of enterprises in 2007-2011 increased by an average of 2.43% per annum, while the average increase in sales value amounted to 1.62% per annum. In addition, these companies have increased the turnover rate of 1.84% per year on average, and also increased their market – an average of 1.59% per annum. The average value of financial expenditures incurred for knowledge management in companies included in the second group is higher than in the first group
and amounted to 48,335.96 PLN. Higher than in the first group is the average annual increase in the percentage of profit as a result of activities related to the management of knowledge (6.65%), the average annual increase in the sales of the company (5.75%), the increase in the value of the annual turnover (6.09%), and increase in the sales market (4.01% annually). For companies in the third group the mean value of investments made on knowledge management in 2007-2011 amounted to 99,470.56 PLN. This value is the highest among the three groups separated. Average annual increase in the percentage of profit was also the highest and amounted to an average of 14.11%, and the average annual increase in the value of the company’s sales, which was an average 14.1%. In this group there was also the highest increase in the turnover of an average 12.61% per year, as well as the largest increase in a market – an average of 7.62% per annum.

Research on the issues of diffusion of innovation in enterprises of the food industry proved to be more complex, but also allowed the determination of their significance in the current functioning of the company and a summary of some interesting conclusions and proposals:

1. In the years 2006-2011 in the surveyed enterprises expenditures on innovation totalled more than 122 million PLN. The result of the spending of these funds was the implementation of 524 projects aimed at the implementation of innovations, giving an average expenditure of 232,865 PLN for one project. Most projects were implemented in the field of product innovation (247), followed by marketing (134), far less – process (78) and organizational innovation (65). Analysing the amount of expenditures, it should be noted that most of the money was spent on projects in the field of product innovation (89.85% of the total), followed by the process innovation (5.62% of the total), marketing innovation (2.79% of total resources) and organizational innovation (1.74% of the total).

2. The core of the innovative activity of the surveyed companies was product innovations. Expenditures for these innovations included mainly the purchase of new machinery, means of transport or new equipment. Implemented marketing innovations were mostly related the introduction of a new package or a new method of promotion. Implemented process innovations most often consisted of changing production technology.

3. Changes in the organizational innovation mainly concerned changes in work organization and implementation of new operating procedures. Such a structure of expenditures on innovation activities means that it depends mainly on the implementation of the new external technologies. In the first years of accession, such activities were connected with Polish enterprises need to adapt to EU standards, and currently it stems from
the need to bridge the gap separating the technologically Polish enterprises from enterprises from highly developed countries.

4. The projects focused on innovations implemented primarily at the level of the company – a new solution for the company accounted for almost 48% of the total number of completed projects in the field of innovations. Less frequently those were implemented at the local level and regional level, national or international level. Among the surveyed enterprises of the food industry in the years 2006-2011 only slightly more than half completed innovative activity during the period of the project. The most frequently cited reasons not to implement innovation by enterprises were large costs associated with this type of project and the lack of sufficient financial resources.

5. Analysing the changes that have occurred in enterprises as a result of the implementation of the innovation, it should be noted that the vast majority of companies that have implemented innovations note their positive effects. As many as 70.3% of the companies indicated increased customer satisfaction, 68.4% reported an increase in productivity. Thanks to the innovations implemented 59.9% of companies increased their range of products, while 57.8% of companies have enabled innovations into new markets. Over 55% of respondents indicated an increase in the level of innovation of products and services. Moreover, in half of the surveyed companies, implemented innovations have contributed to the improvement of internal processes, and in 49.8% due to the reduced costs. More than half of the surveyed companies, thanks to the implementation of innovations, reported improved earnings and the increase in value of the company.

6. In the course of the research the studied population of companies was divided into two groups of companies similar to each other in terms of financial expenditures incurred on innovative activities and the results that were achieved through them. In the first group of companies, the average value of the investments made to implement the innovation amounted to 827,524.82 PLN, as a result of the implemented innovations mean annual profit in 2007-2011 increased by an average of 4.40%, while the value of the company has increased during this period by an average of 5.49% per annum. For the second group highlighted, the average value of financial expenditures incurred for the implementation of innovation amounted to 1,526,831.09 PLN, and so was higher than for the companies forming the first cluster. Enterprises with a second cluster declared a greater impact of implemented innovation on their profits and the value of the plant. The average annual profit growth of these companies in 2007-2011 as a result of the implemented innovations amounted to an average
of 4.96%, while the average annual increase in the value of the enterprise for the period was 6.30%

7. In the years 2006-2011, only about 53% of the enterprises of the food industry employed workers who were involved in work related to research and development, and on such projects spent a total of just over 10 million PLN. So relatively low interest R & D shows a small interest in the industry in setting up or acquiring new knowledge, which arises at the enterprise level.

In considering the issue of the competitiveness of the agri-food enterprises in terms of the implementation of the elements of knowledge management and diffusion of innovation, we can conclude that during the transformation of the Polish economy that has spanned for more than two decades, there has been the transformation of almost all sectors of the economy, which was significantly affected by the privatization and restructuring of conditioning from, implying in these implementation of modern innovative processes. Unfortunately, the increase in the competitiveness of the Polish economy is still limited by its low innovation, which also determines the different levels of economic development. It should be emphasized that, despite the low funding for research and development in this period, although some may consider that incidentally, high innovativeness of enterprises occurred, particularly those that operate on the basis of the thought-out and well-constructed strategy and focused on the changes in the environment economic. Permanent reduction of expenditure on innovative activities can certainly pose a threat to the functioning of enterprises in the future. Competing on price and quality of products produced and offered in most cases reached its peak, so it is more and more difficult for Polish entities to compete with strong foreign corporations without the introduction of new products and the application of modern technology or organizational change and marketing. Food manufacturers point out that the globalization of food markets requires the implementation of thoughtful and modern innovations, which are essential in maintaining the company’s position in the domestic and foreign markets.

Innovation in a market economy has got a broad instrumentation, consisting of heterogeneous strategic tools that are involved in ensuring proper modern production of the whole range of foodstuffs. Recent and current standards in the food require manufacturers of high competence, skill and speed. Systematic awareness of the need for new ones, structuring their plan, creating new methods and patterns of action, develop skills and stimulate the modernization of the current habitual activity is the proper basis for achieving market competitiveness.
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