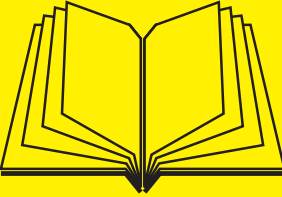


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## THE CARBON FOOTPRINT OF A MEAT PROCESSING COMPANY

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### ABSTRACT

Plans for mitigating greenhouse gas (GHG) emissions in the agri-food sector should not only include the production of agricultural raw materials but also the food processing industry. The aim of the research was to determine the carbon footprint of a meat processing enterprise and to analyze the intensity indicators of GHG emissions. The study was conducted in a medium-sized company, located in the Wielkopolska Province, for which pork is a basic feedstock for the production (over 81.0%). The results show that the largest GHG emissions were related to the consumption of electricity, natural gas and fuels in the transport of products. There were estimated values of several indicators of emission intensity. The main indicator of GHG emissions related to the unit of product was 519 g CO<sub>2</sub> eq. per 1 kg. It is concluded that the analysis of the carbon footprint can be an important instrument for the management of GHG emissions at the company level and can also serve the purpose of assessing the effects of implementing plans for a low-carbon economy in the meat processing sector.

**Key words:** carbon footprint, GHG emissions, climate change, food industry, transport, emission intensity indicators

### INTRODUCTION

Adopted by EU countries in 2013, an action plan for the reduction of gaseous emissions in sectors, not covered by the emission trading scheme, requires a reduction of greenhouse gas (GHG) emissions by 30% by 2030 [European Council Conclusions 2014]. This means that the control of GHG emissions in the agricultural and food sectors should also be considered as an important instrument for supporting environmental management, aimed at mitigating the effects of climate change. In the context of the global increase in demand for food, efforts for emission reductions must focus on all places of the food production chain [Matthews et al. 2008].

Consumer demands and both international regulations and national ones require that sustainable methods of production and high quality environmental products be used [Communication... 2013]. Fulfilling the expectations of consumers and climate policies, companies operating in the agri-food sector must have new diagnostic tools and know how to use them in the evaluation of the environmental effects associated with production processes and manufactured products. To assess the GHG emissions associated with manufacturing processes, the method of the carbon footprint is increasingly used [Burritt et al. 2011]. Dissemination of its application in Poland will allow the monitoring of progress in the development of a low-carbon economy and to achieve long-term climate targets for the country.

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The relatively large load of GHG emissions are ascribed to animal products. Estimates of the FAO show that about 18% of global GHG emissions come from livestock production. The projection of doubling global livestock production by 2050 should be considered as a threat to sustainable development [Steinfeld et al. 2006]. The desire to reduce GHG emissions can not only focus on the agricultural sector of animal production. It should also include the link to the meat processing industry. In this respect, by integrating different chains of meat production, it is possible to comprehensively grasp emissions from other important stages of the life cycle of meat products.

Today, companies in processing industries in Poland are not required to simply record carbon flows. Currently, the best known international standard for connecting goals of the global climate policy with the recording of GHG emissions at the enterprise level is the greenhouse gas standard protocol developed by the World Resources Institute and World Business Council for Sustainable Development [The Greenhouse... 2004]. Reporting GHG emissions in the company is the most recognized form of environmental accountancy, which is also an important measure of a company's sustainable activity [Burrill et al. 2011].

The aim of the study was to identify, using the method of the carbon footprint, GHG emissions for the slaughter and meat processing company, acquiring basic raw materials entirely from the local market. Supplementary purpose of the research was to provide indicators of the GHG emission intensities for the studied company.

## **MATERIAL AND METHODS**

Data for the analysis was acquired from the slaughter and meat processing plant located in the southern part of Wielkopolska. Source data came from existing documentation for the years 2013–2014. In terms of the number of employees, the company is ranked as medium-sized (over 240 people). The basic raw materials for processing is obtained from the local market by co-operating with a number of pig producer groups. Smaller quantities of slaughter material (18.3% of total use), in the form of poultry carcasses and quarters of beef, come from the wholesale market. The company has its own network of retail sales outlets and transport.

The analysis of the carbon footprint of the company was based on the methodology described in the GHG standard protocol for the organization [The Greenhouse... 2004]. The carbon footprint is a measure of climate warming potential of the company resulting from its high GHG emission of industrial processes. It is measured in kg CO<sub>2</sub> equivalents (eq.) It is calculated as the sum of the products of global warming potentials for individual GHG (kg CO<sub>2</sub> eq.·kg<sup>-1</sup> GHG) and emissions (kg). Global warming potentials for different gases have been identified in the IPCC report [Solomon et al. 2007]. They express the warming effect for a given GHG relative to CO<sub>2</sub> over a 100-year time horizon. Thanks to the equivalency factor approach is possible to compare and aggregate different types of emissions between enterprises and products. In the primary agricultural production and processing of agricultural raw materials, the most important gaseous compounds in GHG emissions are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O).

The key issue in the method used is to determine first the organizational boundaries and then – operational limits of the company. For large businesses with a complex organizational structure and ownership bringing together a wide variety of enterprises, emissions from different enterprises are consolidated at the corporate level in proportion to its capital share or the degree of financial control in dependent companies. In a further step, there are determined operational limits of the analyzed companies, which include those activities in which it is possible to identify emissions with a specific production activity. The registration of emissions is carried out in three different scopes, depending on the degree of feasibility of its control. Scope 1 includes direct GHG emissions of the company. Scope 2 embraces the emissions of the production stage related to the generation of electricity which is used by the company. Scope 3 is an optional step. It brings together all the other indirect emissions. The cause of their creation is a business activity of the production company that purchases certain materials for production and then sells their finished products to distribution networks. At this stage, intermediate load emissions could also apply to the phase of product use and the final waste management.

Direct emissions of GHG included in scope 1 are generated as a result of:

- the combustion of fossil fuels in stationary furnaces, boilers or turbines;
- chemical and physical processing;
- transport of raw materials, products and waste, provided they have their own means of transport or control their use in the company;
- emissions of volatile compounds from installed different devices on the company premises, mostly from refrigeration equipment and air-conditioning.

Emissions registered under scope 2 of company inventory are related to electricity, which is used by the machinery and electrical equipment owned by the company or by being under its control. This is the category of indirect emissions. By investing in new technologies with greater energy efficiency, companies have the potential to reduce electricity consumption and related GHG emissions.

Emissions whose place of origin is not already assigned to scope 1 or 2 fall under scope 3. A full catalog of sources of such emissions include:

- extraction of raw materials and production of materials used later by the processing company;
- transportation services provided by an external body, e.g. transport of fuel purchased, transport of input materials, employee travel to and from the workplace, transport of final products and wastes by external entities;
- extraction, production and transport of fuels to power generators in the company;
- consumption of products and waste management;
- outsourced services, and also leased equipment in case of operating leases or of possessing the financial control of the company or equity shares. Due to narrowly defined reporting boundaries for the company, emissions in this scope were not quantified.

In the analyzed company, catalogued direct emissions were from:

- the consumption of diesel, gasoline and motor oil in road transport;
- consumption of natural gas by gas boiler, c) consumption of diesel by the power generator;
- consumption of LPG by forklifts for gas;
- the loss of refrigerants with properties of greenhouse effects during the operation of the cooling system (due to a leak or system failure). Indirect emissions accounted for GHG emissions associated with the consumption of electricity for driving various machinery and electrical equipment in the company.

Emissions of  $N_2O$  from fuel and  $CO_2$  from motor oils in road transport were calculated based on an algorithm appropriate for a Tier 2 of GHG inventory [EMEP/EEA... 2013]. Its structural elements were: categorization according to the characteristics of the vehicle type, fuel type and engine technology, the number of kilometers driven in the year by the vehicles of a given category and  $N_2O$  emission factors ( $g \cdot km^{-1}$ ). Emission of  $CH_4$  was calculated on a more detailed basis, corresponding to a Tier 3 methodology IPCC [IPCC 2006]. Emissions of GHG from the combustion of natural gas was calculated based on the amount of energy contained in the fuel purchased (kWh) and emission factors for  $CH_4$ ,  $N_2O$  and  $CO_2$  from stationary combustion sources in the sector of processing industry based on a Tier 1 approach [IPCC 2006]. These emission factors were, respectively:  $1 \text{ kg } CH_4 \text{ T} \cdot J^{-1}$ ,  $0.1 \text{ kg } N_2O \text{ T} \cdot J^{-1}$  and  $56,100 \text{ kg of } CO_2 \text{ T} \cdot J^{-1}$  net calorific value. Greenhouse gas emissions attributed to the combustion of LPG by forklifts was calculated based on the amount of consumed gas and emission factors specified for Tier 1 in the processing industry using non-road mobile machinery. According to IPCC data, emission factors for  $CH_4$ ,  $N_2O$  and  $CO_2$ , per 1 t of consumed LPG were respectively: 354 g, 161 g and 2,990 kg [IPCC 2006]. Occasional use of the power generator also contributed to GHG emissions. In this case, emissions were calculated by using data based on: the amount of diesel fuel, fuel density, calorific value and emission factors. They refer to stationary sources of diesel fuel combustion, including power generators in the processing industry for Tier 1, and whose emission factors for  $CH_4$ ,  $N_2O$  and  $CO_2$  are equal, respectively, to  $3 \text{ kg T} \cdot J^{-1}$ ,  $0.6 \text{ kg T} \cdot J^{-1}$  and  $74,100 \text{ T} \cdot J \text{ kg}^{-1}$  [IPCC 2006]. The refrigerants R507 and R407C, present in the company refrigeration system, were also included in the recording of GHG



emissions. Of particular importance is their influence on the creation of the greenhouse effect which is underlined by high global warming potentials (GWP) of 3,900 and 1,774 kg CO<sub>2</sub> eq. respectively [Gutkowski and Butrymowicz 2015].

## RESULTS AND DISCUSSION

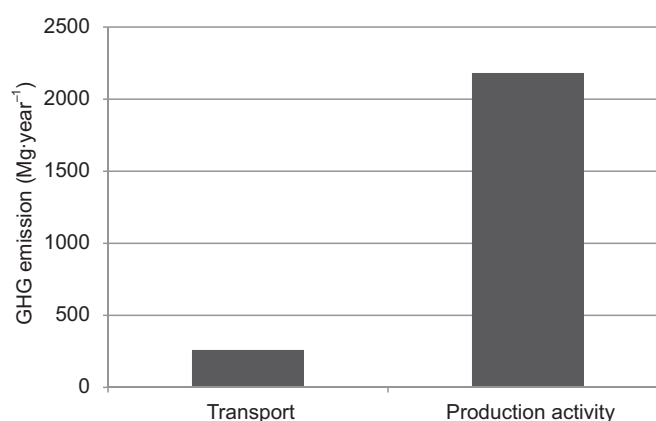
The total GHG emissions of the analyzed company is presented in Table 1. In accordance with the requirements of GHG protocol of corporate accounting and reporting standard, emissions were split into two distinct scopes. Approximately 60% of GHG emissions were concentrated in scope 2. Indirect emission that falls into this scope involves total consumption of electricity in the company used mainly for the propulsion of machinery and meat processing equipment, smokehouses and refrigeration units.

**Table 1.** Annual GHG emission for the analyzed slaughtering and meat-processing firm

Specification	GHG emission	
	Mg CO <sub>2</sub> eq.	%
Scope 1	973	39.9
Scope 2	1 469	60.1
In total	2 442	100.0

Source: Own calculation.

A possibility of reducing emissions by the company in this area will be associated with the improved energy efficiency of installed equipment which usually occurs as a result of modernization works induced by technological development in the meat industry. In the future, the projected changes in the intensity of CO<sub>2</sub> emissions in the Polish power industry, from 0.95 to 0.70 kg CO<sub>2</sub>·kWh<sup>-1</sup> in 2030, will be the additional cause of reducing emission processes in the food processing industry [IEA 2011]. The analyzed company has a network of retail sales of their own products. Freight operations, from the place of production to a shop network, are carried out by the transport department. Transport activity generates about 11% of total GHG emission of the company (Fig.).



**Fig.** Annual GHG emission according to company's main activities

Source: Own calculation.

It is estimated that the transport of food products throughout the world is responsible for generating more than 11% of GHG emissions attributed to the production of food [Weber and Matthews 2008]. The total level of GHG emissions in the company is mainly determined by emissions which are associated with direct production activities. Detailed analysis of emission sources within the company indicates that the largest GHG emissions could be assigned to electricity consumption, then consumption of natural gas in the production process and fuel use in transport activity (Table 2).

**Table 2.** Emission structure according to different sources of emission in the company

Type of activity	Emission source	Share (%)
Transport	product distribution	8.2
	duty trips	0.6
	other uses	1.9
Production activity	electricity use	60.1
	electricity generation	0.1
	cooling system	0.4
	use of natural gas for heat and technological steam production	28.6
	use of LPG	0.1

Source: Own calculation.

Taking into account different sources of emission, GHG emissions related to electricity used was more than two-fold higher than the GHG emissions from the combustion of natural gas. Third in ranking order was emissions from product distribution with a much lower share in total emissions of the company, compared to two major components of total emissions. All other sources of emissions were marginal (3.1%) in the general emission load of the company. By incorporating knowledge of the structure of emission sources into emissions management, important information can be obtained for setting up priority directions of investments to improve the efficiency of electrical appliances and management of processing operations, which at the same time altogether reduce their impact on the GHG emissivity.

In the ongoing company activity, measuring progress in limiting emissions, which would correspond with national and sectoral plans for a low-carbon economy, is not possible without analyzing indicators of emission intensity. They describe most frequently the impact of GHG as expressed per unit of production or unit of economic effect. Intensity indicators calculated per physical units of production are useful for conducting comparative analysis of different companies operating in similar sectors of the economy which provide similar products. Decreasing values of GHG emission intensity over time indicates an improvement of production processes with regard to more efficient use of energy sources. In the case of the company analyzed, the emission intensity was defined by a set of several basic indicators (Table 3).

Emissions of GHG indicator related to 1 kg product was equal to 519 g CO<sub>2</sub> eq., while when calculated per 1 kg of slaughtered meat it was lower and amounted to 460 g CO<sub>2</sub> eq. The process of slaughtering and meat processing was accompanied by the emission of more than 485 g of CO<sub>2</sub> per 1 kWh of energy consumed. In China, the estimated emission intensity across the whole sector of processing of agricultural raw materials amounted to 468 g of CO<sub>2</sub> per 1 kWh energy intake [Lu and Price 2012]. However, it cannot be directly comparable with the intensity indicator of the analyzed company, because the emission intensity quoted for China

**Table 3.** Intensity indicator of GHG emission for the analyzed company

Indicator	Unit	Value
Indicator of GHG emission linked to production and transport of 1 kg of products in total	g CO <sub>2</sub> eq.·kg <sup>-1</sup>	519.1
Indicator of general GHG emission per 1 kg of slaughtering materials	g CO <sub>2</sub> eq.·kg <sup>-1</sup>	460.3
Indicator of GHG emission associated with the production per 1 kWh of energy use in the production process	g CO <sub>2</sub> eq.·kWh <sup>-1</sup>	485.4
Indicator of GHG emission per 1 tkm	g CO <sub>2</sub> eq.·tkm <sup>-1</sup>	45.2
Indicator of general GHG emission per 1 person employed	g CO <sub>2</sub> eq.·person <sup>-1</sup>	10 134

Source: Own calculation.

comprised entirely of both processing of raw plant and animal materials. The usefulness of this indicator in managing the GHG emissions is underlined by the fact that one of the objectives of China's strategy for reducing CO<sub>2</sub> emissions is to reduce the emission intensity of the national economy by 40% by 2020 compared to the level in 2005. Distribution of food products also exerts an essential influence on GHG emissions because of the need to transport great quantities of commodities to a widespread network of sales points often over long distances. The suitable index representing emission intensity in transport is GHG emissions per 1 tkm (tkm represents 1 t of cargo transported over the distance of 1 km). In the analyzed company this indicator amounted to 45.2 g CO<sub>2</sub> eq. The calculated value was well below the recommended level of emission intensity for road transport, being equal 62 g CO<sub>2</sub>·tkm<sup>-1</sup> [McKinnon and Piecyk 2011]. This result points to a certainly good utilization of loading capacity of commercial vehicles in the company and to a shortened supply chain through the transport of products directly from the company to a network of stores.

## CONCLUSIONS

In order to determine the GHG emissions generated across the whole meat processing company, the method of the carbon footprint has been applied. It has been shown that, when having access to a company's documentation containing information on the consumption of energy carriers and to the detailed data from the company transport department, it is possible to estimate the carbon footprint in accordance with an international protocol of recording GHG emissions in enterprises.

It is easier for management to consider the economic costs of new solutions for modernization work directed at reducing emissivity of processes against expected production effects if different cross sectional data on company's GHG emissions is available. Such information facilitates the development planning if the company has in its business strategy also the efficiency improvements of new projects in mitigating GHG emissions. The results of the research and the carbon footprint of companies will also provide a basis for increasing their competitiveness in the market in the future.

The emission effects of a company are related to a specific type of production, technology and volume of production. Synthetic assessment of the state of GHG emissions in enterprises is not possible however without linking emissions with specific characteristics of production. Better recognition of energy use and GHG emissions accompanying the various places of technological process makes it easier to identify the potential for reducing emissions and increase energy efficiency in the most critical areas of manufacturing processes.

An important instrument for managing GHG emissions in the company are indicators of emission intensity. Their use gives a possibility to track changes in emission levels in connection with a scale of production and technology in the long-term perspective. They can be useful at the level of environmental policies, focusing on

development of a low-carbon economy, and for evaluations of the effectiveness of climate policy in various industrial sectors. On this basis, the company will gain a better understanding of the distance, in terms of actual emission intensity, from the reference values of the indicators adopted as the benchmark for specific industries. Indicators of this type can also be used by the National Center for Emissions Balancing and Management (KOBiZE), which is obliged by law to the development and analysis of emission indicators per unit of manufactured goods, fuel consumed or raw material used.

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## ŚLAD WĘGLOWY PRZEDSIĘBIORSTWA PRZETWÓRSTWA MIĘSNEGO

### STRESZCZENIE

Plany mitygacji emisji gazów cieplarnianych (GHG) w sektorze rolno-spożywczym powinny obejmować poza produkcją surowców rolniczych również przemysł przetwórczy żywności. Celem badań było wyznaczenie śladu węglowego przedsiębiorstwa przetwórstwa mięsnego oraz przeprowadzenie analizy wskaźnikowej intensywności emisji GHG. Badania przeprowadzono w przedsiębiorstwie zaliczanym do grupy MŚP, położonym w województwie wielkopolskim, wykorzystującym w produkcji głównie surowiec wieprzowy

(ponad 81,0%). Wyniki badań wskazują, że największe emisje GHG były związane ze zużyciem energii elektrycznej, gazu ziemnego oraz paliw w transporcie produktów. Oszacowano wartości kilku wskaźników intensywności emisji. Podstawowy wskaźnik emisji GHG odniesiony do jednostki produktu wynosił 519 g CO<sub>2</sub> ekw. na 1 kg. Analiza śladu węglowego może być ważnym instrumentem zarządzania emisjami GHG na poziomie przedsiębiorstwa oraz może także służyć ocenie realizacji planów niskoemisyjnej gospodarki w sektorze przetwórstwa mięsa.

**Słowa kluczowe:** ślad węglowy, emisje GHG, zmiany klimatu, przemysł spożywczy, transport, wskaźniki intensywności emisji

## COMPETITIVE ADVANTAGES OF POLISH FOOD PRODUCERS ON THE EUROPEAN UNION MARKET IN THE POST-ACCESSION PERIOD

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### ABSTRACT

Processes and phenomena that appear within world economy result in the increase of competition on lots of markets, including the food markets. This competition is won by the entities, sectors and countries that possess the advantages which create their competitiveness. Different types of food producers' competitive advantages may be identified. Mostly pointed out are price advantages and quality advantages. The aim of this paper is to identify the sources of competitive advantages of Polish food producers on the European Union market that appeared within the period 2004–2016. The analysis covered 26 groups of products which were selected according to their significance for Polish agri-food export. The long-term observation let the Authors identify the dominating strategies of competing which were implemented by Polish food producers on the European Union market. Analysis was conducted with the Aiginger's price-quality approach and was based on the data available within Eurostat Comext database.

**Key words:** competitiveness, competitive advantages, agri-food sector, food producers, agri-food trade, price-quality method, Aiginger's method

### INTRODUCTION

The progressing globalization brings a wide range of challenges for different entities operating on the market, including food producers. Within the conditions of trade liberalization leading to strengthening the economic rivalry the role of ensuring the food producers' competitiveness is increasing on both international and internal markets.

The concept of competitiveness, although it appeared in the literature relatively not far ago, became an important part of many areas of economic sciences. As a consequence of its multidimensionality there is no generally accepted definition of competitiveness. Generally we can define competitiveness after OECD as the degree to which a nation can, under free trade and fair market conditions, produce goods and services which meet the test of international markets, while simultaneously maintaining and expanding the real income of its people over the long-term [Rytko 2016]. Competitiveness can be a result of different characteristics of an entity known as advantages, which in the economic rivalry let it reach bigger gains than those reached by its rivals. Their sources can be price as well as other factors, and as a result we can distinguish price and non-price competitiveness, including quality competitiveness.

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Price competitiveness is indirectly explained by the lower costs of production in a given country and as a result it is a dominating way of competing conducted by less developed countries in international markets [Zawiślińska 2003]. The increase of export's price competitiveness does not always confirm the improvement of country's competitive capability [Bossak 1984]. Similarly, the loss of price competitiveness does not have to lead to the loss of competitive capability, especially in the era of new technology. There exists a non-price competitiveness which is chained to the changes in the global economy (i.e. internationalization of economic processes, globalization etc.). One of its most important sources is quality competitiveness. This form of competition is typical for the most developed countries and wealthy markets. What is more, it is getting more and more important ways of competing [Grębowiec 2009].

Competitiveness is chained to the term of comparative advantages, although these terms does not mean the same. Competitiveness is definitely wider term that takes into account the market distortions which are not included by the comparative advantage [Frohberg and Hartmann 1997, Frohberg 2000]. What is more, the term of comparative advantage can be defined according to two widely accepted approaches: in the Ricardian way (it is sourced by the profitability of export of selected products in comparison to other products and countries on internal and external market at the same time) and in the Balassa way (the basic criterion is the export size in a given branch in comparison to other branches and other countries, so-called ability to sell) [Guzek and Biskup 2001]. Comparative advantages in the Balassa sense can be equated to competitive advantages [Misala 2011]. The source of competitive advantage of a given country's economy or sector is its strength in relation to the international competitors being the suppliers of certain goods both on international and internal markets [Wysokińska 1995]. Competitive potential of a given entity being a source of competitive advantages influences its competitive position, too. In general, as a competitive position we can understand a result of competing of an entity in a defined period of time [Gorynia 2010].

Competitive position under wide range of economic and extra-economic factors can change and it definitely needs activities oriented on its maintaining and improvement. This is why its permanent monitoring is needed, also under the conditions of European Union (EU) membership.

Jasiński [2007] noticed that the accession to the EU does not diminish the need of activities oriented on building the international competitiveness understood as an ability to maintain and improve the existing market position of a country or a defined commodity supplied by this country. Changes in the world economy making the competitive rivalry stronger, such as technological progress and widening liberalization of trade, make this problem especially important from the point of view of national economies and the integration groups [Zawiślińska 2003]. Szymański [1996] saw the accession to the EU as a reason for paying special attention to the issue of competitiveness of Polish economy. In his opinion including Poland into the rules of European single market was tantamount to the need of conducting necessary analyses of "real competitiveness" which decides on the country's share in the supply of certain good and is equivalent to the need of being competitive on both internal and foreign market.

Under the conditions of liberalizing world trade and increasing number of bilateral trade agreement competitiveness gains even more significant meaning. What is more, maintenance of competitiveness can become harder, mostly in the branches characterized by low level of technological advancement. This means that in the future some branches and sectors will not be able to gain the profits from export specialization which is reserved exclusively for the areas in which a certain country is competitive [Jagiello 2007].

The aim of presented paper is the determination of competitive advantages Polish food producers within EU market in the post-accession period. To fulfill the defined objective Authors used so-called the price-quality method. The timespan covered years 2004–2016. The conducted analysis was based on the data available within Comext Eurostat database.

## RESEARCH METHODS

Among lots of methods used to evaluate the competitive positions of producers on foreign markets, Authors in this research chose price–quality method developed by Aiginger [1998]. This method was previously used in works on competitive advantages conducted, i.e. by Guzek [1999], Gehlhar and Pick [2002], as well as Bojnec and Fertö [2009].

The following method is based on the assumption that for the homogenous products unit prices express the costs of production. As a result countries gaining lower costs of production should be net exporters, while countries with higher unit costs should be net importers of following homogenous products. Each situation in which a country gains higher unit prices in export in comparison to import and is still a net exporter of a given product must prove the existence of quality differences [Aiginger 1998]. As a result competitive position will be fixed as a resultant of relation of export prices and import prices as well as the quantitative trade balance concerning a certain product.

According to Aiginger, the successful strategy of quality competition is the most desirable way of competing on international markets. On the other hand the unsuccessful strategy of price competition is the most undesirable way of competing – sectors in which this strategy dominated Aiginger called hopeless sectors.

The groups of commodities selected for the analysis were compiled according to the quantitative trade balance and relations of prices in export and import. The way of grouping them was presented in Table 1. Because of the 13-year long timespan, the results were ranked with points from the most desirable to the least desirable way of competing:

- successful strategy of quality competition – 3 points;
- successful strategy of competition by lower price – 2 points;
- potentially successful strategy of quality competition – 1 point;
- unsuccessful strategy of competition by lower price – 0 points.

On the basis of the received results of ranking the mean for each product was calculated. This step allowed Authors to identify the dominating strategies implemented by Polish food producers on EU market in the whole analyzed period. The border values that were used for ranking the products were presented in Table 1.

**Table 1.** Identification of competitive advantages of Polish food producers utilizing price–quality method

Factor	Relation of prices in export to prices in import above or equal to 1	Relation of prices in export to prices in import below 1
Quantity trade balance above or equal to 0	successful strategy of quality competition (from 2.51 to 3)	successful strategy of competition by lower price (from 1.51 to 2.5)
Quantity trade balance below 0	potentially successful strategy of quality competition (from 0.51 to 1.5)	unsuccessful strategy of competition by lower price (from 0 to 0.5)

Source: Own elaboration based on Guzek [1999], Burzyński [2000] and Ambroziak [2012].

The price–quality method, thanks to its construction, allows us for elimination of influence of exchange rate and because of that it lets us make comparisons between longer periods of time.

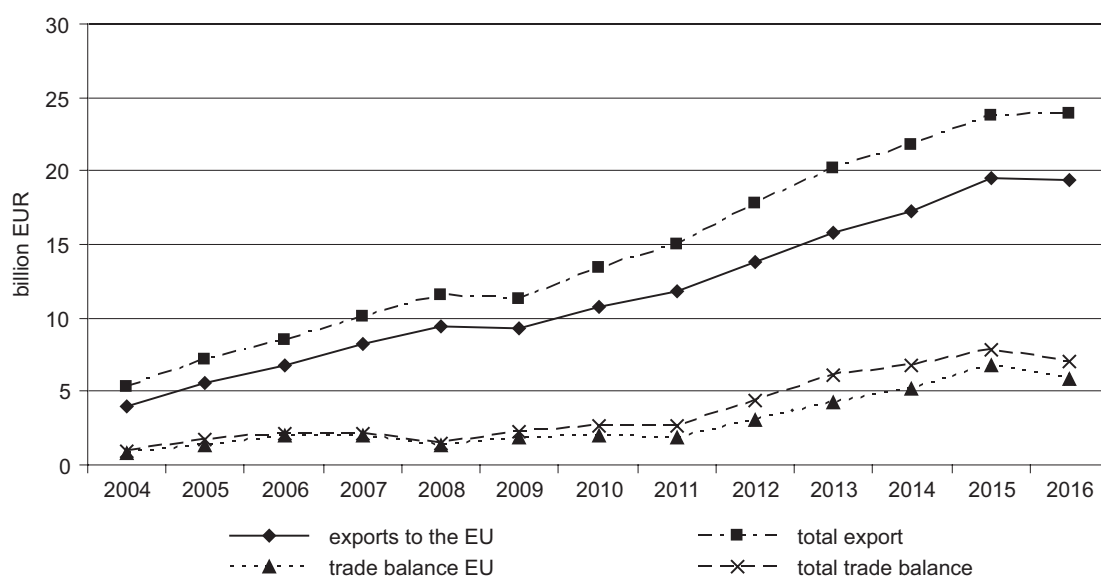


The analysis covered 26 groups of products which were selected taking into account their role in Polish agri-food export. At the same time products which were reexported from Poland but not produced here were eliminated from the analysis (i.e. wines). The analysis covered following groups of products: live animals, beef and veal, pork meat, poultry meat, fish, butter, cheese and curd, milk and cream, yoghurt and other milk drinks, eggs, honey, vegetables, apples and pears, soft fruits (strawberries, raspberries, blackberries etc.), wheat grain, other grains, wheat flour, chocolate and other products containing cocoa, sugar and confectionery, meat and fish products, flour and starch products, fruit and vegetable products, plant and animal fats, coffee, tea and spices, beer as well as non-alcoholic beverages (fruit juices excluded).

## ROLE OF AGRIFOOD TRADE IN POLAND

Agri-food sector plays an important role in Polish economy, also because of its export performance. After the accession to the EU the share of agri-food export in total Polish export has raised significantly from 8% in 2004. Since 2014 the share of agri-food products in total export has exceeded 13% and the whole sector has noted the positive foreign trade balance [Grzelak and Roszko-Wójtowicz 2016].

Up to 2002 Poland was a net importer of agri-food products, but just before the accession – in 2003 – the trade balance in agri-food products became positive. Since that year Poland has permanently been noting the surplus in agri-food products [Stańko and Mikula 2014], which until 2015 was increasing. Positive value of turnover in foreign trade, its level and structure illustrate the state of comparative advantages possessed by the certain branches of the sector [Poczta and Pawlak 2006].



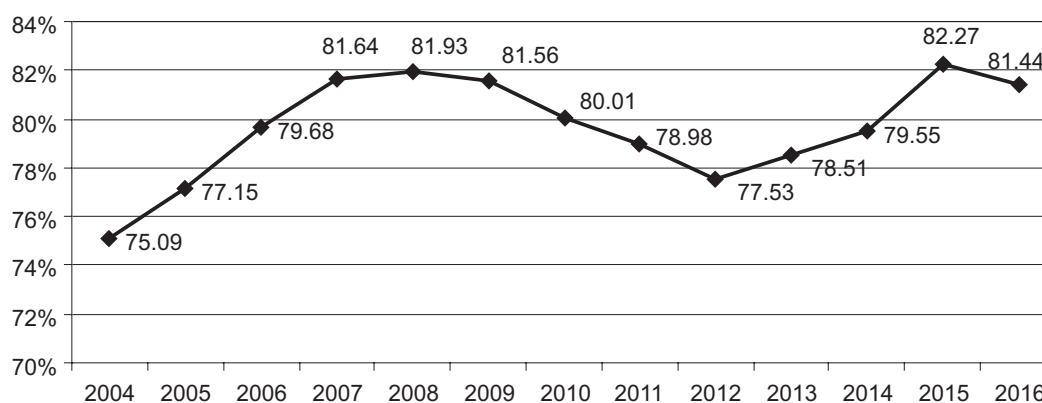
**Fig. 1.** Export and trade balance in agri-food products between Poland and other EU countries in years 2004–2016

Source: Own elaboration based on data available in Comext Eurostat database.

Value of Polish agri-food export to the other EU countries in the period 2004–2015 has increased five times, from 3.9 to 19.5 billion EUR. This rise was stopped for a moment in 2009 as a result of decrease of demand and the worsening economic situation in some states buying Polish food. In 2009 agri-food export from Poland to

other EU countries had decreased to 9.3 billion EUR, from 9.5, but in 2010 it increased to 10.7 and from that year it constantly rises (Fig. 1). In 2016 the slight decrease of export to the other EU countries was noted and export reached 19.3 billion EUR.

The trade surplus in food products in the period 2004–2015 has increased nine times from 0.88 to 7.84 billion EUR in 2015, although in 2016 it slightly decreased. The trade surplus in a trade with other EU countries in the period 2004–2015 has increased nine times, too, from 0.77 to 6.74 billion EUR in 2015, although in 2016 it decreased reaching 5.84.



**Fig. 2.** Share of EU countries in Polish agri-food export in 2004–2016

Source: Own elaboration based on data available in Comext Eurostat database.

After the EU accession other member states became key buyers of agri-food products from Poland. In the period 2004–2016 around 4/5 of Polish agri-food exports was directed to markets of other EU countries (Fig. 2). In 2015 more than 82% of Polish agri-food export was sold to other EU Member States. This can lead us to the conclusion that on the EU market Polish producers located some part of products which previously were sold to Russian Federation and since August 2014 they had to be directed to other markets because of the implemented ban. In the following years EU Member States will remain the most important trade partners of Poland.

## RESULTS AND DISCUSSION

Identification of changes in relations between export and import prices as well as quantitative trade balance in certain groups of food products allowed Authors to evaluate changes of sources of Polish food producers' competitiveness on the EU market in an analyzed period.

In order to evaluate the competitive advantages of Polish food producers Authors made an assumption after Aiginger that the most desirable way of competing on foreign markets is a successful quality competition. It allows the producers to note a positive quantitative trade balance in certain group of products and gain higher prices of exported products in comparison to similar imported ones at the same time. It can be assumed that the branches in which this way of competing dominates have potential to succeed on foreign markets.

The results of conducted research show that in the period 2004–2016 the strategy of successful quality competition on EU markets was dominating for eight analyzed groups of products, including beef meat, pork meat and meat and fish products (Table 2). Gained results are convergent to the results of previous research showing that by competitiveness of meat production and processing Poland has strong competitive advantages and remains one of the most important meat processors within EU [Guzek 1999, Wijnands and Verhoog 2016].

**Table 2.** Dominating competitive advantages of Polish food producers on EU market

Factor	Relation of prices in export to prices in import above or equal to 1	Relation of prices in export to prices in import below 1
Quantity trade balance above or equal to 0	beef meat	grain (excl. wheat grain)
	poultry meat	wheat flour
	yoghurts and other milk drinks	eggs
	vegetables	butter
	wheat grain	cheese and curd
	meat and fish products	apples and pears
	flour and starch products	sugar and confectionery
	fruit and vegetable products	beer
	chocolate and other products containing cocoa	non-alcoholic beverages (excl. fruit juices)
	Quantity trade balance below 0	live animals
honey		plant and animal fats
fish		
soft fruits (i.e. strawberries, raspberries, blackberries)		
coffee, tea, spices		

Source: Own elaboration based on data available in Comext Eurostat database.

Strategy of competing by quality was also realized by vegetable producers and fruit and vegetable processors. On EU markets producers of wheat grain, flour and starch products and chocolate producers were successfully competing with high quality (Table 2).

Gained results proved that in nine analyzed groups of commodities Polish exporters competed with lower prices. This strategy was mostly implemented by entities from dairy sector for butter, cheese and curds. Among products for which strategy of lower price competitiveness was dominating we can also indicate grain of cereals (excluding wheat), wheat flour, eggs, apples and pears, sugar and confectionery, non-alcoholic beverages (excluding fruit juices) and beer (Table 2).

The obtained results have also shown that the perspectives for successful quality competition on EU markets were gained by producers of live animals, fish, soft fruit and honey. In addition the potentially successful strategy of quality competition was realized by producers of coffee, tea and spices. In this case (similar to the issue of chocolate production) imported raw materials were processed and packaged in factories located in Poland and after that they were reexported as a final product of higher value added (Table 2).

Research conducted with price-quality method let Authors appear that in two groups of products processors used unsuccessful strategy of low price competition. These were pork meat and plant and animal fats (Table 2).

For measuring the international competitiveness of food sector level of prices are vital from the perspective of position on international markets. What is more, gained advantages play a crucial role for most of agricultural products [Juchniewicz 2006].

As a result of the conducted research it has been proved that Polish producers maintained the price advantages held in the year of EU accession [Szczepaniak 2009, 2012] – Table 3. Relations of unit prices gained in export and import of dairy products did not indicate significant chances. All of analyzed groups of dairy products

**Table 3.** Relation between export and import prices in agri-food trade between Poland and EU member states in the period 2004–2016

Group of products	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Average 2004– 2016
Live animals (HS 01)	0.76	1.15	1.04	1.13	1.16	1.27	1.09	1.18	1.16	1.11	1.15	1.24	1.06	1.12
Beef meat and veal (HS 0201 and HS 0202)	1.50	1.25	0.98	0.87	0.91	0.91	1.01	1.00	1.10	0.95	1.02	1.23	1.14	1.07
Pork meat (HS 0203)	1.05	1.02	0.86	0.86	0.95	1.09	0.97	1.02	0.99	0.97	0.94	0.94	0.96	0.97
Poultry meat (HS 0207)	3.59	2.93	3.10	2.98	2.16	1.94	1.89	2.17	2.33	1.89	1.50	1.26	1.18	2.22
Fish, molluscs and crustaceans (HS 03)	3.01	2.23	2.19	1.80	1.86	1.40	1.66	1.80	1.68	1.50	1.79	1.51	1.68	1.85
Yoghurts and other milk drinks (HS 0403)	1.08	0.74	0.90	1.10	1.09	0.85	0.95	0.87	0.87	0.77	0.76	0.82	0.96	0.90
Butter (HS 0405)	0.94	0.74	0.79	0.93	0.78	0.83	0.86	0.90	0.76	0.84	0.84	0.82	0.78	0.83
Cheese and curd (HS 0406)	0.76	0.89	0.86	0.87	0.91	0.87	0.91	0.95	0.91	0.91	0.83	0.76	0.81	0.86
Eggs (HS 0407 i 0408)	0.79	0.58	0.82	0.88	0.66	0.69	0.91	1.14	0.64	0.68	0.70	0.69	0.69	0.76
Natural honey (HS 0409)	1.34	2.19	1.38	1.35	1.11	0.91	1.08	1.04	1.08	1.04	1.10	1.10	0.62	1.18
Vegetables (HS 07)	1.00	0.98	1.14	1.21	1.09	1.14	1.38	1.33	0.95	0.94	1.22	1.04	0.98	1.11
Apples and pears (HS 0808)	0.36	0.56	0.50	0.96	0.52	0.48	0.61	0.67	0.64	0.57	0.48	0.52	0.47	0.56
Strawberries, raspberries, blackberries and other soft fruits (HS 0810)	1.04	1.18	1.15	1.76	1.28	1.39	1.51	1.37	1.56	1.54	1.47	1.92	2.02	1.48
Coffee, tea and spices (HS 09)	1.56	1.78	1.43	1.62	1.88	2.00	1.82	1.79	1.75	1.68	1.62	1.81	1.89	1.74
Wheat grain (HS 1001)	0.88	1.13	0.94	1.28	0.91	1.26	1.16	0.99	1.13	1.09	1.11	1.08	1.19	1.09
Wheat flour (HS 1010)	0.95	0.96	0.90	1.16	0.81	0.62	0.70	0.80	0.82	0.78	0.77	0.82	0.77	0.84
Plant and animal fats (HS 15)	0.94	0.96	1.03	0.87	0.92	0.81	0.76	0.86	0.85	0.83	0.76	0.73	0.76	0.85
Meat and fish products (HS 16)	1.44	1.16	1.24	1.20	1.17	1.00	1.01	0.90	0.91	0.97	1.05	1.03	0.98	1.08
Sugar and confectionery (HS 17)	0.57	0.57	0.60	0.75	0.71	1.00	0.89	1.01	1.01	0.84	0.80	0.75	0.85	0.80
Chocolate and other products containing cocoa (HS 1806)	0.85	1.29	1.62	1.20	1.09	1.27	1.21	1.16	1.11	1.16	1.15	1.14	1.14	1.18
Cereal, flour and starch products (HS 19)	1.27	1.44	1.42	1.50	1.40	1.25	1.22	1.17	1.17	1.19	1.21	1.28	1.29	1.29
Fruit, vegetables and nut products (HS 20)	0.98	1.06	1.15	1.34	1.27	0.95	0.96	1.30	1.15	1.08	0.98	0.93	0.97	1.09
Non-alcoholic beverages, excl. fruit juices (HS 2202)	0.62	0.54	0.54	0.63	0.73	0.49	0.57	0.75	0.72	0.68	0.80	0.76	0.56	0.65
Beer (HS 2203)	0.76	1.41	1.75	0.93	0.70	0.59	0.59	0.60	0.63	0.70	0.87	0.81	0.73	0.85

Source: Own elaboration based on data available in Comext Eurostat database.

(yoghurts, butter, cheese and curd) maintained the positive price relations in comparison to imported assortment. Price advantages were also preserved by producers of eggs, apples and pears, sugar and confectionery, non-alcoholic beverages and beer.

On the basis of results of conducted research we can tell that poultry meat producers and fish producers have been improving their price competitiveness on EU market. During the post-accession period the price relations between export and import of this assortment have visibly decreased.

For pork meat, meat and fish products, vegetables as well as fruit and vegetables products unit prices of exported assortment were similar to prices paid for imported products. In case of soft fruit (i.e. strawberries, raspberries, blackberries etc.) and coffee, tea and spices prices reached in export were higher than prices of imported assortment through the whole post-accession period.

## CONCLUSIONS

Processes observed in the world economy result in the increasing competition between acting entities. Because of strengthening economic rivalry on national markets and outside them it is crucial to gain and widen the competitive advantages of enterprises, branches and sectors in order to get and maintain the best possible position in relation to the competitors. This takes place because competitive position is created by the wide range of economic and non-economic factors. Consequently it is shaped again and again and it definitely needs constant observation. It also applies to Polish agri-food sector, which with 13% shares in total export of the country and trade surplus is an important in national economy.

The other EU Member States are and in the following years will remain, important partners in Polish agri-food trade. In the analyzed years 2004–2016 ca. 4/5 of Polish agri-food export was directed to other Member States. On this important market Polish food producers have shown different advantages depending on commodity. The effective use of these advantages resulted in export success of the whole Polish food industry.

The most visible quality advantages were identified for beef meat, poultry meat, meat and fish products, flour and starch products, chocolate and other products containing cocoa, as well as for wheat grain. Producers of this assortment were able to compete successfully on EU markets by quality, which let them gain higher prices, higher margins and more stable prices for their products.

Quality advantages which effective use would create possibilities of successful quality competition were identified for the following commodity groups: live animals, fish, soft fruit, honey, as well as coffee, tea and spices. The results of research show that exporters were managing to compete with quality what can be very promising and successful in the future. In case of pork meat and fats neither quality advantages nor price advantages were identified.

In the export of such commodities, as: butter, cheese and curd, cereal grain (excluding wheat grain), wheat flour, eggs, apples and pears, sugar and confectionery, non-alcoholic beverages (excluding fruit juices) and beer, Polish exporters have shown the price advantages which were mainly the result of lower costs of production. Price advantages and their utilization let them gain new foreign markets effectively thanks to the possibility of offering more attractive pricing conditions.

Polish producers of most of products covered by the analysis affirmed the price advantages identified after accession to the EU. But there is a threat that these advantages can be lost or significantly limited due to the progressing trade liberalization expressed i.e. by bilateral trade agreements negotiated at the moment by the EU.

The results of conducted analyses proved that in the period 2004–2016 national producers of the certain assortment operated efficiently on markets of other EU Member States. Efficient utilization of existing advantages will be a crucial condition influencing the future export performance of the whole Polish agri-food sector on both EU markets and in the third countries.

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## **CENOWE I JAKOŚCIOWE PRZEWAGI KONKURENCYJNE POLSKICH PRODUCENTÓW ŻYWNOSCI NA RYNKU UNII EUROPEJSKIEJ W OKRESIE POAKCESYJNYM**

### **STRESZCZENIE**

Procesy i zjawiska zachodzące w gospodarce światowej powodują, że wzrasta konkurencja na wielu rynkach, również żywnościowych. To współzawodnictwo wygrywiają podmioty, sektory i kraje, które mają przewagi kształtujące ich konkurencyjność. Można zidentyfikować różne źródła przewag konkurencyjnych producentów żywności. Najczęściej wskazywanymi są przewagi cenowe oraz jakościowe. Celem niniejszego artykułu jest określenie źródeł przewag konkurencyjnych polskich producentów żywności w Unii Europejskiej w latach 2004–2016. Analiza została przeprowadzona w podziale na 26 grup produktowych zidentyfikowanych na podstawie ich znaczenia dla polskiego eksportu produktów rolno-spożywczych. Obserwacja wieloletnia pozwoliła na wskazanie dominujących strategii konkurowania polskich producentów żywności realizowanych na rynku unijnym. Analizę przeprowadzono z wykorzystaniem metody cenowo-jakościowej Aigingera na podstawie danych dostępnych w bazie Comext Eurostat.

**Słowa kluczowe:** konkurencyjność, przewagi konkurencyjne, sektor rolno-spożywczy, producenci żywności, handel produktami rolno-spożywczymi, metoda cenowo-jakościowa, metoda Aigingera

## MECHANISMS OF SUPPORTING INFORMATION MANAGEMENT IN AGRICULTURE

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### ABSTRACT

Considering the aspect of the role of information in the development of Polish agriculture, one should pay attention to the existing needs in this field, as well as to the existing support mechanisms stimulating the activity of the agricultural producers' community in obtaining professional information in the form of e.g. consulting or the use of the training offered. At the same time, it should be noted that often the barrier in keeping abreast is not the lack of activity on the part of producers, but the cost associated with it. That is why it is so important to initiate actions, which, on the one hand, serve boosting the efforts of agricultural producers to seek professional knowledge (information), and on the other hand, creating the possibility of compensation for costs incurred in this respect. Given the above, the main objective of this paper is the analysis of the level of implementation of the measures implemented under the Rural Development Programme 2007–2013. The study takes into account the farmers' computer equipment level and access to the Internet compared to other social groups. Analysis of the distribution of funds to each voivodship showed that the allocation of funds was uneven, and this applied to all analysed measures. In the most part, agricultural producers already have the necessary information infrastructure, but its use is insufficient.

**Key words:** agriculture, EU funds, training, information, ICT

### INTRODUCTION

The ability to efficiently obtain information and, consequently, knowledge, depends mainly on two groups of factors. The first is the agricultural producers' ability to acquire knowledge. In this case, one should take into account, among others, the ability to acquire knowledge – “the knowledge about the sources of knowledge”, and the willingness to learn. Also important here is access to the sources of knowledge. The second group of factors is related to the resources of obtainable information. Apart from the aspect of quantity, important is the accessibility of the necessary information, or the linkage between complementary sources of knowledge [Janc 2013]. In the twenty-first century, information is the ubiquitous part of business processes, and its importance continues to grow. But it is choosing the right tools to gather information, and processing it, that becomes a problem. In today's economy, information is seen as one of key and strategic resources. It becomes an asset that has a specific value for companies [Macias, 2008]. The importance of information efficiency highlights also by other authors [Parlińska 2010, Babiak and Parlińska 2014].

Agriculture, like other businesses, becomes increasingly dependent on modern technologies, which themselves require possession of specific information resources. Besides, there are noticeable changes in the environmental conditions and in the agriculture itself (growing importance of the so-called GRIN technologies, i.e.

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genetics, robotics, Internet and nanotechnology). All these processes require the producers to have knowledge of a wide range of areas. Quick access to information, keeping up with global trends, obtainability of information on markets, on dealing with suppliers, customers, co-producers – are all necessary for the agricultural producer. Therefore, in connection with the political, technological and socioeconomic changes in agriculture, it is necessary for producers to constantly obtain information, and to supplement their knowledge and skills [Lorencowicz and Figurski 2008, Janc 2013]. Accordingly, one must agree with the opinion of Sajna et al. [2013] Szeląg-Sikora et al. [2015], who wrote in their work that in the modern economy, after the repeal of the paradigm of perfect information, the role of information in gaining a competitive advantage in all sectors becomes increasingly evident. This applies not only to obtaining information on the market, competition or innovation from the enterprise's environment, but that, which is obtained from within the company as well (e.g. in creating business plans, a marketing strategy). The responsibility of the person managing the enterprise is to select information and adequate analysis, regardless of the industry in which the business operations are conducted. Properly selected information can serve the manager as a tool of control and evaluation. For this purpose, the manager must learn the distinguishing characteristics of useful information [Griffin 2007]. Useful information should have the characteristics shown in Table 1.

**Table 1.** Features of useful information

Feature	Description of the feature
Accuracy	Information is appropriate when it reflects reality accurately and reliably
Topicality	Topical information is available in time for the manager to take up appropriate action
Completeness	Information is complete when it provides the manager with all the necessary facts and details
Adequacy	Information is adequate when the manager is confident that the information is useful in the specific conditions of the business, and in relation to its needs

Source: Griffin [2007], Sajna et al. [2013].

To meet the information needs of the agricultural sector, it became necessary to create mechanisms to support the stimulation of the agricultural producers' activity in obtaining broadly defined information. Therefore, apart from the existing consulting system in the form of, e.g. the functioning agricultural consulting centres, in the Common Agricultural Policy for 2007–2013 implemented were measures facilitating the raising of awareness and providing the possibility of reimbursement of the costs associated with the use of paid information and consulting services. An important element supporting the acquisition and management of knowledge is the sufficient technical infrastructure, i.e. computer hardware. In combination with the Internet, it is one of the major carriers of information. Also, this aspect was taken into account by the existing support mechanisms, in the form of the completed measures of the Rural Development Programme (2007–2013), including the measure “Modernisation of agricultural holdings”, under which it was possible to obtain co-financing for the purchase of said infrastructure.

As a result of consideration, the main objective of this paper is the analysis of the level of implementation of the measures under the Rural Development Programme 2007–2013, i.e. “Use of consulting services by agricultural producers and forest owners” and “Vocational training for persons employed in agriculture and forestry”. The current research in the field of agricultural information conducted by the authors [Cupiał 2006, Szeląg-Sikora and Cupiał 2010] led to the recognition of the necessity to refine the analysis. What requires identification is the level of expenditure of available funding for the purchase of computer equipment being a supporting element in the acquisition and management of information. Also analysed was the data relating to level of allocation of funds for computer equipment in the measure “Modernisation of agricultural holdings RDP 2007–2013” in the region of Małopolska.

## **MATERIAL AND METHODS**

The paper analyses the level of utilisation of the selected existing support mechanisms of obtaining information used by Polish agricultural producers. The source data were obtained from the Agency for Restructuring and Modernisation of Agriculture ([arimr.gov.pl](http://arimr.gov.pl)). The time range of the analysed data related to the accession period 2007–2013. The work uses comparative analysis, and the main grouping variable is the country's territorial division (voivodships). In case of the analysed measure “Modernisation of agricultural holdings”, details as to the final allocation of the obtained funding (for the purchase of computer equipment) was acquired at the level of Małopolskie Province, and the analysis takes into consideration the direction of production of the studied holdings.

### **Measure “Vocational training for persons employed in agriculture and forestry”**

The conditions and procedures for granting assistance was determined the Regulation of the Minister of Agriculture and Rural Development dated 7 July 2009 on detailed conditions and procedures for granting financial assistance under the measure “Vocational training for persons employed in agriculture and forestry” under the Rural Development Programme for 2007–2013” (Journal of Laws 2009 No 113, item 944, as amended) – the implementing regulation for the measure. Its purpose was free professional training for agricultural producers and forest owners, leading to the restructuring and modernization of agriculture, to increase the competitiveness and profitability of agricultural or forestry businesses, and to meet the national and EU standards. Chosen in a competition, the beneficiaries of the measure were private or public training institutions and companies, as well as their consortiums, experienced in organizing training courses for agricultural producers and forest owners, with adequate teaching staff and training facilities and meeting the conditions set out in the above-cited implementing regulation for the measure. Beneficiaries of the measure could be reimbursed up to 100% of eligible costs incurred (eligible costs include VAT) that have been specified in detail in the above implementing regulation for the measure.

### **Measure “Use of consulting services by agricultural producers and forest owners”**

It was a mechanism in the form of reimbursement of costs incurred for the provision of consulting services for individuals, legal persons or organizations without legal personality. The applicant was obliged to run an agricultural holding. The grant had a form of a refund and amounted to 80% of the incurred and documented eligible costs for consulting services (without VAT), and the amount received under this measure during the period covered by the RDP 2007–2013 could not exceed the equivalent of 1,500 EUR. The substantive scope of reimbursable services was very broad; from those relating directly to the agricultural production, i.e. good forestry practices, to those in the area of agribusiness, i.e. developing business plans.

### **Measure “Modernization of agricultural holdings”**

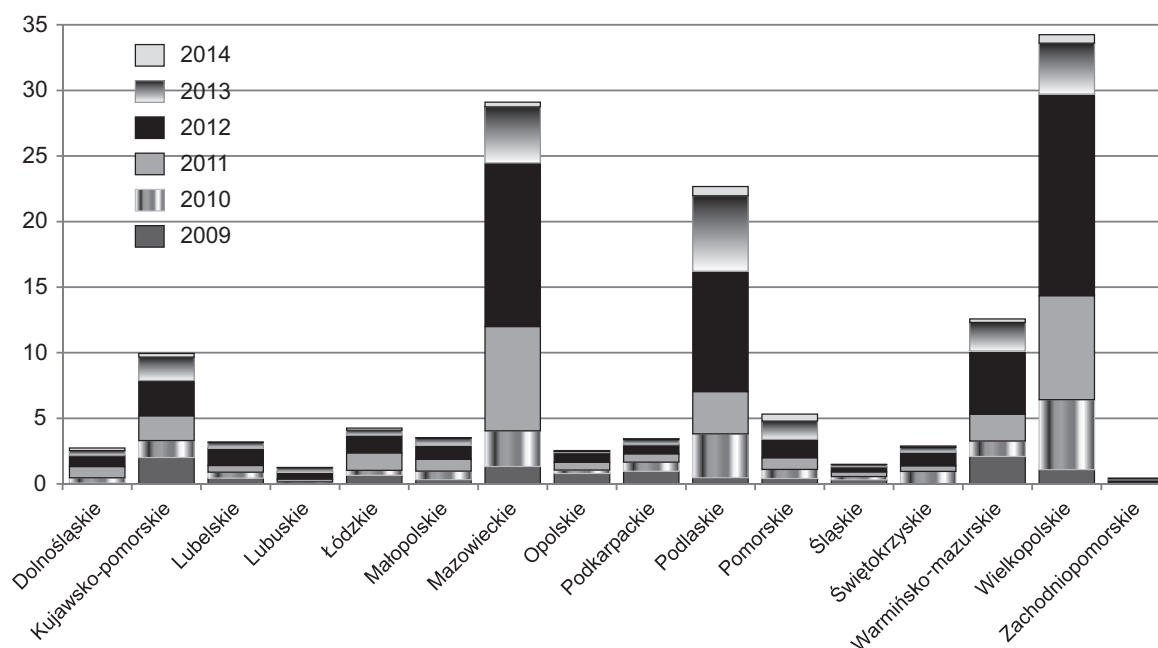
The measure was to support the modernization of agricultural holdings in order to increase their efficiency by, among others, introduction of new production technologies. The beneficiaries were individuals, legal persons and partnerships running an agricultural holding. The criteria for accessing funding under this measure assumed that the implemented project will contribute to improving the overall performance of the holding. The agricultural holding, to which the investment related to, had to be economically viable (the economic size of the applying holding was at least equal to 4 ESU) and was run by a person with appropriate professional qualifications. As part of this measure, supported were tangible and intangible investments to modernize agricultural production, including the purchase of computer equipment. This aid was in the form of refunds from 40 to 60% of eligible investment costs. The maximum amount of aid granted to one beneficiary and one holding under the measure, during the implementation of the RDP 2007–2013 could not exceed 300 000 PLN. Accepted could be investments, which amount of eligible costs was over 20 000 PLN ([www.arimr.gov.pl](http://www.arimr.gov.pl)).

To fully meet the adopted objective of the work, a field research was carried out. It allowed gathering source information on, e.g. the areas of information sought by agricultural producers. The analysis of data obtained from the Central Statistical Office (GUS) allowed also to determine the villagers' activity in using modern information technology.

## RESULTS AND DISCUSSION

The amount of funds per individual voivodships in the measure, “Use of consulting services by agricultural producers and forest owners RDP 2007–2013” is shown in Figure 1 (part of the funds was also released in 2014). The total number of applications in this measure, amounting to 250,400,000 PLN, was 65,780, pursuant to which 47,110 decisions were issued, amounting to 139,610,000 PLN. On average, one grant amounted to 2,960 PLN, with the highest amount in Mazowieckie Province (3,740 PLN) and the lowest in Zachodniopomorskie Province (1,640 PLN).

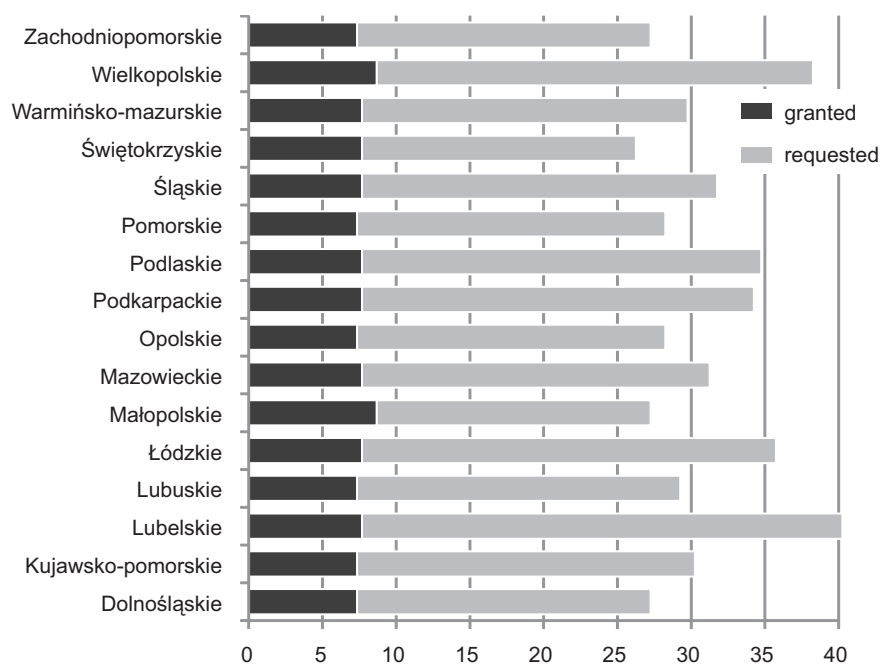
On analysing allocation of funds in individual provinces, significant disparities can be observed. Over 45% of the allocated funds went to two provinces: Mazowieckie and Wielkopolskie, and after adding Podlaskie Province, the amount was 62%. The least funds went to Zachodniopomorskie Province. It is worth noting that the biggest spending coincided with the year 2012, driven primarily by three voivodships with the highest absorption of funds.



**Fig. 1.** The amount of funds per province in the measure “Use of consulting services by agricultural producers and forest owners RDP 2007–2013”

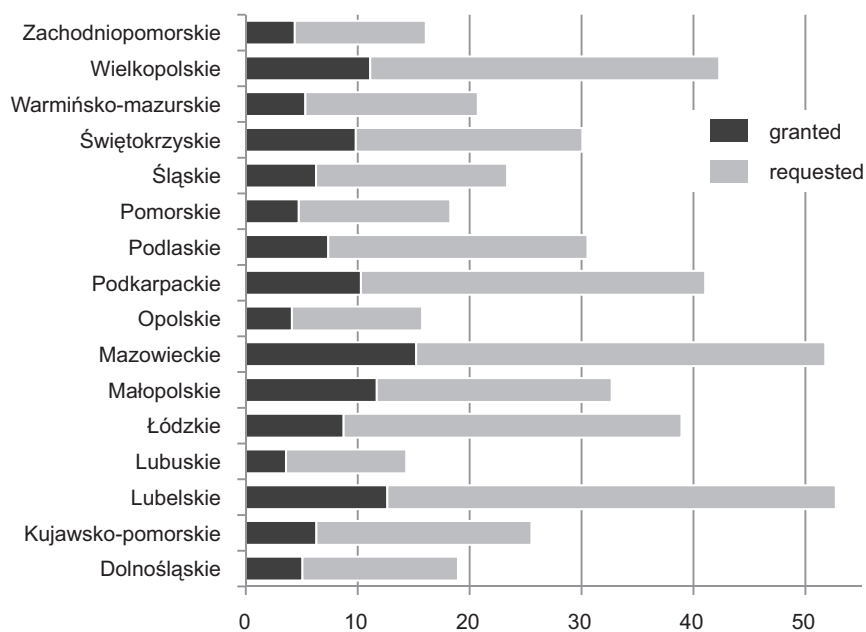
Source: Own study based on the Agency for Restructuring and Modernisation of Agriculture (ARiMR).

Figures 2 and 3 illustrate the level of implementation of the measure “Vocational training for persons employed in agriculture and forestry RDP 2007–2013” in individual regions (since part of the training was carried out in several voivodships, in such cases the amount of separated proportionally). The total number



**Fig. 2.** The number of applications in the measure “Vocational training for persons employed in agriculture and forestry RDP 2007–2013”

Source: Own study based on the Agency for Restructuring and Modernisation of Agriculture (ARiMR).



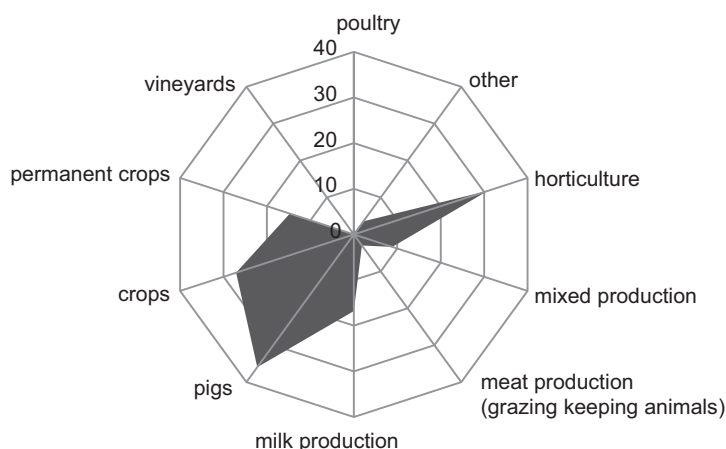
**Fig. 3.** The amount of funding in the measure “Vocational training for persons employed in agriculture and forestry RDP 2007–2013”

Source: Own study based on the Agency for Restructuring and Modernisation of Agriculture (ARiMR).

of applications in this measure, amounting to 473,140,000 PLN, was 500, pursuant to which 123 decisions were issued, amounting to 126,830,000 PLN. The average grant amount per beneficiary was 1,030,000 PLN. The drawings present the number and the amount of applications, as well as the share of applications that received funding. It should be noted that the disparity in the amount of funding (granted and applied for) in the provinces is much higher than the corresponding number of applications. The largest grant per application occurred, as in the previously analyzed measure, in Mazowieckie Province (1,980,000 PLN) and the lowest in Lubelskie Province (490,000 PLN).

The most effective raising of funds was recorded in Małopolskie Province, where 36% of the amount requested was granted (32% of applications), while the least, in Łódzkie Province (22% of applications and the amount). On average, beneficiaries received 27% of the funds. As in the previous measure, the largest amount was allocated in Mazowieckie Province, while the lowest in Lubuskie Province.

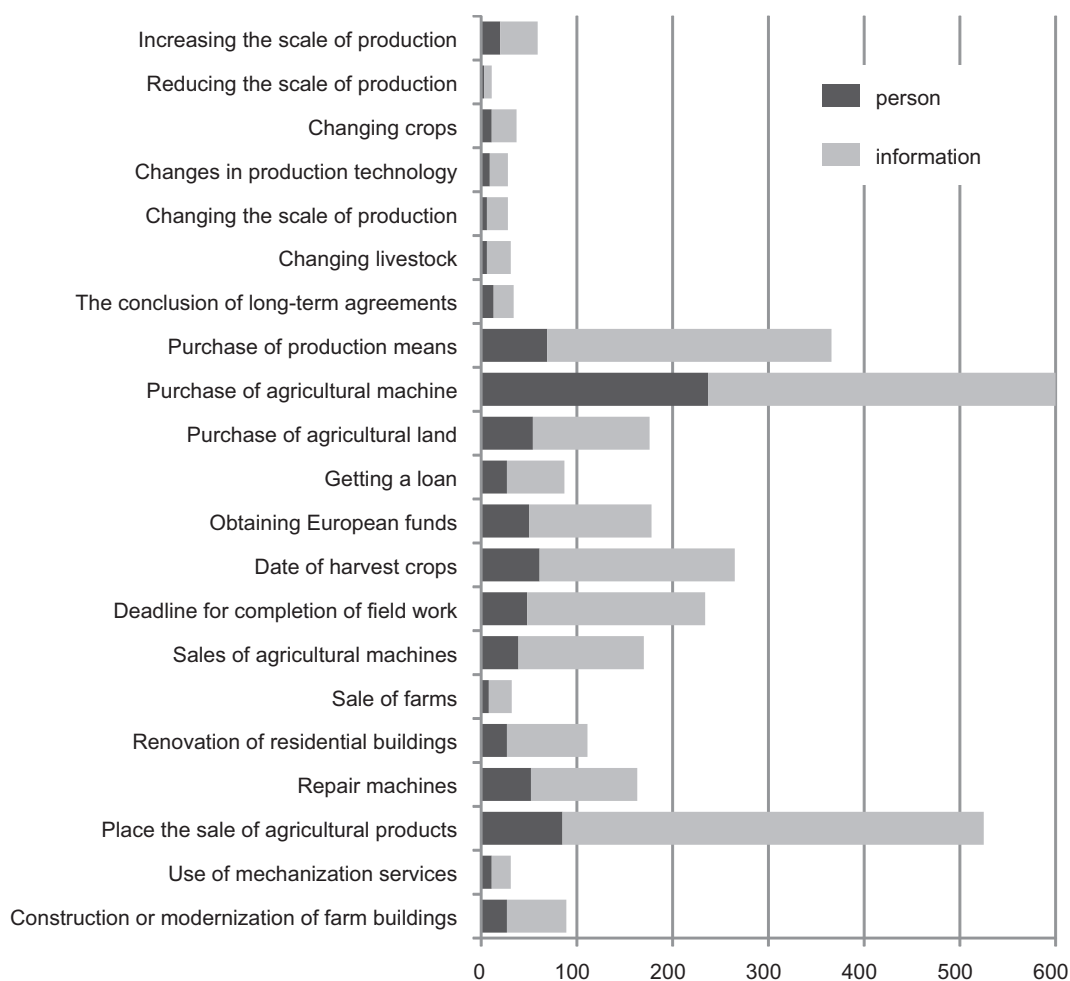
One of the primary media is computer equipment. Figure 4 presents the allocations of funds for computer equipment in the measure “Modernisation of agricultural holdings RDP 2007–2013”, depending on the direction of production. The research relates to Małopolskie Province. According to research, these devices were purchased mainly by pig holdings, and to a lesser extent, gardening holdings. In total, agricultural producers allocated 140,800 PLN of grants to the purchase of computers, which constituted only 0.03% of the amount granted under this measure.



**Fig. 4.** Allocation of funds for computer equipment in the measure “Modernisation of agricultural holdings RDP 2007–2013” in Małopolskie Province, per the direction of production (thou. PLN)

Source: Own study based on the Agency for Restructuring and Modernisation of Agriculture (ARiMR).

The existing support mechanisms should equip agricultural holders with adequate knowledge for conducting their operations efficiently and effectively. Figure 5 shows the results of a survey conducted in agricultural holdings in southern Poland, related to information currently obtained by agricultural producers. The most frequently acquired information related to the purchase of agricultural machinery. Such information was sought by most respondents, and repeatedly, too. Probably, such importance of this information stems from the possibility of obtaining aid for the purchase of agricultural equipment. But perhaps in another study period, this share would also be significant. Very significant for the producer are also the market information related to the sales of agricultural products and the purchase of the means of production.



**Fig. 5.** The number of person and the amount of information obtained by the surveyed producers in making production decisions in individual per year

Source: Own study.

The question whether farmers are willing to use modern media is answered by specific data included in Table 2. The data refer to 2014, but it should be mentioned that in the current year the computer equipment and Internet access rate has exceeded 80%, and Internet access in rural areas reached 77.8%. Please note that as far as indicators of computer equipment in rural areas lag behind the national average, in the case of farmers they generally exceed this average. On the other hand, expenditure on Internet access in rural areas (including producers) are much higher than in urban areas. It is significant that in terms of Internet use, producers are significantly superseded by the national average in each of the presented indicators.

We can conclude that for the most part, agricultural producers already have the necessary infrastructure, but its use is still too scarce. Another motivating factor should be the fact that indicators of ICT usage in our country continues to lag behind the European Union average.

**Table 2.** Differences in the use of information technology in selected groups of people

Specification	Total	Village	Agricultural producers
Household equipment (%) <sup>a</sup>			
Households with a PC	77.9	75.0	83.1
– with Internet access	75.8	72.0	82.1
– broadband	71.0	64.7	76.0
– mobile broadband	28.2	24.9	31.2
Households incurring expenditure on ICT	75.3	71.6	80.8
– on computer hardware, equipment, accessories and other	46.8	44.6	52.5
– on software	18.0	16.6	16.0
– on Internet-based services	74.5	70.4	79.6
The value of expenditure on ICT (PLN) <sup>a</sup>			
– on computer hardware, equipment, accessories and other	41.44	39.27	39.44
– on software	5.39	4.96	3.57
– on Internet-based services	53.17	55.77	57.00
Use of the Internet (%)			
To access information	57.4		45.3
– research on goods or services	42.2		33.0
– downloading computer programs	11.1		3.2
– reading on-line newspapers or magazines	46.6		33.7
– research on health-related information	28.3		19.5
– information on education or training offers	18.3		7.9
– use of on-line dictionaries and encyclopedias	29.8		15.1
For educational and professional purposes	9.9		1.8
– participation in an on-line course	2.6		0.3
– other training materials	6.9		0.9
– contacting an instructor/teacher	2.7		0.8
On-line administration services	26.6		11.7
Ordering goods or services	36.9		23.8

<sup>a</sup> Household in which there is at least one person who is an agricultural producer.

ICT – information and communication technologies.

Source: Own study based on the Central Statistical Office (GUS).

## CONCLUSION

Considerable resources allocated for the implementation of the three analyzed measures, undoubtedly affect the availability of information for agricultural producers. Producers are searching for a lot of information, and as shown by field studies, they bear the costs of it, declaring willingness to spend even larger amounts. This shows that farmers appreciate the importance of information in the modern world, and especially in supporting their business. Analysis of the distribution of funds to each voivodship showed that the allocation of funds was uneven, and this applied to all analysed measures. The largest amounts went to where the beneficiaries were more active, and it was not related to the degree of development of agriculture in the area, the size of farms and the size of agricultural production. Strengthening the competitive position of Polish agricultural producers in the international market must be supported by a variety of measures, to increase the level of use of agricultural information and tools used to obtain the data necessary for proper holding management. This applies both to information supporting the production processes, as well as for buying the means of production and selling the products. Supporting the measures improving the producers' knowledge is therefore necessary, both in the case of less technically and organizationally advanced holdings (in order to reduce their distance from the market-leading entities) and the most advanced (since these producers are the most open to innovation). It can be clearly stated that enhancing Polish agriculture, especially in the conditions of international competition, is not possible without conducting adequate subsidizing policies aimed at raising the level of knowledge, such as presented in this paper.

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## **MECHANIZMY WSPIERAJĄCE ZARZĄDZANIE INFORMACJĄ W ROLNICTWIE**

### **STRESZCZENIE**

Rozpatrując aspekt roli informacji w rozwoju polskiego rolnictwa, należy zwrócić uwagę na istniejące potrzeby oraz na istniejące mechanizmy wspierające pobudzenie aktywności społeczności rolniczej w zakresie pozyskiwania fachowej informacji w formie m.in. doradztwa czy korzystania ze oferowanych szkoleń. Równocześnie należy zaznaczyć, że barierą dla posiadania aktualnych informacji nie jest brak aktywności ze strony rolników, a koszty z tym związane. Z tego powodu podejmowanie działań służących pobudzeniu aktywności producentów rolnych w dążeniu do poszukiwania fachowej wiedzy oraz tworzenie możliwości rekompensaty kosztów ponoszonych z tego tytułu są bardzo ważne. Biorąc powyższe pod uwagę, za główny cel opracowania przyjęto ocenę poziomu realizacji działań w ramach Programu Rozwoju Obszarów Wiejskich 2007–2013. W badaniach uwzględniono poziom wyposażenia rolników w sprzęt komputerowy oraz dostęp do Internetu na tle pozostałych grup społecznych. Analiza dystrybucji środków w poszczególnych województwach wykazała, że ich alokacja była nierówna, a dotyczyło to wszystkich analizowanych działań. Większość producentów rolnych posiada już niezbędną infrastrukturę informacyjną, ale jej wykorzystanie jest wciąż niewystarczające.

**Słowa kluczowe:** rolnictwo, fundusze unijne, szkolenia, informacja, ICT

## FACTORS OF FUNCTIONING AND CHANCES OF DEVELOPMENT OF FISH INDUSTRY IN POLAND

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### ABSTRACT

The aim of the article is to present the factors of functioning, the chances of development and an assessment of attractiveness of the fish processing industry in Poland. There is a reference to competitive powers inside the industry, entrance barriers, substitution risks, a role of suppliers and purchasers as well as the arguments for an importance of aquaculture in functioning of the industry and an indication of the growing import level. The strong points and weak points of the industry are also determined with the use of Porter model, SWOT analysis and for statistical analysis Spearman rank correlation coefficient and tests of significance. The biggest chances of development in the industry have the big units that ensure a significant part of income for the industry and determine their economic situation. The small entrepreneurs are mainly oriented for a local sale because in their case the access barriers on a market are smaller and little experience is required. The analyses of academic literature and statistical data were used in the article.

**Key words:** fish industry, food industry, SWOT analysis of food industry

### INTRODUCTION

The accession of Poland to the European Union became a factor causing significant changes in the food sector and was supported by the development of agriculture and influenced on the gradual increase of the competitiveness of the whole food economy. One of the fastest developing food industry trades in Poland became fish processing because its complete restructuring and quality changes of products cause the increase of domestic demand and fish consumption. The accession of Poland to the European Union resulted in the Polish enterprises being provided with the Common Fishing Policy, which on the one hand created the necessity to comply with its requirements and on the other hand enabled development and modernization of the fish processing. A reliable technological advancement and a high technical productivity and work efficiency in connection with an improving quality of products determine the high competitiveness of Polish fish processing at the European scale [Czapliński 2011].

The main aim of the article is an attempt to indicate factors of functioning, chances of development and an assessment of attractiveness of the fish processing trade in Poland. The present state of fish processing shows the sufficient level of its development to provide fish supply for the domestic market and meet the expectations of purchasers. A complete restructuring of fish processing in the pre-accession period and the quality changes of products resulted in an increase of domestic demand and a fish consumption. For this reason the study refers in detail to the competitive forces inside the trade, access barriers, substitution risks, the role of suppliers and

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purchasers as well as defines the importance of aquaculture in the industry functioning and shows the growing level of import. The authors of the article decided to verify the thesis that the big units producing for the domestic and international market determine the development of fish industry whereas the small units have chances to support local markets. The studies were based on a method of analysis of academic literature and statistical data. The article determines strong and weak points of the industry supporting the conducted studies with Porter model, SWOT analysis, and in the case of statistical analysis the Spearman rank correlation coefficient and the tests of significance were used.

## **FISH TRADE IN THE FOOD INDUSTRY**

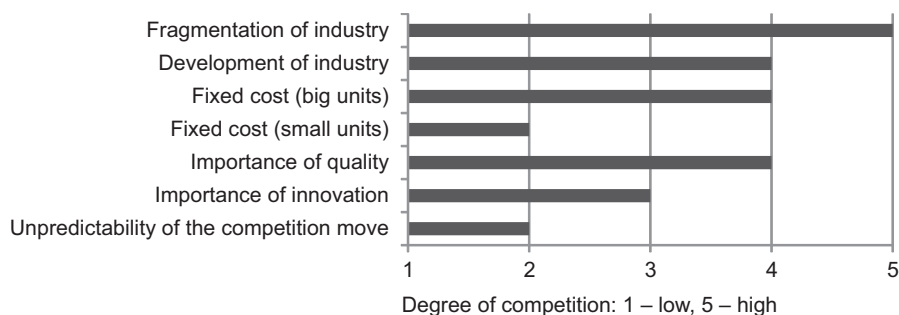
The growth of competition on a market results in the fact that the managers of economic units search for new perspectives that can strengthen their competitive position. This task is becoming more and more difficult because the conditions surrounded enterprises are characterized by great changeability and dynamics. One of the methods for an assessment of enterprises competitiveness is Porter model of five forces which belongs to the large set of methods of a strategic analysis of an organisation. Porter proposes to assess the enterprise activity by analysing five factors that influence on its attractiveness and are decisive for the present and future investors. These factors include: competition inside the sector; the risk of appearance of new products and producers; the risk of appearance of substitutes; the risk of appearance of new suppliers (their bargain power); the risk of purchasers' influence (their bargain power) [Gierszewska and Romanowska 2002]. The analysis of these factors was performed to show the organisational situation of the trade.

### **Internal competition**

The structure of the fish processing sector in Poland should be recognized as fragmented (Fig. 1). Most of enterprises (about 80%) belong to the sector of small and medium enterprises. According to the data of the Main Veterinary Inspectorate, in Poland at the end of 2014 there were functioning 253 fish processing entities that also possessed entitlements to trade in the European Union [MIR-PIB 2015]. It is worth to emphasize that as much as 53% of processing plants were located in the Pomeranian and West Pomeranian Voivodeships. The number of plants that were authorized to direct sale only on the local markets at the end of 2014 was 756 plants (109 more than in 2013). The main criterion of competition among plants is the size of a plant. This factor significantly influences on the amount of possessed assortment. The smaller units produce mainly salted and smoked fish [Koszarek 2005], which is determined by the possibility of incurring low costs and do not require to comply with too excessive quality standards. Large plants that have resources for investments are able to compete on the Polish fish market due to advanced production processes and sophisticated technological lines (Fig. 1).

A trend causing significant evolution of the market has been observed recently. This trend involves a complete change of consumers expectations. The society, taking into account health advantages, is more often choosing more expensive but good quality goods. As a consequence there is a growing pressure of competitiveness among the processing enterprises, that in order to survive on the market are obliged to meet more and more increasing consumers expectations.

Increased competition is also connected with a searching for new consumer groups. The important target groups became young people and children. A customer in a given segment can easily change a supplier. Wide offer selection means that the consumer often compares, what is better for them without the necessity of incurring additional costs. That is why the entities have to shape their sale strategy in such a way that a relation between a price and quality ensures that a given product will become competitive on the market (Fig. 1). It is not easy, because it depends on a number of factors that influence the competitiveness of a given company. They include the scale of activity, investments, technology that is used and developmental research being conducted. These activities require a lot of outwork funds, which triggers a need for searching for a new funding source. To retain the



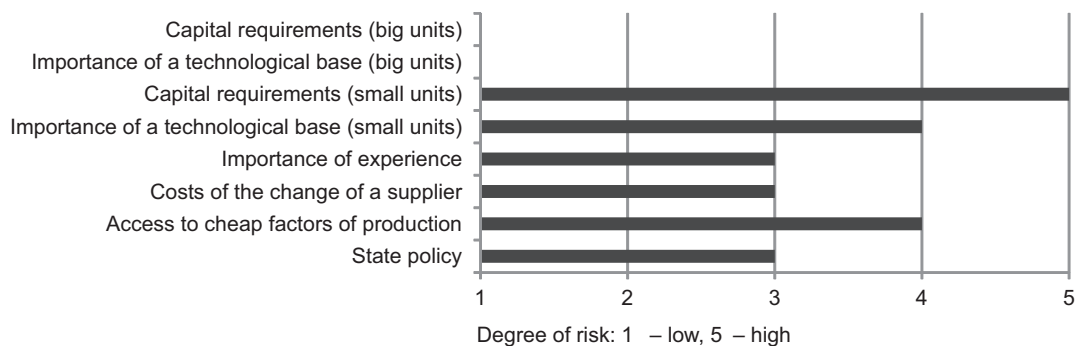
**Fig. 1.** Competition inside the fish processing trade

Source: Own studies.

appropriate quality standards of the manufactured goods it is crucial not only to purchase good quality resources but also to use suitable seasonings and put the products in an aesthetic packaging. However, it is the only way for an economic unit to be noticed by a potential consumer. It is worth paying attention to appearing risk at the moment of searching new directions of activity. In a phase of an entity initiation it is necessary to incur a lot of cost but only the biggest companies can afford that (Fig. 1). In case of inappropriate grade of a management and investment control it can be connected with great losses and as a consequence inability to produce a good quality product at an affordable price. It also cannot be forgotten that the process of creating new products requires fulfilment a number of technological requirements and a creation of appropriate organoleptic properties, which contributes to increase of costs incurred by an enterprise (Fig. 1).

### The risk of appearing new products and producers

The possibility of obtaining the right to enter the market forces the new units to give competitive prices or an attractive product offer. The appearance of new innovative entities causes an essential risk of decreasing profitability of the existing companies. However, their entrance can be made difficult by certain barriers which are presented below (Fig. 2). Small enterprises as well as big enterprises with significant capital diversity are functioning on the fish industry market. The biggest players on the fish market consolidate the trade by adding to their capital group smaller partnerships. For the reason of the scale of activity they possess a substantial capital which leads to the limitation of the number of potential new enterprises. In the case of the local sellers the costs are not high. An important factor in the case of big units is to possess a technological base and experience



**Fig. 2.** A degree of risk of new enterprises entering the fish processing industry

Source: Own studies.

gained for years. The relationships between a consumer and a producer often change as well as the requirements of the final recipients are still increasing. The biggest market players have their own laboratories where they develop products that are to increase a sale and become competitive. Experience is of lower importance to new technologies and the small entities selling locally seldom have experience. The costs connected with the change of a sources supplier are not very important and the given units usually have the regular base of suppliers and they make a long-term contact with them.

The consumers in Poland do not have the appropriate knowledge of fish. This can be used both by importers and sales specialists. The high quality products are connected with incurring higher costs because of their delicacy, time for their processing and creating appropriate conditions for processing. In practice there is a risk of replacing fish by their very similar substitutes which are not as high quality as the original products.

### Substitution risks

Polish society is to a large extent oriented to meat consumption. Due to the latest problems caused by frauds in the meat sector and the spread of certain diseases there can be noticed a gradual increase of fish products importance that more often are becoming an element of everyday meal. For the purpose of an assessment if the consumption of the specific kinds of meat has an influence on the consumption of fish the basic statistical study was used, that is Spearman's rank correlation. The study results are presented in Table 1.

**Table 1.** The study of a connection between the consumption of the specific kinds of meat and the consumption of fish with the use of Spearman rank correlation

Year	Consumption per 1 inhabitant (kg)			
	fish ( $x$ )	poultry meat ( $y_1$ )	pork meat ( $y_2$ )	beef meat ( $y_3$ )
2010	12.8	24.6	42.2	2.4
2011	11.9	25.0	42.5	2.1
2012	11.4	26.1	39.2	1.6
2013	12.3	26.5	35.5	1.5
2014	13.2	26.9	38.5	1.6
Dependence between		Results of the study		
$x, y_1$		$= 1 - \frac{6 \cdot 14}{120} = 0.3$		
$x, y_2$		$= 1 - \frac{6 \cdot 26}{120} = -0.3$		
$x, y_3$		$= 1 - \frac{6 \cdot 17,5}{120} = 0.125$		

Source: Own studies based on Mieczkowski [2015], MIR-PIB [2015].

The data analysis shows that the fish consumption is characterized by a low dependence in relation to the consumption of poultry meat or pork meat. In relation to beef meat there is a lack of linear relationship. It means that society do not subject the choice of one product to another. Fish products are a very good source of protein so they are a group of products that are seldom replaced. Hence there is a small risk that substitutes can effectively replace fish products in a price and object respect (Fig. 3).



**Fig. 3.** Substitution risks in the fish processing industry

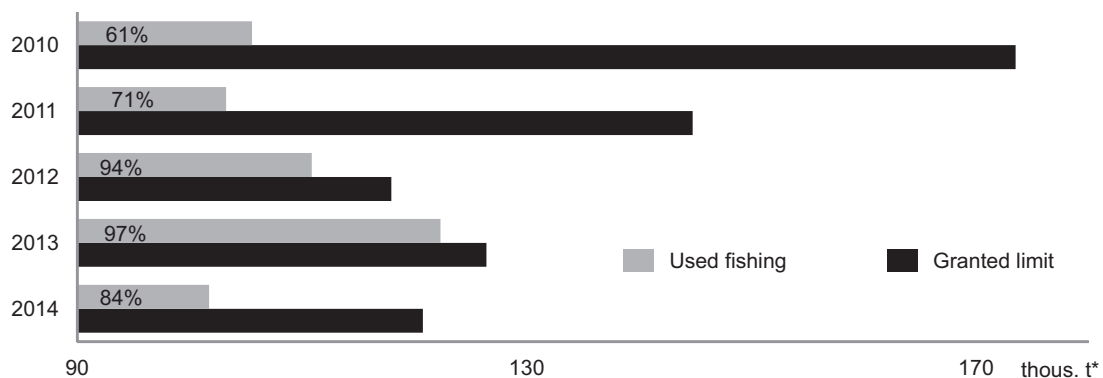
Source: Own studies.

### The risk of appearing of new suppliers

Domestic fishing and fish production in aquaculture provide fish supply in about 50%, and in reality – after eliminating a side export – this share is 30% [Hryszko 2013]. On account of this an import has mainly a source character and is regarded as a base of functioning of fish processing in Poland.

In order to characterize a bargain power of suppliers it is necessary to analyse three main ways of supplying resources: sea fishing, aquacultures and import.

In 2014 the Polish sea fishing amounted to 170,500 t and was lower by 12.8% compared with the previous year [MIR-PIB 2013]. The reason can be found in the decrease of sprat fishing in the Baltic Sea and a significant limitation of fishing grounds exploitation in Mauritania, especially pelagic fish. The characteristic feature of the Polish Baltic fishing is the fact that fishing quotas granted Poland are not fully realized by the Polish fishermen. The analysis of this phenomenon is presented in Figure 4.



The data contain the following species of fish: cod, salmon, sprat, herring.

\* In the case of salmon the number of fish was taken into account.

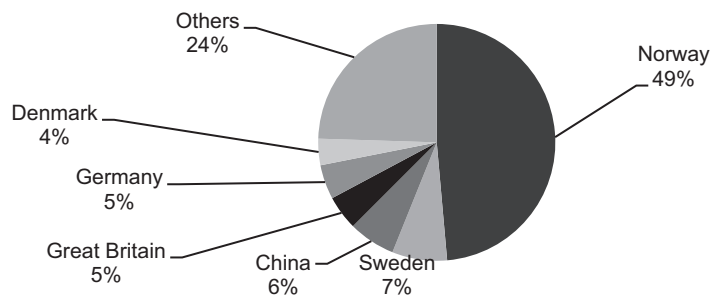
**Fig. 4.** The use of fishing limits in the Baltic Sea in the years 2010–2014

Source: Own studies based on the statistical data of the Ministry of Agriculture and Rural Development.

The alternative of solving problems in the fishing industry is focusing on an aquaculture. Despite its great potential in Poland it cannot satisfy needs of the producers and processing enterprises owners. This situation cannot be changed by a fact that according to the planned development the level of fish supply from an aquaculture is going to amount to 49 000–62 000 t to 2020. Focusing on aquaculture may be crucial for consumers.

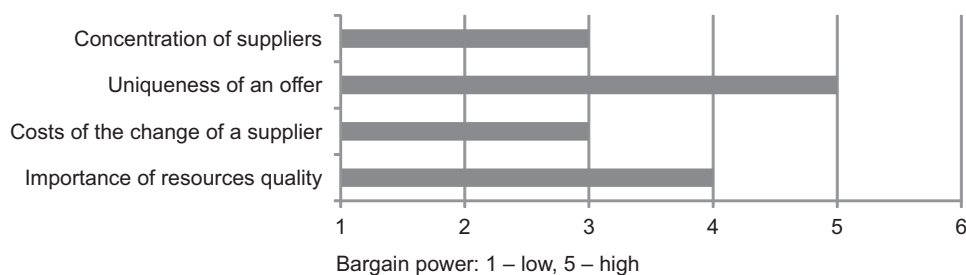
Its development can increase a market supply, which could result in decrease of prices and attracting new customers. That in turn would allow to increase companies profitability. The problem should be solved not only at the domestic level but also the European Union level where the structure of procedures should be strengthened by among others limitation of Norwegian monopoly for salmon that gradually is becoming fish of international expectations.

In terms of a species and product structure the import of fish is greatly developed. Sea fish are mainly imported to Poland (about 90% of the whole import) with a small share of other products. Figure 5 presents the main fish suppliers to Poland.



**Fig. 5.** The directions of import of fresh fish, frozen fish, salted and smoked fish  
Source: Own studies based on the Statistical Yearbook of Foreign Trade 2015 [GUS 2016].

The significant import of resources is not a big threat for domestic producers. Only a small percentage of the all imported resources end up on a finished products market. The most important are fish that after appropriate processing are intended for further export. The bargain power of the fish industry in Poland is quite significant (Fig. 6). It is mostly dependent on a situation on the world markets. The certain states put an enormous pressure on the price development by established monopoly. The Polish potential in supplying resources is not fully used. The biggest chance is a gradual development of the aquaculture that allows with time to satisfy the needs of the fish processing enterprises owners.



**Fig. 6.** The bargain power of the fish processing industry suppliers  
Source: Own studies.

### The risk of purchasers influence

As it results from the data in Table 1 the fish consumption in Poland is increasing. During the studied period the consumption of salmon rose the most (by 88.6%) and cod (by 45.9%) [MIR-PIB 2015]. The consumption of river cobbler and tilapia decreased the most. The increasing trend is mainly caused by the growing customers

awareness concerning a healthy diet. They more often realize that fish is an important element of a balanced diet, source of protein and other vital nutrients. The other very important factors influencing the level of fish consumption are price and quality. It is worth emphasizing that during the last five years prices of fish have been growing faster than the prices of meat products and even than the prices of the basic food products. The statistical data of the discussed problem are presented in Table 2. It should be noticed that during the last studied year the prices of meat and food dropped. It is connected with the world food overproduction and that the resources got cheaper, above all the reserves of pork and a good harvest. An opposite situation is on the fish market where the amount of resources maintains the growing tendency.

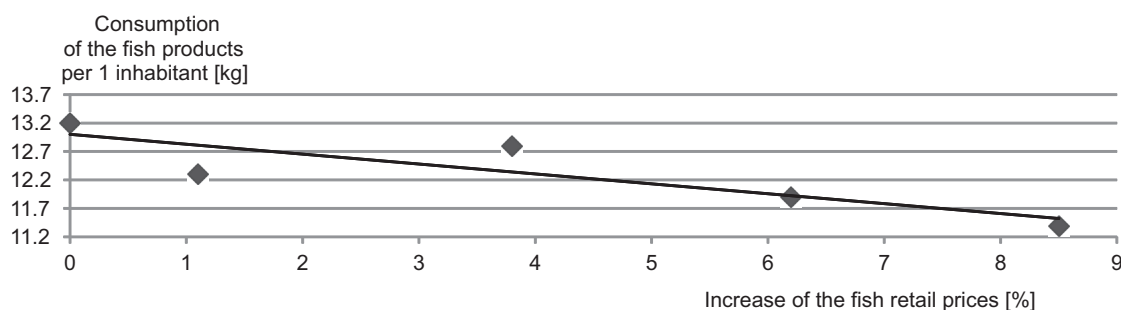
**Table 2.** The factor of the fish retail prices changes compared with the meat retail prices and food in total (%; the previous period = 100)

Year	Fish retail prices	Meat retail prices	Food retail prices in total
2010	103.8	98.6	102.7
2011	106.2	105.3	105.4
2012	108.5	108.4	104.3
2013	101.1	101.8	102.0
2014	100.0	98.9	99.1
Average annual pace of increase of the fish retail prices			4.9
Average annual pace of increase of the meat retail prices			3.2
Average annual pace of the increase of food retail prices			3.4

Source: Own studies based on Statistical Yearbook of Foreign Trade 2012, 2015 [GUS 2013, 2016].

Despite the growing prices the quality of the purchased goods is becoming more and more important for customers. However, they are a little afraid of consuming fish because of their anatomical structure. In spite of advanced technologies enabling the enterprises to get rid of fishbones customers still do not feel safe.

It is also essential to show an impact of the fish retail prices growth on the amount of fish consumption in society. In order to present this dependence Pearson correlation coefficient may be used. Figure 7 shows a dispersal of the values of the studied variables.



**Fig. 7.** Dispersal of the value of the fish retail prices growth to the amount of the fish products consumption in society

Source: Own studies.



A detailed analysis of the problem indicates that the correlation of the studied variables is negatively strong (amounted to  $-0.86$ ). It means that a growth of the fish retail prices on the market results in a decrease of the fish products consumption in society. This trends have been very distinct for five years now.

Another factor that has an influence on a bargain power are the distribution channels. There are three main distribution channels in Poland. They include: own distribution to consumers; foreign distribution by brokers; export.

The big companies belonging to the incorporated companies are mainly oriented for a wholesale and retail sale. A few years ago small groceries were the main sale channel for the fish processing products. The super- and hypermarkets chains have been taking up stronger and stronger position recently. They provide professional organisation of sale, exposition of goods and the proper products promotion. The significant number of producers and a rich offer of processing companies enables an easy change of a supplier, so the bargain power of purchasers significantly grows (Fig. 8). It is worth paying attention to development of own brands as their development plays an important role on the market. The Graal company cooperates especially closely with these units. The smaller units often do not have access to a foreign distribution, that is why they build a local sales coverage.



**Fig. 8.** The bargain power of the fish processing industry purchasers

Source: Own studies.

A very important distribution channel is export which is available especially for big international companies. The total export of fish and fish products in 2014 amounted to 366 400 t and was 10.1% smaller than in the previous year [MIR-PIB 2015]. This fall is caused by decrease of the sprats direct sale in the foreign ports. For abroad the dominant values in the structure have salted and smoked fish (42.8%), tinned fish and marinated fish (25.3%) and fish fillets and fish meat (23%). In 2014 they amount to 91.1% in total of the whole fish products export.

## SWOT ANALYSIS

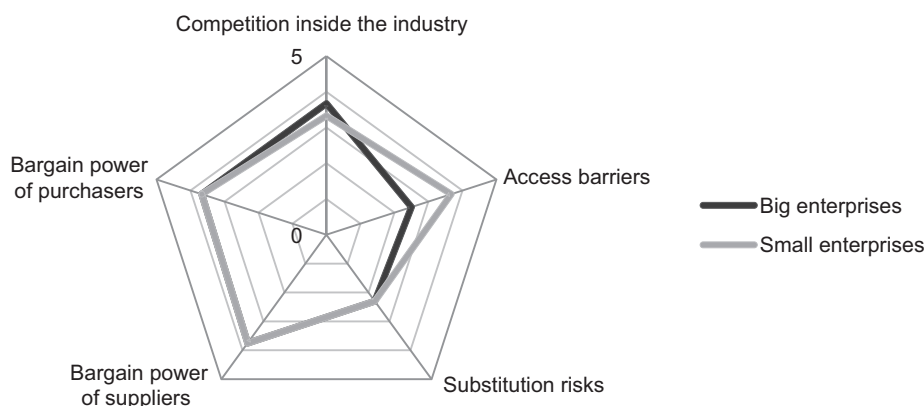
As a supplement of a competitiveness assessment of a given industry SWOT analysis may be used, which is one of the basic methods used in economy and finances of economic entities (Table 3). It involves finding determinants that influence on functioning of the unit and classify them into four groups. That allows to recognize the strong and weak points of the fish processing industry as well as the potential chances and risks for its further development.

Figure 9 shows the final assessment of the performed analyses. It may be noticed from the figure that the biggest powers both for big and small enterprises are the bargain powers of the suppliers and purchasers. In the case of the big enterprises the competition inside the trade is at the same level, and as for the small enterprises the access barriers should be recognized (in the case of the big enterprises they were recognized as average). The substitution risks should be recognized as having a little influence on both kinds of enterprises.

**Table 3.** SWOT analysis of the fish processing industry

Strong points	Weak points
significant dynamics of the fish processing sector development	high prices of fish compared with the other food products
gradual increase of the fish consumption per 1 inhabitant	not fully used fishing limits
modern production lines of big economic units	dependence from the world fish processing trends
health properties of fish	seasonal access to the Baltic resources
well developed science and research base	producers different opinions concerning the association representing producers interests
big share of export in sale	
Chances	Risks
better quality of fish products	possibility of competition – the European fish processing companies
change of consumers eating habits	dishonest sellers – substitution of fish by their cheap substitutes
development of an aquaculture as an alternative source of resources	increase of fish prices
	significant development of own brands

Source: Own studies.



**Fig. 9.** Competitive powers in the fish industry according to Porter model

Source: Own studies.

## CONCLUSIONS

To sum up the arguments on the factors of functioning and chances of development of the fish industry in Poland it should be emphasized that this industry provides the supply of fish, fish products and sea food at the sufficient level for the domestic market with their growing consumption in spite of decreasing fishing in the Baltic Sea. It may be expected that in the nearest years the big decrease in domestic fishing results in a limitation of the export volume of fish, fish products and sea food from Poland. There are also tendencies to decrease prices of a lot of imported species of fish on the domestic market, which is additionally strengthened by

the falls of prices of the other food products and more and more noticed the effect of deflation. The preliminary research of the source data and the studies based on them allow to formulate the following findings:

1. The fish processing industry in Poland is characterized by the significant fragmentation which greatly increases its competitiveness level both for the big and small units. The certain difference in shaping the level of possible risks for the previous companies in terms of their size should be also taken into consideration.
2. The possibilities to enter a market decrease with the growth of a company – in order to enter the market it is necessary to incur a big capital outlay to compete with the strong incorporated companies.
3. A high innovation, an appropriate technical and research base and experience become factors that allow to fight with big market players.
4. The opposite situation is present among the smaller entrepreneurs who are oriented for a local sale. In their case the entrance barriers are smaller and experience is not very important.
5. The bargain power of the suppliers in the fish industry is significant. The vital shortage of the supply of resources from the local markets is compensated by import.
6. The bargain power of purchasers is also shaped at the medium-high level. The manufactured goods are distributed by three distribution channels. The companies more often have to adopt a quality and price strategy because of the changes in development of the consumers behaviour.
7. For the potential customer the health issues are becoming more and more important, the quality as well as the other not connected with price factors are more crucial.
8. The big units will be more competitive in the future and they are shaping the development of the industry.

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## **UWARUNKOWANIA FUNKCJONOWANIA I SZANSE ROZWOJU BRANŻY RYBNEJ W POLSCE**

### **STRESZCZENIE**

Celem artykułu jest próba określenia uwarunkowań funkcjonowania, szans rozwoju oraz ocena atrakcyjności branży przetwórstwa rybnego w Polsce. Odniesiono się do sił konkurencyjnych występujących wewnątrz branży, barier wejścia, zagrożeń substytucyjnych, roli dostawców i nabywców, jak również zdefiniowano znaczenie akwakultury w funkcjonowaniu branży i wskazano na rosnący poziom importu. Określono także mocne i słabe strony branży, korzystając z modelu Portera oraz analizy SWOT, a w przypadku analizy statystycznej wskaźnikiem korelacji rang Spearmana oraz testami istotności. W branży większe szanse rozwoju mają jednostki duże, które zapewniają znaczną część dochodów dla branży i stanowią o jej koniunkturze. Przedsiębiorcy mniejszego formatu są nastawieni głównie na sprzedaż lokalną, gdyż w ich przypadku bariery wejścia na rynek są mniejsze i wymagane jest niewielkie doświadczenie. Wykorzystano analizy piśmiennictwa oraz danych statystycznych.

**Słowa kluczowe:** branża rybna, przemysł spożywczy, analiza SWOT branży rybnej



## POLISH REAL ESTATE FUNDS AND INTERNATIONAL EXPERIENCE

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University of Szczecin

### ABSTRACT

Funds investing in the Polish real estate market have been functioning since 2004, but they have lived through both the times of the 2006–2008 boom and the times of the 2009–2014 crisis. The first close-end funds were established in 2004 and were originally intended to close down after eight years. However, their results did not guarantee the return expected by investors. The purpose of the study is to evaluate the performance of the Polish investment funds operating on a young, ten-year-old market in the context of the experience of mature markets with a long history of funds investing in real estate. The paper presents the cause and effect analysis of the impact of macroeconomic factors on the funds' results as well as of behavioral factors contributing to low interest in the real estate investments with the participation of Polish investment funds operating on the Polish real estate market.

**Key words:** real estate funds, investments, capital market

### INTRODUCTION

The real estate market is the domain of direct and indirect investments. Due to a permanent characteristic of the real estate market and the property itself (cost-intensity), each of these investments require considerable capital commitment, which stands in contrast to indirect investments. The effectiveness of individual direct and indirect investments on the real estate market depends both on the field of investment (the subject to the investment on the real estate market), diversification of the investment portfolio, the type of investments (formal and legal regulations), market experience and competences of the asset manager and, finally, the market environment of the investment<sup>1</sup>. The purpose of this study is to evaluate the performance of the Polish investment funds operating on the young, ten-year-old market as seen from the perspective of mature markets with a long history of funds investing in the real estate market. The article proposes the following research hypothesis: even though the Polish capital market is at the early stage of development of real estate investment funds, it is still open to new REIT solutions<sup>2</sup>. The paper presents a cause and effect analysis of the impact of macroeconomic factors on the funds' results as well as of behavioral factors contributing to low interest in the real estate investments with the participation of Polish investment funds operating on the Polish real estate market. The first step of the study was an analysis of regulatory framework for investment funds in Poland, with a special focus on investments in

<sup>1</sup> For example, the results of closed-end funds in the Italian real estate market whose returns over the last 10 years were at 0.5%, compared with the government bonds that yielded 5.6% [Galoppo and Mundula 2015].

<sup>2</sup> Real estate investment trusts (REIT) – their principal feature is the possibility to deduct the dividend from the taxable base.

the real estate market. In the next step the oldest funds operating in the Polish market were selected (first issues in 2004–2006) that were intended to close in 2012–2014. Thus selected funds allowed for assessing their results over a full business cycle (the market downturn and upturn) as well for looking at the fund managers' decisions when the expected goals had not been met.

## **LEGAL AND FORMAL BASIS FOR INDIRECT INVESTMENTS IN THE POLISH REAL ESTATE MARKET**

The establishment and functioning of investment funds in Poland is regulated by the relevant legal provisions. The first such provisions were the Act of 22 March 1991 on trading in securities and on trust funds and the Act of 28 August 1997 on investment funds. Those Acts were amended or completed with new regulations in 2000, 2004, 2009 and 2013 (Acts of 16 November 2000, 27 May 2004 and 1 February 2013). The Act of 1991 introduced onto the Polish capital market just the open-end trust funds that were based on the concept of contractual funds and served the purpose of collective investment of cash in securities. The funds were financially separated sets of common assets of volatile value and fixed business purpose, but without legal personality. They issued fund units that were not securities, were non-transferable and interest-free but hereditary. The funds were founded and managed by trust funds management companies (IFC).

Following another regulation of 1997 two legal persons emerged: Investment Fund Corporation (IFC) and Investment Fund (IF). The core business of the IF, IFC was to set up investment funds, manage them, represent them before the third parties as well as to establish the institution of a depositary being an entity responsible for safekeeping the assets of the fund. The total payments required to create a fund was 4 m PLN, while the minimum net value of assets was 2.5 m PLN. Although the minimum value of assets was later lowered to 2 m PLN, it turned out to be one of the barriers preventing that young market from flourishing. As a result of those changes on the Polish market, four types of funds could start emerging: Open-end Investment Fund (OIF), Specialized Open-end Investment Fund (SOIF), Closed Investment Fund (CIF), Mixed Investment Fund (MIF).

Following the example of the American Unit Investment Trust (UIT), the 2000 amendment introduced the construction of a collective securities portfolio [Evans and Fahlenbrac 2007], where assets were bought by IFC which then allotted investment units in the fund's collective portfolio to the investors. Subsequently, in 2004 the amendments were made to the Polish law with a view of adapting the Polish legislation to the UCITS requirements, which resulted in the increased interest in the investment funds operating on the real estate market and, consequently, in their dynamic expansion. The Act of 2004 on investment funds was not regarded as an amendment to the earlier acts but as a completely new act. It introduced many changes that were fundamental to the functioning of investment funds in Poland in response to Poland's accession to the European Union (EU). The Act has significantly changed and regulated the terms on which the funds can operate on the market. Moreover, it puts more emphasis the rights of investors. The provisions of the Act are in compliance with the EU standards concerning the investment funds operating in Member States.

What was vital for the development of investment funds on the real estate market was the 2009 amendment to the Act that gave them the right to feed real estate into CIF. Additionally, it permitted to transform an open-end investment fund into a sub-fund of another open-end investment fund consisting of separate sub-funds. The amendment also opened the opportunity to expand the catalogue of funds given the rights to reconstitute as a single fund with separated sub-funds. Another amendment of 2011 simplified the rules for creation of closed-end investment funds, which contributed to the establishment of new small funds investing in the real estate market. Consequently, nowadays in Poland there are over 650 diverse investment funds, 2% of which operate on the real estate market. But it is the equity and mixed funds that have the largest share in the market (over 50% in total).

In 2013 the purpose of the amendments made to the Acts was to implement in the Polish legal system the EU laws regulating the financial market. The new Act is compliant with the European Parliament and the Council Directive (2009/65/EC of 13 July 2009) on the coordination of laws, regulations and administrative provisions

relating to undertakings for collective investment in transferable securities. Such legislative proceedings to revise the law follow from the adjustment process between Poland and the EU countries concerning the functioning of the capital market and its institutions. Moreover, the revised laws influence the transparency and facilitate trading in financial instruments on the European markets.

The above-presented synthetic outline of legal acts shows the changes in the regulatory framework for the investment funds. It should be stressed that these changes have resulted from the evolution of the Polish capital market and, consequently, from the need to adjust and clean up the existing legislature. Another important aspect was the emergence on this market of the real estate investment funds.

## **PERFORMANCE ANALYSIS OF INVESTMENT FUNDS OPERATING ON THE POLISH REAL ESTATE MARKET**

Beside the above legal regulations, both the growth of the Polish capital market and the emergence and the development rate of the real estate market were a consequence of the late market entrance of investment funds interested in real estate [Foryś 2013, Esrig et al. 2015]. From the formal point of view, the failed pioneer attempts to create real estate funds in Poland took place in 2002: Skarbiec Nieruchomości I SCIF, CA IB IFC.

The failure of the first subscriptions was the result of high investment limits as well as of the constraints put on asset purchase or the area of investment (e.g. in construction land properties or in farmland that could be re-developed into a housing area, the prices of which rocketed before Poland's accession to the EU). Other reasons were the shortage of experienced managerial staff and increasingly attractive investment targets, such as stable and balanced growth funds [Pochmara and Zapała 2004].

It was only after lowering investment limits in 2004, raising the limits for one transaction to 25% of the fund assets as well as the dynamic growth of the real estate market did BZ WBK IFC (Arka Real Estate Fund CIF) and Skarbiec IFC (Skarbiec Real Estate Fund CIF) decide to successfully establish the first two real estate funds in Poland. *Arka* sold investment certificates for the total of 339.5 m PLN at a price of 91 PLN. The fund aimed at investments in office and residential properties and the shares in companies from the real estate market. Similar strategy was adopted by BPH IFC that issued certificates at a price of 91 PLN for the total of 87.43 m PLN. The subsequent issue of the certificates of the second fund BPH CIF Real Estate Sector the total reached 330 m PLN at a price of 97 PLN). In the late 2008 there were 16 investment funds in Poland. They were usually concluded for a period of 6-8 years. In 2009 and 2010 four funds were established annually. In the subsequent years their number was growing, disregarding the downturn on the real estate market. However, the subscriptions went down, their duration was assumed to be indefinite and they were often the private equity funds. In the late 2008 seven IFCs were managing 15 real estate funds, which constituted 4.7% of the Polish investment fund market. After the three-year downturn there were 27 such funds managed by thirteen IFCs, which amounted to 5.3% of all the investment funds. The emerging closed-end investment funds were then dedicated to a small group of investors who were willing to take high risk and expecting above-average returns on their investments. Both the history of the Polish real estate investment funds as well as their number and the value of their assets (2.3 bn PLN in August 2015) indicate the early stage of development of the discussed here market of intermediate investments, which may be beneficial for new solutions, such as REIT funds (Real Estate Investment Trust). REITs are direct and indirect investment funds that receive special tax considerations and due to this fact they are very popular in, for example, the United States. In Poland and in other EU countries, REITs could provide another opportunity for tax-positive investments in the real estate market, particularly in the times of slow-down. New solutions can attract the investors to this market again. However, the main barrier preventing the introduction of REITs in Poland is the absence of relevant legal regulations. Polish legislators can follow numerous examples worldwide, as each country adopts its own internal regulations regarding REITs operation.



The barrier in creating the investment offers on the Polish real estate market may be high aversion to risk on the capital market and to intermediate investments in the real estate [Kelly et al. 2012]. The results of the first real estate investment funds are shown in Table 1 below (from the opening to the closing date or on 30 April 2016).

**Table 1.** Rates of return of the oldest investment funds operating on the Polish real estate market (%)

Real estate investment fund	Date of commencement of activities	From first valuation	Average year rate return from first to end valuation
Arka Real Estate Fund	27.05.2008	12.32	1.36
Arka Real Estate Fund 2	27.05.2008	2.07	0.43
BPH Real Estate Sector Fund	03.08.2005	-37.20 <sup>a</sup>	0.10
BPH Real Estate Sector Fund 2	21.07.2008	17.13 <sup>a</sup>	7.71
KBC Index Real Estate Fund 2	06.07.2007	-0.70	-0.12
Ipopema Rynku Mieszkaniowego FIZ Aktywów Niepublicznych	27.12.2010	13.96	5.98
KBC Index World Real Estate	08.09.2006	0.00	0.00
Skarbiec Real Estate Fund	29.10.2004	3.76	0.44

<sup>a</sup> As on the date of opening of the liquidation (29.12.2015).

Source: Funds' annual reports [www.fiz.pl/analizy](http://www.fiz.pl/analizy) (30.04.2016), <https://www.bphtfi.pl/klienci-indywidualni/fundusze-inwestycyjne/fiz/bph-fiz-sektora-nieruchomosci>.

All funds but one (Ipopema RM FIZ) were building their portfolios over 2005–2008, i.e. they invested on the bull market, which resulted in their poor performance. The example of overestimating the value of a property in the portfolio was BPH RESF whose assets on the close-down date were worth 207.7 m EUR, including 198.8 m EUR in the real estate portfolio<sup>3</sup>, and with acquired assets at 332 m EUR on the date of opening. On the closing date the net assets per investment certificate were as low as 0.64 PLN. Additionally, since 2007 Polish investors have had an indirect opportunity to invest in REIT via KBC Index Światowych Nieruchomości which is based on the index of Japanese and European REITs. Excluding two funds, the rate of return on investment did not exceed the values forecasted in the fund statutes. Poor results of the real estate funds first of all resulted from the period of time when properties were bought for portfolio (the largest purchase was in 2005 and in the subsequent boom years) and from the fact that closing dates of the funds (usually after eight years) happened to be in the time of the economic crisis and the dramatic drop in property prices. Relatively good performance of BPH RESF2 in comparison to other funds was an effect of both the opening date at the onset of the real estate crisis as well as of the choice of purchased properties. When commencing its operation, the Fund had 74 m PLN of acquired assets, while on the closing date of 16 December 2015 its net assets were at 56.5 m PLN (110.76 PLN per certificate at the issue price of 98 PLN). At the same time, the Fund's real estate portfolio was worth 67.3 m PLN.

Unstable returns on this market are also manifested by the share prices of listed companies over the recent years. Investors cautiously approach the investments in the certificates of closed-end investment funds (CIFs)

<sup>3</sup> The portfolio included 61 thou. m<sup>2</sup> of office space, 66 thou. m<sup>2</sup> of retail space and 8 thou. m<sup>2</sup> of warehouse space. The latter lost the least value due to downturn market.

listed on the Warsaw Stock Exchange. The results of individual funds differ significantly, in terms of both assets valuation by presented by IFC and the share prices [Berk and Green 2004]. The difference between the valuation of the funds' assets per certificate and the quotation of certificates (the capital market participants' valuation) has been considerable over the recent years (Table 2).

**Table 2.** The difference between the WAN and the valuation of the several oldest Warsaw Stock Exchange investment funds operating on the Polish real estate market in 2009–2012 (%)

Specification	2012	2011	2010	2009
Arka Real Estate Fund 2	-29.7	-37.9	-19.2	-23.9
Arka Real Estate Fund	-19.6	-24.8	-21.8	-36.8
BPH Real Estate Sector 2 Fund	-46.5	-42.4	-27.0	-38.5
BPH Real Estate Sector Fund	-39.8	-41.7	-39.7	-43.3
Skarbiec Real Estate Fund	-32.9	-27.5	-36.5	-30.0
Average	-29.8	-28.4	-21.4	-30.0

Source: The funds' annual reports (30.08.2012) WAN – net asset value per certificate.

In the case of closed-end investment funds their quotations always differ to a certain extent from WAN. Securities of closed-end funds trade at a discount, i.e. below the WAN valuation or, more rarely, at a premium. The value of a discount or a premium changes according to the investors' attitude that is an effect of a economic situation in a given industry or in general. On average, the stock exchange values the certificate of a fund investing in the real estate 30% lower than it follows from the valuation of assets made on the basis of estimated values of properties and other assets in the portfolio. The most accurately valued funds (i.e. the discrepancies were the smallest) were Arka REF and Arka REF2, while the least – BPH RESF. A data analysis (Table 2) shows that low confidence in the market is confirmed by the fact that capital market investors' estimation of fund assets differs considerably from the evaluations made the funds themselves. It means that the investors' opinion about the attractiveness of the real estate market is negative (negative values shown in Table 2). All the funds from Table 1 that had invested their assets in 2005–2008 eventually postponed the original date of liquidation due to the failure to reach the projected results (negative rates of return).

## REAL ESTATE INVESTMENT FUNDS WORLDWIDE VERSUS POLAND

Real Estate Investment Trust, whose story commenced after the American legal regulations had changed in the 1960, have several features that distinguish them from the real estate investment funds. They are allowed to deduct the dividend from the taxable base. Most REITs pay 100% of their profits as a dividend, thus avoiding the income tax. Not all real estate funds, however, have the REIT status. The American classification of the real estate funds is based primarily on the source of the fund's income [Nelling and Gyourko 1998]. There are dividend funds (investing directly in real estate and generating revenue from rent), mortgage funds (managing investments based on mortgage lending; they either offer such loans themselves or invest in mortgage bonds (MBS); their revenue comes from mortgage rates) and the hybrid ones (combining the above two). To qualify as REIT, the fund must meet the following requirements:

- it must be an entity taxable as a corporation;
- its shares must be fully transferable;

- it must be governed by the board of directors;
- it must distribute 90% of its gross profit as a dividend;
- it must have at least 100 shareholders and not more than 50% of the ownership may be held by five or fewer individuals;
- it must invest not less than 75% of its assets in real estate;
- it can invest not more than 20% of assets in subsidiaries subject to ordinary tax regulations;
- at least 75% of its income must come from rents from real property and interest on obligations secured by mortgages on real property.

In the USA (REIT Watch 2011) the share of real estate funds in the assets of investment funds is estimated at the total of 3.75%. The value of the FTSE NAREIT U.S. Real Estate Index<sup>4</sup> for All REITs is 181.51 (Table 3), and 604.90 for equity funds (Equity REIT).

**Table 3.** Performance of several REITs in the USA

Index	Years	Index value
FTSE NAREIT U.S. Real Estate Index All REITs	2015	181.51
FTSE NAREIT U.S. Real Estate Index Equity REIT	2015	604.90
Five-year average return (excl. capitalisation) from All REITs	2010–2015	11.59%
Five-year average return (excl. capitalisation) from All Equity	2010–2015	11.91
Five-year average return (excl. capitalisation) from Equity REITs	2010–2015	11.96%
Five-year average return from Mortgage REITs	2010–2015	4.26%

Source: REIT [2011].

The average five-year return (without capitalizing) on All REITs in 2010–2015 reached 11.59% (accumulated<sup>5</sup> 73.01%). Simultaneously, All Equity REITs gave the return of 11.91% (accumulated 75.51%), while Equity REITs – 11.96% and 75.94%, respectively. Mortgage REITs gave the lowest five-year return rates at 4.26% (accumulated 23.21%). In comparison, the average five-year return for Dow Jones was 11.30% (accumulated 70.83%). Over the period of 1999–2013 the rate of return on REITs was lower than the rate of inflation only once, in 2008 [Orzano 2014]. As of 30 September 2015, the FTSE EPRA/NAREIT Global Real Estate Index included 487 stock exchange-listed real estate companies in 38 countries around the globe. Of the 1.2 trillion USD in equity market capitalization represented in the Developed Markets index, 79% came from REITs. Additionally the FTSE EPRA/NAREIT Emerging Market index included 157 publicly traded Equity REITs and listed real estate companies from 16 emerging markets (Americas, Europe, the Middle East, Africa, Asia)<sup>6</sup>.

Real estate investment trusts are also known in Europe, although their expansion started first of all with the boom on the real estate market in the last decade, e.g. in France in 2003 and in the UK, Italy and Germany in 2007. In the post-communist countries REITs have been operating in Bulgaria (since 2005) and Hungary (since 2011). The demand for shares in the European real estate funds is a result of the interest of pension funds, Ger-

<sup>4</sup> [www.reit.com/data-research/reit-indexes/real-time-index-returns/ftse-nareit-us](http://www.reit.com/data-research/reit-indexes/real-time-index-returns/ftse-nareit-us).

<sup>5</sup> Including the paid out dividend.

<sup>6</sup> [www.reit.com/data-research/reit-indexes/real-time-index-returns/ftse-nareit-us](http://www.reit.com/data-research/reit-indexes/real-time-index-returns/ftse-nareit-us).

man investment funds and private equity funds. According to CapGemini and Merrill Lynch report, real estate purchase reach 16% of investments made by wealthy individuals (excluding their place of residence), while their investments in cash and bank deposits accounts for 13% of their total investment. Germans invest as much as one third of their savings in real estate funds, while France is a country with the largest number of real estate funds, i.e. 139 in the late 2004 [EFAMA 2011].

Globalization of financial markets, as well as opening real estate markets to foreign capital is favorable to the growth of REITs, mainly on the markets where the real estate ownership is regulated and there is demand for capital necessary for their further development. On the other hand, as exemplified by the USA, Canada or Germany and other developed countries, all forms of long-term indirect investments on real estate markets are an indispensable instrument for pension funds or other financial or insurance companies that have been forced to make long-term investments and diversify their investment portfolios. The authors of publications about these instruments indicate high dividend as the main benefit of investing in REITs [Guourko and Keim 1992, Campbell et al. 2008, Marchlewski 2008]. An additional argument is poor correlation between the return rate on these instruments and the return on stocks and bonds in portfolios including these financial instruments [Guourko and Keim 1992, Westerheide 2006], which allows to diversify these portfolios. Another reason why REITs should be promoted in Europe is their presence on 12 European real estate markets as well as positive experience in this field [Chan et al. 2003].

On the Polish market REIT could offer a likely return at 80–85% in dividend, while direct investments in office or commercial properties offer the rate of return at 5%. The return from warehouse properties does not exceed 7%. The emergence of REITs in Poland has been determined not only by new legislation and regulated terms of transforming the existing investment funds into REITs, but also by adjusting them to the European markets<sup>7</sup>. These markets, in turn, must be unified, at least in respect of requirements concerning the funds' assets, internal EU operations or the rules of dividing profits and dividend taxation [Marchlewski 2008]. The benefits of REITs taxation can prove attractive to the Polish capital on the local real estate market, particularly in the times of a bull market (also the capital one), which results in low rates of return on other assets.

The benefits of REITs are both a regularly paid dividend and its stability. Depending on the country, REITs pay about 75–90% of their annual revenues in dividend in order to avoid double taxation of the fund and the investor. Also, their main sources of income (long term lease of office and commercial space) guarantee steady annual revenue. An additional advantage are low costs of management (annual management fee ranges from 1 to 1.5%). Another benefit for investors is the portfolio stability as the properties are rarely sold unless the unfavorable market conditions force the fund to do it.

The REIT Association Poland has already been founded with an aim of promoting the idea of collective investments in real estate that yield steady income in a form of a dividend. The Association's mission is to initiate and support the initiatives to create a regulatory framework for entities operating according to the REIT formula. What is more, on the developing markets the introduction of REITs means an increased inflow of capital that encourages investment and offers the opportunities for long-term investments in the instruments of pension fund assets, increased importance of indirect investments in the real estate market through a tax deduction schemes associated with the idea of REITs. Also, Warsaw Stock Exchange will benefit from the emergence of REITs. In the USA the Equity REIT Total Return Index in 2010–2016 was higher than Dow Jones (e.g. at 228.6 and 172.4 in January 2016, respectively).

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<sup>7</sup> The example of a company operating similarly to REIT but without tax benefits is REINO Dywidenda Plus. Echo Investment, Griffin Real Estate, Redefine Properties are also planning to implement similar solutions.

## CONCLUSIONS

The development of the Polish real estate investment funds was conditioned by two important factors: the legal basis for the operation of these funds and the situation on the real estate market. In the former case there were three principal stages of the investment fund market: their sudden surge after the introduction of Belka's tax (November 2001 – July 2003), re-allocation of assets to the equity funds (August 2003 – June 2004), and adjustment of the investment fund regulations to the EU law (from July 2004). Due to the condition and development stages of the Polish real estate market, we can talk about the bull market in the periods of 1995–1999 and 2006–2008 and the bear market in 2000–2005 and from 2009 on [Foryś 2011]. In this context it is difficult to evaluate the real estate funds due to their short lives – they have been present on the Polish market since 2004. Yet, when we compare their performance, we can draw a conclusion that the choice of a right fund is rather risky as the results of individual funds differ significantly (e.g. ranging from –14% to +134% between February 2009 and February 2010). What is more, low dividend payments and the closed funds' results below the declared values and below other financial instruments increase the aversion of potential investors towards direct investments in the Polish real estate market.

Over the last two decades, in many European countries REITs appeared as a popular and effective way of investing. However, both the world financial crisis and other key characteristics of those investments, such as liquidity, the volume of dividend payments or the potential of the hedge against the inflation risk, contributed to the decreased attractiveness of REIT, or even led to investors' averse attitude towards entering this instrument to the market. It seems, however, that the powerful incentive to introduce REITs onto the Polish market will be their tax aspect as well as the positive effect on the situation of the local real estate market, thus reducing the investors aversion to new solutions.

We can assume that the Polish capital market is ready to get involved in a safer than before forms of real estate investment funds, despite the continuing bear market. One of such forms are REITs because they are more diversified in terms of space and type. The pool of properties is much larger than in the case of the existing Polish funds. Additionally, tax solutions are more investor-friendly and management fees are lower. Real estate investment trusts also contribute to the national budget revenue due to the increased tax revenue from high dividends.

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## **FUNDUSZE INWESTYCYJNE RYNKU NIERUCHOMOŚCI W POLSCE NA TLE DOŚWIADCZEŃ ZAGRANICZNYCH**

### **STRESZCZENIE**

Fundusze inwestujące na polskim rynku nieruchomości funkcjonują od 2004 roku, a ich historia obejmuje zarówno okres hossy na rynku nieruchomości (lata 2006–2008), jak i bessy (lata 2009–2014). Pierwsze fundusze zamknięte powstawały w 2004 roku i z założenia miały być zakończone po ośmiu latach, ale ich wyniki nie zagwarantowały oczekiwanego zwrotu dla inwestorów. Celem badania jest ocena funkcjonowania polskich funduszy inwestycyjnych działających na młodym, dziesięcioletnim rynku w kontekście doświadczeń rynków z długą historią działania funduszy inwestujących w nieruchomości. W artykule przeprowadzono analizę przyczynowo-skutkową wpływu czynników makroekonomicznych na wyniki funduszy oraz czynników behawioralnych powodujących małe zainteresowanie inwestycjami w nieruchomości z udziałem funduszy inwestycyjnych na polskim rynku nieruchomości.

**Słowa kluczowe:** fundusze rynku nieruchomości, inwestycje, rynek kapitałowy



## THE UTILIZATION OF EU FUNDS IN THE YEARS 2007–2015 FOR THE PRESERVATION OF CULTURAL HERITAGE OF RURAL AREAS IN EASTERN POLAND

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### ABSTRACT

The article presents the problems of financing cultural heritage of rural areas from the European Union funds in the macroregion of Eastern Poland. It outlines the scale and structure of the use of the EU funds for projects relating to the protection and promotion of cultural heritage. It also describes the scale of regional differentiation in the field of the use of European Funds for the protection of cultural heritage in rural areas. The temporal range of the study included the years from 2007 to 2015. The analysis was conducted across the six types of projects distinguished according to their subject matter, that is to say the promotion of natural values, protection and valorization of natural heritage, other forms of support for the enhancement of tourism services, protection and preservation of cultural heritage, development of cultural infrastructure, other forms of support for the improvement of cultural services, as well as integrated projects for the revitalization of urban and rural areas. The analysis focused on four types of areas: rural areas, towns with county rights, voivodship towns and the area of the voivodship. The information used in this study was based on the data pertaining to the projects co-financed from the EU funds and stored in the National Information System (KSI SIMIK 07-13) as of 31 December 2016.

**Key words:** Eastern Poland, rural areas, cultural heritage, European funds

### INTRODUCTION

One of the main elements of the EU Cohesion Policy is the support for the development of peripheral areas. In Poland, this region comprises five voivodships of Eastern Poland which are among the least developed regions in the European Union (EU). They constitute an external peripheral region, not only in Poland but also in the entire EU [Zarycki 2011]. The peripheral character of Eastern Poland has a geographical dimension stemming from its considerable distance from the domestic and continental economic and political centres, as well as an economic dimension, which is associated with a low level of economic development. The concentration of negative social and economic phenomena and the ensuing weakest economic performance especially applies to the areas situated along Poland's eastern border [Stawicki 2012].

Structural intervention of the EU and the resulting allocation of assistance resources are directed towards lessening the distance between Eastern Poland and the remaining regions of the country. Financial resources from the EU Structural Funds came to be an important source of support for the socio-economic development of Eastern Poland [Szlachta 2013]. They made it possible for the country to undertake many-sided activities

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intended to promote economic growth, primarily through increasing the level of the use of factors inherent in the local environment of the regions. Eastern Poland, and especially its rural areas, is a region with a rich cultural heritage, which is a legacy of a multi-cultural character of the area [Kruczek 2011a]. The use of cultural values in Eastern Poland is likely to contribute to the development of new social and economic functions, first of all tourism, and indirectly, according to the multiplier effect [Gralak 2008], this should be reflected in some other economic activities, including food production, provision of equipment for accommodation facilities, development of tourism and tourism-related services, etc. Thus, cultural landscape of rural areas of Eastern Poland, being the effect of long-lasting development processes, makes it possible for the region to develop new socio-economic functions of Eastern Poland.

The main purpose of the paper is to examine the level of the use of the EU funds for preservation, promotion and development of cultural heritage in the rural areas of Eastern Poland. In order to realize the main goal, the following set of detailed goals was adopted:

- determination of the share of undertakings in the field of cultural heritage in the value of total EU funds allocation, with special reference to rural areas;
- determination of the share of the selected types of areas in the allocation of financial resources for the protection of cultural heritage;
- examination of the scale of regional differentiation in the field of the use of the EU funds for the protection of cultural heritage in rural areas;
- identification of the scope of the projects accomplished.

## **MATERIAL AND METHODS**

One of the key concepts, from the point of view of the topic under study, is cultural heritage. Its semantic scope encompasses both cultural identifiers of the sites and the natural goods, being the points of reference of identity and landscape [Kruczek 2011b]. Cultural heritage includes both material and immaterial forms of culture transmitted from generation to generation by the residents of the particular region. In the cultural landscape which was shaped in the historical process there is much evidence of distant past epochs and events. Cultural goods being the carriers of material and non-material values of the region are of particular importance.

The subject matter of the analysis was the financial support from the EU funds for the preservation of cultural heritage. The temporal scope of the study covered the years 2007–2015, since under the so-called  $n + 2$  rule the EU financial resources in the 2007–2013 programming period were subject to spending by the end of 2015. On the other hand, the spatial extent of the analysis included the macroregion of Eastern Poland, which encompassed five voivodships: Warmińsko-mazurskie, Podlaskie, Lubelskie, Podkarpackie and Świętokrzyskie.

The research material was provided by the data concerning the projects co-financed by the European Union, collected in the National Information System (KSI SIMIK 07-13) as of 31 December 2016 (<http://www.funduszeuropejskie.2007-2013.gov.pl>). From the scope of the available variables we selected the data which allowed us to identify the usefulness of the projects for the present analysis, that is to say the title and location of project realization (voivodship, county or commune). These undertakings were financed through the budgets of five Regional Operational Programmes (ROP) and two national programmes: Infrastructure and Environment as well as Innovative Economy Operational Programmes. The basis for the analysis were the following categories: number of projects, total value of the projects and the amount of co-funding from the EU funds.

The survey sample was chosen using the method of purposive selection. The criterion for selection was the eligibility of the projects within the framework of seven priority interventions, which concerned, either directly or indirectly, the protection of cultural heritage. The titles of the topics were as follows: promotion of natural values, protection and valorization of natural heritage, other forms of support for the enhancement of tourism

services, protection and preservation of cultural heritage, development of cultural infrastructure, other forms of support for the improvement of culture services, integrated projects for revitalization of urban and rural areas. The projects covering the above-mentioned thematic fields were analyzed from the perspective of their scope which led to the selection of those projects which were directly related to cultural heritage. The method of selection adopted in this study resulted in the survey sample comprising 498 projects.

A wide range of projects implemented in Eastern Poland and concerning the protection of cultural heritage made us group them according to their scope<sup>1</sup>. The following types of projects were distinguished:

- renovation (repair, conservation and adaptation) of historic buildings;
- revitalization of urban and rural areas;
- natural heritage (landscape objects, health resorts, botanical and zoological gardens, etc.);
- cultural events (festivals, music concerts, performances, exhibitions, stage productions, etc.);
- promotion of cultural values;
- others (including historic trails, construction and rebuilding of the objects of the institutions of culture and cultural heritage).

An important aspect of the study was the analysis of the structure of projects across space. To this end, the areas in which projects were implemented were classified by type of the territorial self-government units (rural communes, urban-rural communes, urban communes, counties, towns with county rights, and voivodships) [Rakowska 2012]. Projects implemented in rural, and urban-rural communes as well as in small towns and counties were considered as having a significant influence on the preservation of cultural heritage of rural areas. The latter were presented against a background of other types of areas, such as: towns with county rights, voivodship towns (that is to say towns being the voivodship capitals), as well as the area of the voivodship in which regional projects were realized [Rakowska 2013]. This classification allowed us to conduct a comparative analysis of the allocation of European Union financial resources to rural areas in Eastern Poland *vis-à-vis* the remaining types of areas.

## FINDINGS OF THE STUDY

In the years 2007–2015, more than 18.5 thousand EU co-financed projects were realized in Eastern Poland (excluding the projects carried out under the Human Capital Operational Programme), from which 498 projects were designed for the purposes related to the preservation of cultural heritage. Taking into consideration the fact that solely 2.6% of the total number of projects concerned cultural heritage, it should be said that the potential of cultural values was not among the major purposes of the European projects accomplished. This is also confirmed by the data relating to the total value of the projects and the value of the EU co-funded projects. In the total value of the projects implemented in Eastern Poland, amounting to more than 99.3 billion PLN, only 2.3 billion PLN was comprised of the expenditure on projects which were thematically related to cultural heritage. A similar relation is shown by the comparison of the value of co-funding for all projects in relation to the cultural heritage projects (56.5 billion compared to 1.4 billion PLN). The share of the EU funds allocated to the purposes relating to the preservation of cultural heritage in Eastern Poland was similar to that in the Mazowieckie Voivodship [Powęska 2016].

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<sup>1</sup> The topics of the projects analyzed in the study included: revitalization, conservation, renovation, restoration, preservation and adaptation of historic buildings and areas for future cultural uses; protection, preservation and safeguarding of cultural heritage objects and of historic objects; conservation and safeguarding of museum collections, archives, old prints and other tangible memorials; safeguarding of monuments against theft and destruction; adaptation of cultural heritage objects to meet the needs of disabled people; creation of the information systems and organization of cultural events of regional importance (for example, festivals, fairs, etc).

It is worthwhile emphasizing a relatively small scale of disproportions regarding the value of the projects. An average value of the project accomplished in Eastern Poland totalled around 5.4 million PLN, while the value of the EU co-funding amounted to 3 million PLN; however, as per one project relating to the protection of cultural heritage these values totalled about 4.6 million and 2.8 million PLN respectively, thus being 14 and 7 percentage points lower (Tables 1 and 2).

**Table 1.** The number and the total value of projects in the voivodships of Eastern Poland in the years 2007–2015

Specification	Number of projects		Value of the projects		Amount of co-funding from the EU funds	
			total	for 1 project	total	for 1 project
	total	%	thousand PLN			
Lubelskie	5 421	29.2	22 135 885.1	4 083.4	13 165 266.4	2 428.6
Podkarpackie	4 929	26.6	29 683 203.2	6 022.2	16 640 584.2	3 376.1
Podlaskie	2 085	11.2	14 674 044.5	7 037.9	7 383 574.4	3 541.3
Świętokrzyskie	2 391	12.9	13 077 675.2	5 469.5	7 516 426.9	3 143.6
Warmińsko-mazurskie	3 727	20.1	19 769 552.9	5 304.4	11 796 890.4	3 165.3
Eastern Poland in total	18 553	100.0	99 340 360.9	5 354.4	56 502 742.2	3 045.5

Source: Own elaboration based on KSI SIMIK 07-13 as of 31 December 2016.

**Table 2.** The number and the total value of cultural heritage projects in the voivodships of Eastern Poland in the years 2007–2015

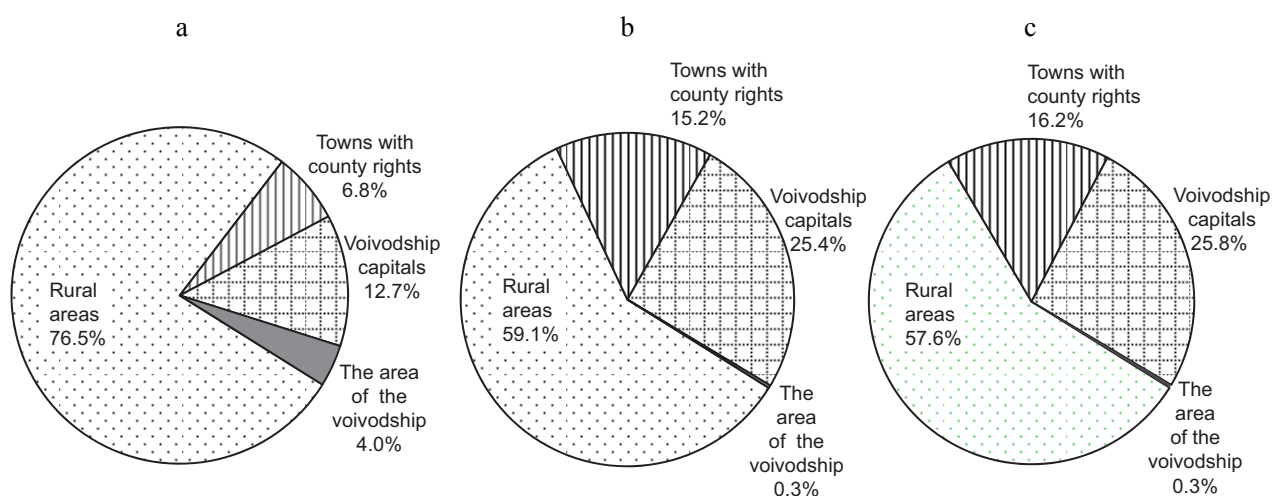
Specification	Number of projects		Value of the projects		Amount of co-funding from the EU funds	
			total	for 1 project	total	for 1 project
	total	%	thousand PLN			
Lubelskie	94	18.9	624 403.7	6 642.6	396 271.8	4 215.7
Podkarpackie	104	20.9	402 165.3	3 867.0	258 907.4	2 489.5
Podlaskie	27	5.4	93 853.5	3 476.1	66 674.0	2 469.4
Świętokrzyskie	155	31.1	642 255.3	4 143.6	393 240.3	2 537.0
Warmińsko-mazurskie	118	23.7	532 886.4	4 516.0	290 709.9	2 463.6
Eastern Poland in total	498	100.0	2 295 564.2	4 609.6	1 405 803.5	2 822.9

Source: Own elaboration based on KSI SIMIK 07-13 as of 31 December 2016.

Among five voivodships of Eastern Poland there were significant differences in respect of both the number and the total value, as well as the value of the EU co-funding for projects concerning cultural heritage (Table 2). Most of such projects were accomplished in the Świętokrzyskie Voivodship (31.1%). This was also the leading region in terms of the total value and of the amount of the EU co-funding (28% each). Although the Lubelskie Voivodship realized much fewer projects (18.9%), their total value as well as the EU co-funding (27.2 and 8.2%

respectively) were very similar to the level of the Świętokrzyskie Voivodship. However, the weakest position in the field under study was occupied by the Podlaskie Voivodship. Its share in the number of projects totalled barely 5.4%, and its share in the value of projects amounted to 4.1%, while its share in the value of the EU co-funding totalled 4.7%. This was the result, first of all, of the lack of revitalization projects in this region, since under the Regional Operational Programme of the Podlaskie Voivodship for the years 2007–2013 no actions were taken under any of the priority axes, and, hence, no financial resources were allocated to the revitalization of degraded areas.

While analyzing the structure of projects in the spatial cross-section one can observe a clear-cut dominance of rural areas. This applied both to the share in terms of the number of projects and of their total value, as well as in terms of the value of the EU co-funding for the projects (Fig. 1).



**Fig. 1.** The structure of cultural heritage projects in the macroregion of Eastern Poland in the years 2007–2015 by type of area: a – number of projects, b – total value of the projects, c – the amount of co-funding from the EU funds

Source: Own elaboration based on KSI SIMIK 07-13 as of 31 December 2016.

In the rural areas of Eastern Poland more than three-fourths of all projects related to the protection of cultural heritage were accomplished; also, around 1.4 billion PLN was allocated to the projects, which constituted almost 60% of financial resources earmarked for this purpose. Therefore the relationship between rural areas and the highly urbanized areas (towns with county rights and voivodship towns) in terms of the number of implemented projects totalled 4 : 1; however, in terms of the value of projects it amounted only to 1.5 : 1 and in terms of the value of the EU co-funding it totalled 1.4 : 1. One should emphasize here that an average value of a project in rural areas was much lower than that in the remaining types of areas. An average value of the project implemented in rural areas amounted to some 3.6 million PLN, while in the remaining types of areas it totalled 8 million PLN; therefore, the disproportion in this regard was greater than twofold. At the same time, the highest values across the entire region of Eastern Poland were observed in the towns with county rights (10.3 million PLN) and in the voivodship capitals (9.2 million PLN). Across voivodships the highest average project value was recorded in the capital city of the Świętokrzyskie Voivodship, that is to say in Kielce (17.5 million PLN), as well as in the towns with county rights of the Lubelskie Voivodship (13.9 million PLN). On the other hand, with respect to the areas the Warmińsko-mazurskie Voivodship was the leading region in Poland (4.3 million PLN), while the Podlaskie Voivodship was ranked last (2.7 million PLN).

The number of cultural heritage projects varied greatly depending on the type of the area (Table 3). A very clear-cut concentration of the projects implemented in rural areas was observed in two voivodships: Świętokrzyskie and Podkarpackie – 88 and 84% respectively. In the three remaining voivodships of Eastern Poland the share of rural areas reached approximately 66%. On the average, every fifth project (19.5%) was realized in a highly urbanized area (towns with county rights and voivodship towns), and a relatively highest number of such projects (by region) was recorded in the Lubelskie Voivodship (35.1%) and in the Podlaskie Voivodship (33.3%). Only a very small number of projects covered the whole region: their share at the macroregional level reached barely 4%.

**Table 3.** The number and structure of cultural heritage projects in the voivodships of Eastern Poland in the years 2007–2015 by type of area

Specification	Number of projects	The structure of projects by types of areas				total
		rural areas	towns with county rights	voivodship capitals	the area of the voivodship	
%						
Lubelskie	94	64.9	13.8	21.3	0.0	100.0
Podkarpackie	104	83.7	9.6	3.8	2.9	100.0
Podlaskie	27	66.7	14.8	18.5	0.0	100.0
Świętokrzyskie	155	88.4	1.3	5.2	5.2	100.0
Warmińsko-mazurskie	118	66.1	4.2	22.0	7.6	100.0
Eastern Poland in total	498	76.5	6.8	12.7	4.0	100.0

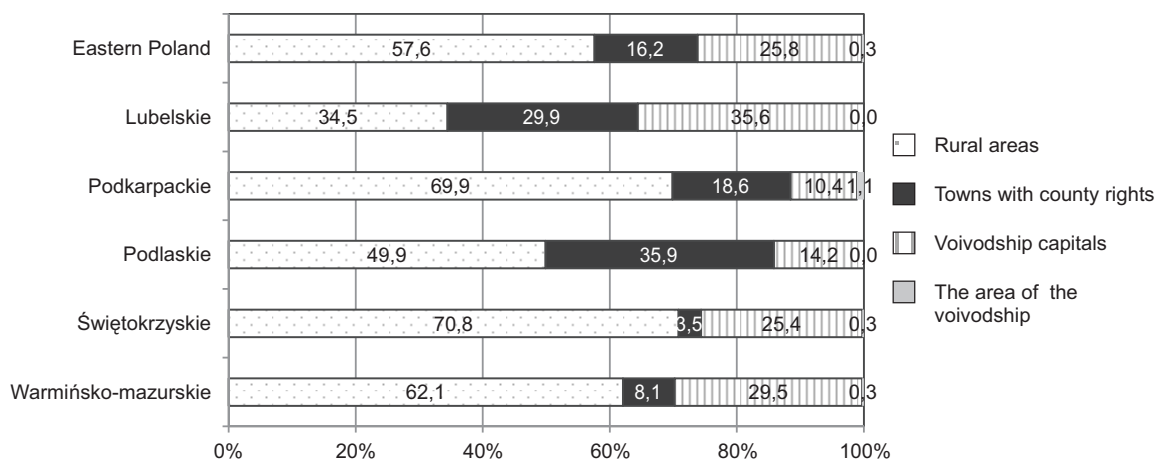
Source: Own elaboration based on KSI SIMIK 07-13 as of 31 December 2016.

The largest amount of funds for projects associated with the protection of cultural heritage was allocated to the rural areas of the Świętokrzyskie Voivodship (482 million PLN). In terms of the share of rural areas in the total value of this type of projects two voivodships ranked the highest, namely Świętokrzyskie Voivodship (75%) and Podkarpackie Voivodship (69.5%).

Almost 58% of the value of the EU co-funding for the projects regarding the protection of cultural heritage was allocated to rural areas in Eastern Poland (Fig. 2). As regards the structure of the value of the EU co-funding by type of areas, a high level of differentiation between voivodships was observed.

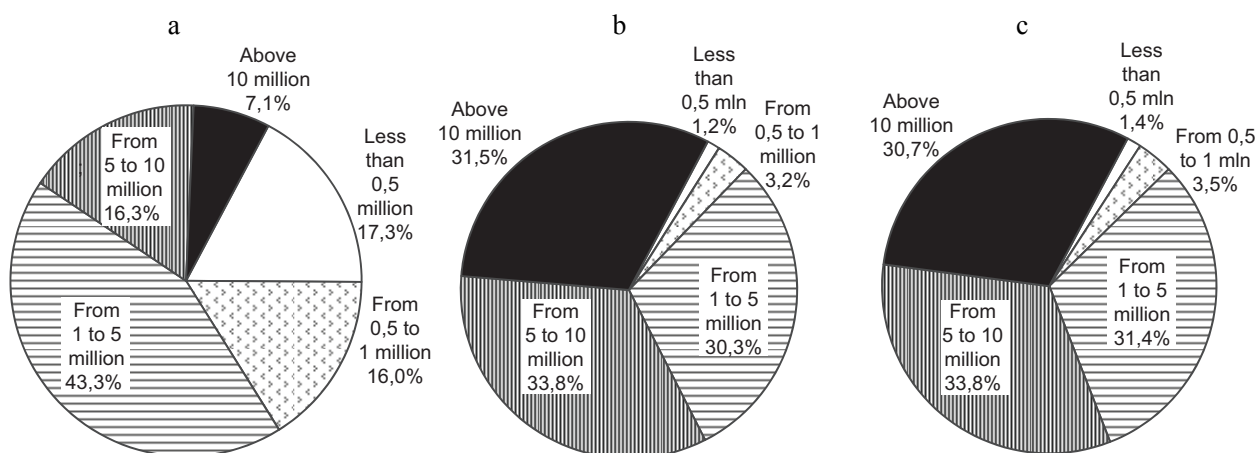
The amount of the EU co-funding for projects relating to the protection of cultural heritage, which was spent in rural areas in the particular voivodships was as follows: Świętokrzyskie Voivodship – 279 million PLN, Podkarpackie Voivodship – 181 million PLN, Warmińsko-mazurskie Voivodship – 180 million PLN, Lubelskie Voivodship – 137 million PLN, and Podlaskie Voivodship – 33 million PLN. Therefore, the scale of disproportions between the voivodships in this field was more than eightfold higher. The highest share of rural areas in the value of the EU co-funding acquired by the regions was recorded in the Świętokrzyskie Voivodship (71%) and in the Podkarpackie Voivodship (70%). On the other hand, the lowest share of rural areas in the value of the EU co-funding was that of the Lubelskie Voivodship (34.5%), which, as compared to the number of the implemented projects, indicates that the value of co-funding per project was many times lower in rural areas in comparison with other types of areas.

The analysis of the structure of projects concerning cultural heritage according to the total value and according to the value of the EU co-funding shows that small-scale projects prevailed in the rural areas of Eastern Poland (Fig. 3).



**Fig. 2.** The structure of the value of the EU co-funding for cultural heritage projects in the voivodships of Eastern Poland in the years 2007–2015 by type of area

Source: Own elaboration based on KSI SIMIK 07-13 as of 31 December 2016.



**Fig. 3.** The structure of cultural heritage projects implemented in rural areas in Eastern Poland in the years 2007–2015 by value of projects: a – number of projects, b – total value of the projects, c – the amount of co-funding from the EU funds

Source: Own elaboration based on KSI SIMIK 07-13 as of 31 December 2016.

The level of differentiation of the value of their budgets ranged from 38.2 thousand to 70.1 million PLN. The budget of every third project was lesser than 1 million PLN. Most projects, as many as 43%, had at their disposal a budget totalling between 1 million and 5 million PLN. The share of large-scale projects (exceeding 10 million PLN) in rural areas reached its lowest level and it totalled 7%. On the other hand, with regard to an aggregate value of the projects, and by the same token to the scale of financial resources allocated to rural areas, the share of small-scale projects (less than 1 million PLN) was insignificant since it amounted to 4.4%. On the other hand, the share of the three remaining groups of projects was relatively even and it ranged between 30 and 33%. The structure of the projects relating to the co-financing through the EU funds was similar.

As already stated earlier, projects implemented in rural areas were considerably smaller than those carried into effect in the highly urbanized areas. At the scale of the macroregion of Eastern Poland an average value of the EU co-funding for the projects in rural areas was nearly three times lower than in large towns. Across the voivodship the highest disproportion in this field to the disadvantage of rural areas was recorded in the Świętokrzyskie Voivodship (5.6 : 1), while the lowest one was observed in the Warmińsko-mazurskie Voivodship (1.5 : 1).

Among 498 projects relating to the protection of cultural heritage carried into effect in the macroregion of Eastern Poland, most projects were related to revitalization (41%) and the renovation of historic buildings (36%). Of relatively little importance (5.6%) were projects concerning cultural events, such as festivals, music concerts, performances, exhibitions, stage productions, etc. A few projects were related to the promotion of the values of cultural heritage (6%) and to the areas constituting cultural heritage (3.8%), such as, for example, layouts of scenic parks, botanical and zoological gardens, arboreta, geological objects, etc.

The analysis of the structure of projects implemented in the rural areas of Eastern Poland confirmed a clear-cut dominance of revitalization undertakings (42.5%), the scope of which covered revalorization, conservation, renovation, and restoration of objects and areas of cultural heritage, as well as their adaptation for cultural purposes. Revitalization projects concentrated nearly 60% of the total value of funds allocated to cultural heritage (Table 4). Projects intended to renovate historic buildings were also of great importance (38%).

**Table 4.** The structure of cultural heritage projects implemented in rural areas in Eastern Poland in the years 2007–2015 by type of project

Specification	Number of projects		Total value of the projects		The amount of co-funding from the EU funds	
	total	%	thousand PLN	%	thousand PLN	%
Renovation of historic buildings projects	144	37.8	350 122.3	25.8	229 028.7	28.3
Revitalization projects	162	42.5	804 789.7	59.3	460 470.4	56.9
Natural heritage projects	15	3.9	50 992.9	3.8	31 051.5	3.8
Cultural events projects	23	6.0	4 492.4	0.3	3 180.2	0.4
Promotion of cultural values projects	8	2.1	9 834.8	0.7	7 216.7	0.9
Others projects	29	7.6	137 112.4	10.1	78 709.8	9.7
Eastern Poland in total	381	100.0	1 357 344.4	100.0	809 657.2	100.0

Source: Own elaboration based on KSI SIMIK 07-13 as of 31 December 2016.

The total value of the EU co-funding for cultural heritage projects which were implemented in the rural areas of Eastern Poland amounted to about 810 million PLN. For the most part, these resources were earmarked for revitalization undertakings (57%). Two times smaller financial support was awarded for projects related to the renovation of historic buildings (28%). Around 10% of the EU funds was involved in the realization of “other” projects, which covered, i.a., the topics of historic trails, historic parks, etc. The smallest number of projects and the lowest grants from the EU funds concerned the three remaining types of projects selected for the analysis, that is to say natural heritage (3.8%), promotion of the values of cultural heritage (0.9%) and cultural events (0.4%).

## CONCLUSIONS

The results of this study lead to the following conclusions:

1. The expenditures on the preservation of cultural heritage constituted a small part of the financial resources acquired from the EU funds in the years 2007–2015. Projects related to these topics constituted barely 2.6% of the total number of projects implemented in the macroregion of Eastern Poland and 2.5% of the amount of co-funding through the EU grants. This demonstrates that the preservation of cultural heritage was of minor importance against a background of the main priorities of the structural intervention of the EU in the voivodships of Eastern Poland.
2. The structure of the allocation of financial resources for preservation of cultural heritage according to the types of areas was highly dominated by rural areas which comprised rural communes, small towns and counties. They concentrated about 77% of all projects and nearly 60% of the amount of allocated funds. Also, the value of the projects realized in rural areas was almost three times lower than the value of projects implemented in highly urbanized areas.
3. There were considerable differences between the five voivodships of Eastern Poland, both in terms of the number and of the total value, as well as in terms of the amount of the EU co-funding for cultural heritage projects. The largest number of projects was carried into effect in the Świętokrzyskie Voivodship (155), while the smallest number of projects was realized in the Podlaskie Voivodship (27); thus, the scale of differentiation between these voivodships was nearly sixfold. Differences in the value of financial resources for the preservation of cultural heritage between the two regions (Świętokrzyskie and Podlaskie) were almost sevenfold.
4. The structure of the types of projects implemented in the areas of Eastern Poland was clearly dominated by revitalization undertakings and by the projects intended for the renovation of historic buildings. Altogether, they constituted as much as 80% of the total number of cultural heritage projects, 85% of the total value of projects and 85% of the financial resources received from EU funds.

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## **FINANSOWANIE DZIEDZICTWA KULTUROWEGO OBSZARÓW WIEJSKICH W POLSCE WSCHODNIEJ Z UNII EUROPEJSKIEJ W LATACH 2007–2015**

### **STRESZCZENIE**

Artykuł prezentuje problematykę finansowania dziedzictwa kulturowego obszarów wiejskich z funduszy Unii Europejskiej w makroregionie Polska Wschodnia. Przedstawiono skalę oraz strukturę wykorzystania funduszy europejskich na przedsięwzięcia związane z ochroną i promocją dziedzictwa kulturowego. Określono również skalę zróżnicowania regionalnego w zakresie wykorzystania funduszy europejskich na ochronę dziedzictwa kulturowego obszarów wiejskich. Zakres czasowy badania obejmował lata 2007–2015. Analizę przeprowadzono w przekroju sześciu typów projektów wyodrębnionych według ich zakresu przedmiotowego, tj.: promowanie walorów przyrodniczych; ochrona i waloryzacja dziedzictwa przyrodniczego; inne wsparcie na rzecz wzmocnienia usług turystycznych; ochrona i zachowanie dziedzictwa kulturowego; rozwój infrastruktury kulturalnej; inne wsparcie dla poprawy usług kulturalnych; zintegrowane projekty na rzecz rewitalizacji obszarów miejskich i wiejskich. Analizę przeprowadzono w układzie czterech typów obszarów: obszary wiejskie, miasta na prawach powiatu, miasta wojewódzkie oraz obszar województwa. Bazę informacyjną badania stanowiły dane dotyczące projektów współfinansowanych ze środków UE, zgromadzone w Krajowym Systemie Informatycznym (KSI SIMIK 07-13) według stanu na 31 grudnia 2016 roku.

**Słowa kluczowe:** Polska Wschodnia, obszary wiejskie, dziedzictwo kulturowe, fundusze europejskie

## FOOD PRODUCERS' COMPETITIVENESS GAP IN POLAND ON THE EUROPEAN UNION MARKET

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### ABSTRACT

This article presents the gap in potential and competitive position of food producers in Poland as compared to selected the European Union countries. The timeframe of research covered the years 2005–2015. The conducted analyses indicate the positive phenomenon of a decreasing but, at the same time, a very clear distance between the competitive potential of food producers in Poland and European leaders. The productivity level of particular production factors indicates, at the same time, the fact that the least beneficial situation was recorded in the case of the productivity of human work. A definitely smaller competitive gap was present at the level of the capital's productivity. The decreasing competitive gaps were also observed with regard to particular partial measures of the competitive position. The nearly double increase in the share of Polish food producers in intra-Community export was particularly beneficial. This was not reflected in a significant change of the competitive position of domestic food producers on the EU market with the low output level of this index.

**Key words:** competitive potential, competitive position, competitiveness gap, food producers, productivity

### INTRODUCTION

The concept of competitiveness, defined in source literature in different manners, is associated with its specific economic dimension. According to the division proposed by Flejterski [2000], distinguishes the micro – micro-, micro-, meso-, macro- and megacompetitiveness. The international competitiveness of food producers refers to the meso-economic level. From this perspective particular attention is paid to the ability of the industry to compete with foreign competitors on international markets and on the internal market. This is clearly visible in the definitions of competitiveness proposed by Kim and Marion [1997] as well as Carraresi and Banterle [2008], who define it as the ability to maintain shares in the domestic market and on foreign markets under the conditions of free trade. Research on the competitiveness of the food industry in the EU countries [Wijnands and Verhoog 2016] treats this branch's competitiveness as the ability to constantly gain profit and market share on the domestic and export markets in which the industry operates. We should emphasize the fact that special attention is paid in them to the aspect of international competitiveness, regardless of differences existing between them.

The issue of international competitiveness of the food industry in the EU and its particular countries was an issue in numerous studies [Traill 1998, Banse et al. 1999, Wijnands et al. 2008, Tacke et al. 2009, ECORYS 2010, LEI 2011, Puticová and Mezera 2011]. This results from the special significance of this branch, and the agricultural and food sector in the wider context, in the EU economy and budget. Food producers are an integral

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part of the cultural identity of the individual member states. Its meaning is even greater as the EU countries remain the largest exporters and importers of food products in the world [Hockmann et al. 2013]. The validity of the assessment of international competitiveness of food production companies in Poland results also from the particular importance of this branch in the domestic economy of Poland. Internal competitiveness of the food industry is associated with high potential resulting from the number of employed persons – 17.5% of share in the entire production sector, the highest percentage of sold production in industrial processing – 19.0% [Juchniewicz and Łukiewska 2014] as well as the significant share – 11–13% of the Polish agricultural and food export in total [Szczepaniak 2014a].

International competitiveness at the mesoeconomic level has, on the basis of definitions referred to above, a confrontation nature. For this reason, the analysis of food producers' competitiveness in Poland was conducted with regard to the most important competitors on the intra-Community market. The purpose of the study was to identify the competitiveness gap of food producers in Poland as compared to the selected EU countries. The selection of countries for the analysis was intentional – it included countries with the greatest share in employment and sold value on the intra-Community market.

## MATERIAL AND METHODS

The ambiguity of the concept of competitiveness results in the fact that indexes with a different structure and a different semantic extent are proposed for its measurement. Some indexes refer to the assessment of potential, respecting the ability to compete, while others present the achieved condition, namely the assessment of the market position. Competitive potential, associated with factor competitiveness, results from the availability as well as the degree of use of resources. The basic factors in industrial production are labor and capital. For this reason, the size and productivity of these factors were used to measure the competitive potential of food producers. The productivity of labor was calculated as the relation between the value of sold production per 1 employed person (EUR thousand per employed person), and the productivity of capital was calculated as the relation between the value of production per 1 EUR of an investment in tangible fixed assets (EUR per EUR investment outlay). The assessment of labor and capital productivity was connected with the analysis of the capital – labor index that expresses the quantity of capital units per a labor unit (EUR thousand per employed person). Adamczyk [2008] pointed out its significance in the case of growth in labor productivity resulting from better equipment of labor force in machines and devices.

The international dimension of the competitiveness of Polish food producers requires the assessment of their capacity to compete on foreign markets. Analyses of foreign trade may employ a number of measures and indexes that make it possible to identify the character, correctness as well as changes in trade flows. The competitive position was assessed on the basis of the most frequently used indexes of competitiveness in international trade, namely Export Market Share – *EMC*, Trade Coverage – *TC*, as well as Revealed Comparative Advantage – *RCA*. The share in the sector's export is one of the most widely used measures of competitiveness. It was calculated according to the following formula Banterle [2005]:

$$EMS = \frac{E_{Fi}}{E_{FW}}$$

where:  $E_{Fi}$  – export of food products of the country  $i$  on intra-EU market;  
 $E_{FW}$  – export of food products of the EU-28 countries on intra-EU market.

Trade coverage is used to examine the relation between export and import of a given sector and it is defined as follows [Verdoorn 1960]:

$$TC = \frac{E_{Fi}}{I_{Fi}}$$

where:  $I_{Fi}$  – import of food products of the country  $i$ .

Revealed comparative advantages determines the share of the food industry in the entity's total export with regard to the share of that sector in total export. It was calculated according to the formula [Balassa 1965]:

$$RCA = \frac{E_{Fi}}{E_i} \cdot \frac{E_W}{E_{FW}}$$

where:  $E_i$  – total export of the country  $i$  on intra-EU market;  
 $E_W$  – total export of the EU-28 countries on intra-EU market.

The competitive gap, according to Gorynia's concept [2000], was calculated as the difference in the competitive potential (*ex ante* competitiveness) also the competitive position (*ex post* competitiveness) of food producers in Poland and selected countries. A dynamic assessment of the competitiveness gap was also made, meaning the process of changing the initial competitiveness gap (2005) as compared to 2015. The timeframe of research covered the years 2005–2015. Data was acquired from the websites of Eurostat, Structural Business Statistics and Eurostat-Comext. Food producers in the study were defined according to the Polish business activity classification PKD 2007 (section 10) as well as the Standard International Trade Classification SITC Rev. 3 (sections: 01-09).

## COMPETITIVE POTENTIAL OF FOOD PRODUCERS

It depends on the available resources and the effectiveness of their use. We should seek theoretical relations between productivity and international exchange in the latest trends in the theory of foreign trade. The New, New Trade Theory – NNTT, the foundation of which is laid by the model by Melitz [2003] as well as the model by Melitz and Ottaviano [2008] states that only entities with the highest productivity are able to enter and compete on the export market (hypothesis of self-selection), while operating on the foreign market leads to their expansion. Labor resources are one of the most important factors whose size and effectiveness of use determines the level of generated production [Mrówczyńska-Kamińska 2012]. The largest number of employed persons in food production was recorded in Germany and France (accordingly 20.3 and 14.0% of all the employed in EU-28 in 2013). Relatively large workloads in this branch were also involved in Italy (9.7%), Poland (9.5%), UK (9.2%) and Spain (7.7%). The remaining countries had relatively smaller significance within the structure of employment in EU-28 (from 4.1% in Romania to 2.2% in Belgium). The productivity of labor of food producers did not fully correspond to the number of employed persons in particular countries. The highest level of this index was recorded in Belgium and in the Netherlands (Table 1). The productivity of labor in France and UK was approx. 2 times smaller, and in Germany – 2.5 times smaller. These are mainly well-developed countries in which the level of the food industry's development is highest in the entire Community [Poczta and Beba 2014]. A definitely lower (4–5 times lower) level of this index was recorded in Poland and in the Czech Republic. The most unfavorable situation was recorded in Romania where the productivity of labor was nearly 50% smaller than in Poland and in the Czech Republic and as much as 10 times smaller as compared to Belgium.

Improvement in labor productivity was a common phenomenon, taking place in all analyzed countries, although the scale of changes varied. The highest average annual pace of changes in the years 2005–2015 occurred

in Romania and in Poland (Table 1). This resulted from a significant increase in the value of sold production which took place under the conditions a small decrease in employment. A very beneficial change in this index took place in Belgium. The average annual pace of changes amounted to 5.2% with a high starting level of labor productivity in 2005. The stability of the number of persons employed in entities producing food in this country, with a significant increase in the value of sold production, results in the fact that Belgium is the unquestionable leader in this classification. A clear growth in labor productivity of food producers also took place in the Czech Republic. This change did not result from an increase in production value (as in countries discussed previously) but from the reduction in employment.

The productivity of capital, as yet another index of the competitive potential, makes it possible to assess the effectiveness of the use of assets in entities producing food. The highest effectiveness of the use of capital outlays was recorded in the Netherlands (Table 1). More than 34 EUR of production fell per 1 EUR of investment outlays incurred in this countries in 2015. A smaller level of this index was recorded in Germany and Italy. Another group of countries contains Spain and Belgium where the effectiveness of use of investment outlays was approx. 28 EUR. In Poland, ranked eighth, the index of labor productivity in 2015 amounted to 23.7 EUR·EUR<sup>-1</sup>. The productivity of capital of food producers in the Czech Republic and in Romania was definitely lower, although at a similar level to one another. It is worth emphasizing that the diversity of this index between the analyzed countries was more than two times smaller than that of labor productivity.

The average annual pace of changes in the productivity of capital in the years 2005–2015 was not so clear as in the case of labor productivity. A decrease in the productivity of capital was observed in the Czech Republic and in Germany in the analyzed period. This resulted from the highest, among the analyzed countries, increase in the value of investments in tangible fixed assets. The highest pace of changes in the productivity of capital was recorded in Romania. However, this cannot be interpreted as beneficial because it resulted from a 30% decrease in the value of investments in tangible fixed assets. A similar situation was noticed among food producers in Spain. Slight, positive changes in the index of capital productivity were recorded in other countries.

The presented analysis indicates the fact that the growth in labor productivity may be a consequence of better equipment of labor force in machines and devices. This leads to a simultaneous decrease in the value of the capital productivity index. Therefore, the research on the productivity of labor and capital should be combined with the research on changes in the capital – labor index which makes it possible to assess the degree of outlay substitution. The highest level of this index was observed in Belgium and in the Netherlands (Table 1). Relatively large investments in fixed assets per employed person were also incurred by entities producing food in Italy, Spain and UK. A less favorable situation was observed in Germany, Poland and the Czech Republic. The capital – labor index in these countries was almost three times lower as compared with the leaders. Definitely the smallest investment outlays per employed person were recorded in Romania.

When analyzing changes in the capital – labor index in the years 2005–2015, it was stated that it decreased only in Romania and in the Netherlands. A growth in the equipment of fixed assets per employed person was recorded in other countries. The highest average annual pace of changes of the capital – labor index was observed in the Czech Republic as well as in Belgium and Poland and the UK. The conducted discussions also indicate the fact that the average annual growth rate of labor productivity in all analyzed countries is greater than that of capital productivity. At the same time, a growth in the capital – labor index was observed in the majority of countries. The described situation indicates the presence of labor substitution by capital.

The competition of Polish food producers has been focused on the European market for many years. In this context, it is important to define the gap in potential and competitive position as compared to the rivals. The largest gap of competitive potential was recorded in the case of labor productivity. As compared to the leaders, namely the Netherlands and Belgium, in 2005 it amounted to respectively 421 and 346% (Table 2).

An unfavorable situation in this issue was observed in comparison to of the so-called old EU. The competitiveness gap of labor productivity was approx. –200%. The only country over which Poland had competitive

**Table 1.** Indexes of competitive potential of food producers in selected EU countries in 2005, 2009 and 2015

Country	Labor productivity (EUR thousand per employed person) in year				Capital productivity (EUR per EUR investment outlay) in year				Capital – labor index (EUR thousand per employed person) in year			
	2005	2009	2015	average annual pace of changes (%)	2005	2009	2015	average annual pace of changes (%)	2005	2009	2015	average annual pace of changes (%)
Germany	173.7	183.3	188.8	0.8	38.4	34.2	30.3	-2.3	4.8	5.4	6.2	2.6
France	205.8	212.4	236.0	1.4	27.4	36.5	25.7	-0.6	7.5	7.4	9.2	2.1
Italy	213.8	238.4	279.8	2.7	28.6	21.4	30.9	0.8	7.5	11.1	9.0	1.8
United Kingdom	186.6	194.0	262.6	3.5	30.3	36.9	22.2	-3.1	6.2	5.2	11.8	6.6
Spain	196.0	220.2	262.7	3.0	23.1	25.1	27.8	1.9	8.5	8.8	9.5	1.1
Netherlands	337.0	377.5	477.2	3.5	30.7	37.8	34.5	1.2	11.0	10.0	13.8	2.3
Belgium	288.5	371.4	479.6	5.2	29.2	27.9	28.0	-0.4	9.9	13.3	17.1	5.6
Poland	64.7	76.8	110.8	5.5	19.1	24.1	20.3	0.6	3.4	3.2	5.5	4.9
Romania	27.6	37.8	53.2	6.8	7.0	9.7	18.6	10.3	3.9	3.9	2.9	-2.9
Czech Republic	70.2	85.2	92.8	2.8	21.4	27.2	19.9	-0.7	3.3	3.1	4.7	3.6

Source: Own study based on data Eurostat, Structural Business Statistics [accessed 05.11.2016].

**Table 2.** Gap in indexes of competitive potential of food producers in Poland in 2005, 2009 and 2015

Country	Gap in indexes of competitive potential (Poland = 100%)								
	labor productivity in year			capital productivity in year			capital–labor index in year		
	2005	2009	2015	2005	2009	2015	2005	2009	2015
Germany	-168.4	-138.7	-70.4	-101.3	-42.0	-49.3	-42.4	-68.1	-12.7
France	-218.0	-176.6	-113.0	-43.5	-51.2	-26.6	-121.5	-132.4	-67.3
Italy	-230.3	-210.4	-152.5	-49.8	11.2	-52.2	-120.4	-249.4	-63.6
United Kingdom	-188.3	-152.6	-137.0	-58.4	-53.2	-9.4	-82.0	-64.9	-114.5
Spain	-202.8	-186.7	-137.1	-21.1	-4.0	-36.9	-150.1	-175.8	-72.7
Netherlands	-420.6	-391.5	-330.7	-60.9	-56.7	-70.0	-223.5	-213.6	-150.9
Belgium	-345.7	-383.6	-332.9	-52.8	-15.6	-37.9	-191.7	-318.2	-210.9
Poland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Romania	57.4	50.7	52.0	63.1	59.8	8.4	-15.6	-22.7	47.3
Czech Republic	-8.5	-11.0	16.2	-12.1	-12.9	2.0	3.2	1.7	14.5

Source: Own study based on data Eurostat, Structural Business Statistics [accessed 05.11.2016].

advantage was Romania and the Czech Republic. The analysis of the competitiveness gap from a dynamic perspective indicates that its level is being decreased, which is a positive tendency. The highest decrease in the competitiveness gap in 2015 (almost 2.5 times) took place as compared to Germany. This is a very beneficial phenomenon because this country is the largest recipient of Polish products. A significant compression of the competitiveness gap of labor productivity was also observed in comparison to other countries. The competitiveness gap of labor productivity remained almost at the same level, and it even increased from the value perspective, only referring to Belgium. However, the differences in labor productivity between Poland and the leading EU countries are still high. Szczepaniak [2014b] indicates the fact that the improvement in the efficiency of this branch's operation may take place through the growth in technical-organizational progress.

A definitely lower and systematically decreasing gap of competitive potential was observed in the productivity of capital and in the capital – labor index. The highest differences in the productivity of capital were observed in 2015 as compared to Germany and Spain, but their level was only 53–56%). The productivity of capital of food producers in Poland, compared with other countries, was definitely smaller (21–37%). A higher productivity of capital was recorded only referring to Romania and the Czech Republic. Relatively productivity of capital was associated with high capital intensity of production [Łukiewska and Juchniewicz 2016]. Food industry companies took a lot of investments related to the adjustment of plants to the EU requirements and to reduce the technological gap. Such actions were appropriate since, as indicated Urban [2010] technological innovations and the increase in development investments were the key factors for the improvement of the competitiveness of Polish food producers on the European market. The level of labor productivity depends both on the investment and non-investment method of improving the effectiveness of human resources. The investment (capital-intensive) growth in labor productivity is associated with increasing the property equipment. The gap in competitive potential associated with the relation between the value of employed capital per unit of labor was the highest in comparison to Belgium and the Netherlands, namely countries with a high advantage in labor productivity. A particularly clear decrease (approx. five times) in the gap in the capital–labor index was observed as compared to Germany.

## **COMPETITIVE POSITION OF FOOD PRODUCERS**

Discussion related to international competitiveness are undoubtedly associated with progressing integration and globalization processes. Competitiveness may then be identified with the ability to maintain or increase shares on global markets. Indexes based on international trade are most often used to measure it. The basic index of the competitive position as resulting competitiveness is the share in export to the EU market. The Netherlands and Germany are indisputable leaders on the EU market (Table 3). These countries executed 1/3 of internal export throughout the entire analyzed period. The most important items in the export structure in the Netherlands included vegetables and fruit, meat and meat products as well as dairy products and eggs. Food producers from Germany mainly exported meat and meat products, dairy products and eggs, cereals and cereal products as well as products from the section coffee, tea, cocoa and spices. The next place among food exporters is occupied by France whose share in export amounted to 13–10%. France's export structure was dominated by cereals and cereal products, dairy products and eggs as well as vegetables and fruit. A relatively large share in the intra-Community export market was also observed in: Spain, Belgium and Italy. The total share of the countries referred to above in the value of export of food producers on the EU market was more than 60%. Poland was definitely the largest food exporter among the countries of the new EU. It traded mainly in meat and meat products as well as vegetables and fruit.

When examining changes in the share of the analyzed countries in export in the years 2002–2015, very slight average annual fluctuations were observed in the countries of the old EU. This index decreased in the majority of them (from 1.1–1.8% in France, the UK and Belgium to 0.5% in Spain). A growth in the share of export to

**Table 3.** Indexes of competitive position of food producers in selected EU countries

Country	Export market share (%) in year				Trade coverage in year				Revealed comparative advantage in year			
	2005	2009	2015	average annual pace of changes (%)	2005	2009	2015	average annual pace of changes (%)	2005	2009	2015	average annual pace of changes (%)
Germany	15.5	16.6	16.0	0.4	0.85	0.93	0.89	0.6	0.69	0.73	0.71	0.4
France	12.9	11.7	9.8	-3.4	1.07	0.95	0.84	-3.0	1.21	1.19	1.12	-1.0
Italy	7.0	7.0	6.7	-0.5	0.73	0.79	0.85	1.9	0.83	0.91	0.92	1.3
United Kingdom	4.5	4.0	4.2	-0.9	0.37	0.38	0.35	-0.7	0.56	0.64	0.69	2.6
Spain	9.5	9.2	9.9	0.5	1.53	1.50	1.89	2.7	1.88	1.78	1.83	-0.3
Netherlands	18.1	17.7	17.3	-0.6	2.19	2.13	1.98	-1.3	1.55	1.42	1.36	-1.6
Belgium	10.7	10.2	9.4	-1.6	1.50	1.53	1.46	-0.3	1.16	1.13	1.12	-0.4
Poland	3.0	3.9	5.8	8.6	1.45	1.25	1.57	1.0	1.18	1.09	1.25	0.7
Romania	0.2	0.4	0.7	17.0	0.34	0.35	0.48	4.4	0.24	0.44	0.53	10.4
Czech Republic	1.1	1.3	1.7	5.6	0.69	0.65	0.76	1.2	0.44	0.41	0.43	-0.3

Source: Own study based on data Eurostat-Comext [accessed 05.11.2016].

the EU market among the largest EU food exporters was observed only in Germany. The average annual pace of changes was definitely higher among new member states. An improvement in this index was particularly visible in the case of Romania (average annual growth by 17%), Poland (average annual growth by 8.6%) and in the Czech Republic (average annual growth by 5.6%). The low initial level of share in trade exchange and the liberalization of the EU market affected positive changes in this respect. However, their significance on the EU market of food products still remained incidental. Poland was definitely the largest food exporter among the countries of the new EU in all analyzed years. A beneficial tendency of a systematic growth in this index (average annual pace of changes – 8.6%) allowed Poland to get ahead of UK in 2015.

When assessing the results of foreign trade, it is important to analyze the trade coverage index. The largest surplus in trade exchange with EU countries was recorded in the Netherlands. Revenues from the export of food products exceeded the exceed on account of import two times. A high level of this index was also recorded in Spain, Poland and Belgium. A negative balance of foreign trade in food was observed in other countries. The pace of changes of this index in the discussed period was slight. Staszczak [2013] lists several premises for the affiliation of countries to net food exporters or importers. He claims that this may result from climatic conditions or a focus on agricultural production or other. For instance, Poland is characterized by high importance of agriculture and food economy in the domestic economy and still has price advantages associated with lower labor costs. The Netherlands and Denmark maintain their position of net food exporters due to intensive cultivations, while France and Spain – due to favorable climatic conditions. The advantage of food import over export may, on the other hand, result, among others, from high labor costs in UK. This index should thus be interpreted in a wider context.



The next element in the assessment of the competitive position of food producers was to identify the revealed comparative advantages. The RCA index above unity was observed in five countries: Spain, the Netherlands, Poland, France and Belgium. The highest comparative advantages characterized food producers in Spain. In other countries, this index is smaller than unity which means the lack of comparative advantages. The correlation between the high index of revealed comparative advantages and high significance of food producers in the domestic economy was observed only in Spain and France. Definitely different tendencies were recorded in Germany. The highest share in intra-Community export was not convergent with the significant importance of food producers on the internal market. Changes in the discussed index were small in the analyzed period. This suggests a relatively stable competitive advantage and economic structure of particular countries. The revealed comparative advantage index in Poland increased from 1.18 to 1.25 (the average annual pace of changes amounted to 0.9 percentage points). The following groups of products are recognized as the most competitive ones in the Polish agricultural and food trade, which is indicated by Szczepaniak's results [2014b]: meat and giblets, dairy products, vegetables, meat and fish products, cereal products and pastry as well as fruit and vegetable products. The comparative advantages of the food products referred to above have a relatively permanent character on the global market and on the European market.

The distance separating Polish food producers from entities conducting activities in compared countries depended on the assumed measure of the assessment of competitive position. The largest competitiveness gap was observed in the share of export on the EU market. As compared to Spain and Germany it amounted, accordingly, to –504 and –418% in 2005 (Table 4).

**Table 4.** Gap of indexes of the competitive position of food producers in Poland in 2005, 2009 and 2015

Country	Gap of indexes of the competitive position (Poland = 100%)								
	export market share in year			trade coverage in year			revealed comparative advantage in year		
	2005	2009	2015	2005	2009	2015	2005	2009	2015
Germany	–418.0	–329.5	–175.9	41.3	25.3	43.3	41.7	33.2	43.2
France	–329.9	–203.5	–69.0	26.4	24.1	24.0	–3.0	–9.0	10.4
Italy	–132.2	–80.6	–15.5	50.0	36.5	36.8	29.1	17.1	26.4
United Kingdom	–48.7	–4.7	27.6	74.5	69.7	69.6	52.6	41.7	44.8
Spain	–215.9	–137.7	–70.7	–5.2	–20.0	–20.0	–59.7	–63.1	–46.4
Netherlands	–504.0	–359.1	–198.3	–50.9	–70.7	–70.4	–31.3	–29.7	–8.8
Belgium	–258.5	–165.4	–62.1	–3.1	–22.7	–22.4	1.5	–3.1	10.4
Poland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Romania	94.2	88.7	87.9	76.9	72.1	72.0	79.3	59.3	57.6
Czech Republic	64.3	67.2	70.7	52.5	47.9	48.0	62.5	62.8	65.6

Source: Own study based on data Eurostat-Comext [accessed 05.11.2016].

The previously presented positive changes in this index in Poland led to its decrease more than two times in 2015. As compared to France, the third country in terms of share in export on the EU market, the distance of Poland in the starting period amounted to –330%. It was almost three times smaller in 2015. The greatest

improvement in the gap in the share of Polish food producers in EU export was observed as compared to Italy. In 2013 it amounted to less than 27%. An even more beneficial situation occurred as compared to the UK. In 2005 this country had competitive advantage at the level of almost -50%, while in the last year of the analysis it was not only leveled by Polish food producers but they obtained a competitive advantage. The share of Poland in EU export of food products throughout the entire analyzed period was higher than in Romania and the Czech Republic. Competitive advantage, despite insignificant differences in particular years, was of a permanent nature.

A definitely better situation of food producers in Poland was recorded when comparing the next two measures of the competitive position, namely trade coverage as well as revealed comparative advantage. The surplus of export over import was smaller than in Poland only in two countries, namely the Netherlands and Spain. The competitiveness gap was, however, small and amounted, accordingly, to -20 and -70% (Table 4). In other cases, this dependence indicates the advantage of Polish food producers. The highest difference was observed as compared to the UK (70%) and Romania (72%). As compared to the largest EU food exporters on the EU market, namely Germany and France, it was at a slightly lower level (24–43%). A similar situation applied to the competitiveness gap at the level of revealed comparative advantages. Food producers in Spain were characterized by the highest level of this index, while the competitive gap of Poland amounted to -20%. It was definitely smaller as compared to the Netherlands (-9%). Food producers in Poland obtained comparative advantage as compared to other countries. The greatest advantage, among countries of the old EU, was observed as compared to the UK and Germany. The competitive advantage of Polish food producers was clear as compared to Romania and the Czech Republic – accordingly 57 and 65%, similar to all analyzed indexes of the competitive position. However, when examining these beneficial levels of the revealed comparative advantages index, we should note that the specific cost – price system of comparative advantages of a given country over foreign countries, determining the development of foreign trade to a large extent, is relative. It indicates the specialization of a given country in trading in food products and, in the case of Poland (at a relatively low level of labor productivity), it is not a factor enabling a significant increase in the share of export on the EU market.

## CONCLUSION

The greatest improvement of competitiveness was recorded in the analyzed new EU countries. The expansion of the Community led to the effect of creating trade and the development of intra-Community trade, including food producers. The conducted analyses indicate the positive phenomenon of a decreasing but, at the same time, a very clear distance between the competitive potential of food producers in Poland and European leaders. The productivity level of particular production factors indicates the fact that the least beneficial situation was recorded in the case of the productivity of human labor. In order to increase the share of export to the EU market, it is necessary for this sector to further increase its labor efficiency. A definitely smaller competitive gap was present at the level of the capital's productivity. The decreasing competitive gaps were also observed with regard to particular partial measures of the competitive position. The nearly double increase in the share of Polish food producers in intra-Community export was particularly beneficial. Such a significant improvement in this index confirms the systematic development of this sector but, with its low starting level, it is not reflected in a significant change of the competitive position of domestic food producers on the EU market. Reducing the competitiveness gap of the producers' share on the EU market is possible through the growth in productivity associated with non-measurable factors. Because the total productivity of production factors is associated with organizational changes, improved management practices, improved methods of producing goods and services, it should be stated that there is an unused source of growth in the competitive potential of food producers in Poland in this case.

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## **LUKA KONKURENCYJNOŚCI PRODUCENTÓW ŻYWNOSCI W POLSCE NA RYNKU UNII EUROPEJSKIEJ**

### **STRESZCZENIE**

W artykule zaprezentowano lukę potencjału i pozycji konkurencyjnej producentów żywności w Polsce w porównaniu do wybranych krajów Unii Europejskiej. Zakres czasowy badań obejmował lata 2005–2015. Przeprowadzone analizy wskazują na pozytywne zjawisko zmniejszającego się, ale jednocześnie bardzo wyraźnego dystansu między potencjałem konkurencyjnym producentów żywności w Polsce a europejskimi liderami. Poziom produktywności poszczególnych czynników produkcji wskazuje jednocześnie, że najbardziej niekorzystną sytuację odnotowano w przypadku produktywności pracy ludzkiej. Zdecydowanie mniejsza luka konkurencyjna występowała w poziomie produktywności kapitału. Zmniejszające się luki konkurencyjne stwierdzono także w odniesieniu do poszczególnych miar cząstkowych pozycji konkurencyjnej. Szczególnie korzystny był prawie dwukrotny wzrost udziału polskich producentów żywności w wewnątrzunijnym eksporcie. Przy niskim poziomie wyjściowym tego wskaźnika nie przełożyło się to na istotną zmianę pozycji konkurencyjnej krajowych producentów żywności na rynku UE.

**Słowa kluczowe:** potencjał konkurencyjny, pozycja konkurencyjna, luka konkurencyjna, producenci żywności, produktywność



## THE BEGINNINGS AND DEVELOPMENT OF AGRICULTURAL ADVISORY SERVICES IN POLAND

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### ABSTRACT

The main objective of this article is to present the development of agricultural advisory services in Poland from its beginnings on the Polish lands, until the entry of our country into the European Union (1 May 2004). The data was obtained from a review of literature, published mainly in Polish, hence, not known in English publications and originates from the author's research carried out in the framework of research grant. The study used a descriptive method and documents the history of agricultural extension dating back to the mid-19th century. In the interwar period (1918–1939), advisory services were carried out by the newly established agricultural chambers, and after World War II, after their liquidation, by state system of agricultural advisory services, which was subject to many changes in the organizational structure and objectives pursued. In the first period of transition of agriculture to a free market economy, the author emphasized the big role of the Polish/American Extension Project for the reorganization of Polish advisory and improvement of skills of our advisers.

**Key words:** social agronomy, agricultural chambers, advisory services, Polish/American Extension Project

### INTRODUCTION

Poland was the only country of the former socialist camp in Central and Eastern Europe which retained private farms and had state-owned agricultural advisory services established after the liquidation of chambers of agriculture at the outset of the centrally planned economy (1946/1947). The share of natural person's holdings in the use of agricultural land (UAA), according to the CSO, was as follows: 1950 – 89.6%, 1980 – 74.5%, 2002 – 87.4%. State owned farms (18.1% in 1989) were privatized and they use now 1.8% of UAA. The rest of land is using by private companies ltd. – 3.6% and agricultural cooperatives – 3.8% (5.7% in 1989). Agriculture in Poland was and still is an economic sector of high importance and has a crucial impact not only on the socio-economic situation of the rural areas, but also on the environment, the structure of the landscape and the biological diversity of those areas. The number of agricultural holdings in Poland at the end of analyzed period, i.e. in 2002, was 1.9 million and the area structure is characterized by great diversity. There is a group of large farms in the west part and a lot of smaller holdings in the south-eastern part of the country. The average area of the utilized agricultural area (UAA) per farm was 7.41 ha in 2002.

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## OBJECTIVES AND METHODS

The main objective of this article is to present the development of agricultural advisory services in Poland from its beginnings on the Polish lands, until the entry of our country into the European Union. The study used a descriptive method. The basic sources of historical data are scientific articles and books or textbooks published in Polish in this field by the following authors: Dębowski [1977], Maziarz [1981, 1984], Kuźma [1986], Przychodzeń [1991], Wawrzyniak [1991, 2003], Michałowski and Szafranski [1993], Kujawiński [2009], Sikorska-Wolak et al. [2014] and others.

Research questions which I would like to address are: Since when have we been dealing with agricultural advisors and agricultural advisory services in Poland; Who was responsible for agricultural extension and advisory services; What were the goals of agricultural advisory services in the past; Who helped Poland in reorganization and improvement of agricultural advisory services in the first period of economic transmission.

### The beginnings of agricultural services in the Polish lands

The beginning of institutional grounds for agricultural extension in Poland dates back to the mid-19th century in the period when our country was under partitions: Russian, Austrian and Prussian<sup>1</sup>. At that time, it was the development of capitalistic relations in agriculture and related enfranchisement process which emphasized the issue of peasant farms. Released from serfdom, Polish peasants were facing problems completely new for them, relating not only to personal freedom, but also to economic self-reliance. The enfranchisement of the peasants was initiated in the Prussian Partition in the period of 1818–1850. In the Austrian Partition it took place on the basis of the edict of 1848, and in the Russian Partition in 1864 [Wawrzyniak 1991].

The new situation in agriculture gave rise to grass roots formation of various associations and agricultural organizations related to the introduction of elements of knowledge and agricultural progress, focused on civil and national goals which was the reason why they were frequently liquidated by the invading states. The first agricultural company in the Russian Partition was the Economic-Agricultural Association in Warsaw (1810–1818) which started a socio-professional movement in the country. The League of Poland operated since 1848 within the Prussian Partition, aiming at strengthening of farms held in Polish hands, which was subsequently transformed into the Central Economic Association in 1861, being a precursor of the contemporary agricultural circles<sup>2</sup> (in Polish – *kółka rolnicze*). The Economic Association in Lviv and the Agricultural Association in Cracow were created in the Austrian Partition in 1845. It was their initiatives which resulted in the creation of the agricultural schools in Dublany near Lviv (now Ukraine) and Czernichow near Cracow, which played a key role in formation of agricultural education on the Polish territories. Drawing on German, English, French and Danish experiences, these associations, although created within separate Partitions, were aiming at the propagation of knowledge and progress in agriculture by means of, e.g. agricultural exhibitions (farm animals and machines), publishing activity (journals, calendars, leaflets, magazines); they initiated formation of experimental stations. In 1836, the first experimental fields were established on Polish territories in the Agricultural Institute in Mary-

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<sup>1</sup> Poland lost its independence at the end of the 18th century as a result of three subsequent partitions (1772, 1793 and 1795). Russia took over 82% of Poland's territory owned in 1772 and 5.5 million of its inhabitants, Austria – 11% and ca. 4.2 million inhabitants, and Prussia – 7% and ca. 2.6 million inhabitants. In 1807, Poland obtained a small fraction of independence in the form of the created Principality of Warsaw, transformed in 1815 into non-sovereign Congress Poland. Poland regained its independence after 123 years, i.e. in 1918.

<sup>2</sup> Agricultural circles – voluntary socio-economic organizations of farmers, working to increase and improve agricultural production. The first agricultural circle was created in 1862 in Pomerania in 1882 in the Austrian and Russian Partitions. They developed in the interwar period. In communism time treated by the authorities, as a tool of the socialist reconstruction of the village. Many of them still offering services in the field of agricultural mechanization.

mont near Warsaw (presently the Warsaw University of Life Sciences – SGGW), which was the second field of this type in Europe, after Rothamsted in England (1834) [Maziarz 1975, Wawrzyniak 1991].

Bronikowski [1934], recorded that the first paid speaker in Poland, who delivered between 100 and 150 lectures annually and visited 80 agricultural farms, was active from 1883. The position of a Farm inspector appeared in 1911, and the instructor dedicated to addressing rural women's issues appeared in 1918. The number of instructors employed at the associations increased rapidly no sooner than after 1900, i.e. 1908 – 5, 1909 – 12, 1910 – 21, 1911 – 27, 1912 – 32, 1913 – 34, 1914 – 50.

### **Agricultural extension in the system of social agronomy in the interwar period 1918–1939**

The concept of social agronomy was created by a Russian agricultural scientist Czajanow (in English – Tschajanow), 1888–1937, author of the book “The social agronomy”. Social agronomy in his definition means working with “autonomous farmers who run a farm according to their own insights and will. Nobody can dispose over their farm without their consent, nobody has the right to issue orders to them” [Rist et al. 2009].

According to definition of Polish scientist and Prime Minister, Grabski [1928], social agronomy is “a social activity, based on a private initiative, or on associations or institutions, or on local government and the state, consisting in dissemination of agronomic knowledge and on its application by the broadest social classes (from priests to peasants, inclusively)”. A similar definition can be found in the works of Miklaszewski [1933], Bronikowski [1934] and Wojtysiak [1937]. The creators of social agronomy<sup>3</sup> in Poland also included: S. Biedrzycki, S. Moszczeński, J. Mikułowski-Pomorski, Z. Ludkiewicz and B. Składziński [Pawlikowski 1975, Wawrzyniak 1991, Sikorska-Wolak et al. 2014].

Two directions of education derived from this function in the countryside: agricultural advisory services and extramural agricultural education, are currently known as on the job training in agriculture. According to Przychodzeń [1991], the theory of extramural dissemination of knowledge and progress in agriculture (agricultural popularization) is to be treated as a convergence of three parallel and mutually complementary systems of knowledge: the didactics of occupational training in agriculture, agricultural advisory services and innovatics. The subject of interest in agricultural innovatics include innovations and innovation processes occurring in agriculture and the environment of rural areas and their surroundings<sup>4</sup>.

In the interwar period, social agronomy was built on three pillars, i.e. science and agricultural education, agricultural institutions and organizations and agricultural producers. The first pillar was represented by academic education services of scientific-research institutions, as well as primary and secondary agricultural schools. Over this period, one independent agricultural university was established (Warsaw University of Life Sciences – SGGW) and four agricultural faculties (Cracow, Poznań, Lviv and Vilnius) with approx. 2 thousand graduates annually [Maziarz 1984].

Among the agricultural institutions and organizations, agricultural chambers employing advisors occupied a special place. The first three agricultural chambers were created in the period of 1918–1920 in Pomerania, Wielkopolska, and Silesia. Their activity was modeled on the experience of Western European countries, mainly Germany. The governmental regulation of 1928 provided a possibility of organizing agricultural chambers in the newly created provinces. These were single-level, county organizations, which had the right to collect compulsory premiums from all the farmers as well as to conduct business operations. The development of the agricultural groups (8.5 thousand) falls onto the same period, with the same tendency being observed in the country housewives groups, as well as in rural cooperatives and trade associations.

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<sup>3</sup> It corresponds to the contemporary system of the dissemination of knowledge and agricultural progress (in Polish literature) or to the top-down transfer of technology (in western literature).

<sup>4</sup> Therefore, agricultural advisory services have been enriched by the so-called sociological aspects of diffusion and the adaptation of agricultural innovations formulated by Rogers [1983], in his theory of innovation.



The following are worth mentioning among extension personnel: general agricultural instructors, subject matter specialists, instructors responsible for farms operated by women and instructors responsible for rural youth affairs [Maziarz 1975]. The number of instructors was not large, but it increased from 200 (1919) to 2,000 in 1930 and to 3,000 in 1939 [Pawlikowski 1975].

### **Shaping of agricultural extension in the centrally planned economy in Poland (1945–1989)<sup>5</sup>**

At the turn of 1946/1947, agricultural chambers were liquidated (to be restored in 1996) and their tasks were transferred to the Peasant Self-Help Cooperative, the activities of which were restricted to the development of rural trade and agricultural trade. A turning point of rural policy (1948), consisting in accepting the concept of the collectivization of farms and the creation of agricultural production cooperatives resulted in reorganization of the extension service system and impediment of its development. The agricultural service found itself separated into two organizational divisions, namely at the level of management boards for agriculture and forestry on a county level and at the state machinery centers (in Polish – POM) on a county and district level.

The new agricultural policy drawn up in 1957 recognized the importance of extension in the processes of social and economic transformation of rural areas and agriculture. While state agricultural farms (in Polish – PGR, approx. 15–20% of arable lands) and agricultural production cooperatives (in Polish – RSP, 5–7%) were employed more and more professional personnel and they themselves were improving efficiency of production, more than 2 million minor individual farmers were unable to overcome emerging difficulties without the assistance of professional extension service.

Legal recognition of extension service operations and the determination of their tasks took place in 1958. A rapid increase in the number of agricultural instructors appeared: from 2,558 persons in 1959 to 3,893 in 1960 (ca. 75% with secondary school and 7% – higher education diplomas) [Stelmach 1963]. This was also a result of an increase in the number and importance of agricultural groups frequently at farmers' own initiatives (1,700 in 1956 and 2,000 in 1959). The increase in employment of advisors resulted in a decrease in the number of individual farms per 1 agricultural instructor from 1,795 (1958) to 923 farms (1960). Such a large number of farms still hindered the implementation of an individual extension service [Wawrzyniak 2003].

In the years 1960–1967 the number of agricultural instructors, so-called agronomists appointed at the Meeting of the Agricultural Groups in 1959 increased to 5,364 individuals, meaning that there was one advisor, employed by the County Agricultural Group Associations in every district (the smallest administrative unit), who usually resided in the county capital. In order to bring agronomists closer to farmers and inhabitants of rural area, the construction of apartments in districts was commenced; in the first stage – apartments for agronomists, in the 2nd stage – for agronomists and zootechnicians, and in the 3rd stage – for agronomists, zootechnicians, and veterinarians.

In 1968, reorganization of agricultural services took place, which resulted in an organizational structure consisting of the following links [Maziarz 1981, Wawrzyniak 1991]:

- at the district level (the smallest administrative unit): agronomists and zootechnicians were employed, as well as their assistants and an agricultural clerk;

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<sup>5</sup> As a result of the Jalta agreement (1945) Poland lost the eastern borderlands and partially received a territorial compensation in the west from Germany. The Soviet Union received authority over Poland. In this way began the process of creating a new economic and social system – socialism and centrally planned economy in which the decisions about production, rationing of goods and their prices has taken the state power. According to the Act from 3 January 1946, private enterprises were nationalized, including the landed estates on the basis of which were created state-owned farms and agricultural cooperatives. Private property remained private houses, flats and peasant farms. The development of agriculture has been progress in the yields of plants and animals and the stagnation in the size of private farms which were not the basis for socialism economic system.

- at the county level: deputy managers of departments of agriculture and forestry of County Offices and two specialized extension inspectors: for plant production and for animal production;
- at the province level: deputy managers of agriculture and forestry departments of Province Offices; and inspectors – advisors, experts of the Regional Agricultural Research Centers (in Polish – rejonowe rolnicze zakłady doświadczalne – RRZD).

This improved organizational model of agricultural services was criticized immediately after its formation. The criticism was directed at the fact of retaining separate positions of an agronomist and a zootechnician, who are inherently in conflict with the properties of a sustainable agricultural farm.

The introduction of the new administrative division of the country in 1973 (i.a. the area of districts was increased and they were given new competences) constituted a premise for the introduction of subsequent changes with regard to the organization of agricultural services: the separate positions of an agronomist and a zootechnician ceased to exist, and a universal advisor – agricultural inspector was introduced in their place. The new organizational structure, according to the Regulation, included: an agricultural services manager (usually the previous agronomist), general instructors for a given district, specialized instructors and field – general agricultural instructors. All of them answered to the head of the district. General instructors for a given district covered a minimum of three positions: instructor for rural households, for melioration and grassland, for livestock facility construction, as well as for land management and geodesy. The head of the district could also employ instructors – experts in orcharding, gardening, pig production, cattle production, etc. depending on the needs and capacity of the district.

The introduced organizational changes brought along another step to turning agricultural services into actual advisors for farmers. The research results indicate changes in the style of work of agricultural services. A gradual transfer was observed, from mass advisory, to individual (specialized) and group advisory, due to the processes of specialization and cooperation taking place in Polish agriculture. During this period, exemplary and implementation farms were created.

On the basis of 19 RRZD employing 1,900 employees, 18 Provincial Agricultural Progress Centers (in Polish – wojewódzkie ośrodki postępu rolniczego – WOPR) were established in 1975, with branches in the new provinces, as a result of the new administrative division of the country, and by the end of 1980 their number increased to 49, i.e. one Agricultural Progress Center in each province. The number of employed advisors involved in implementation, popularization and training activities in WOPRs amounted to 5,235 people in 1980/1981 (2.3 million farms) [Wawrzyniak 2003].

The factors differentiating WOPR from RRZD include: reduction in the area of operation of advisors, which caused a growth in the capacity to recognize the extension needs of farmers and to more effectively adapt the research results to practice, decreasing the way from learning to practice through removing one administrative link, i.e. counties, renaming county specialized consulting inspectors (administrative positions) to expert field advisors, strengthening the regions with specialists in economics and farm organization (since 1974) and with out-of-school agricultural education (since 1979), and an increase in the number of general agricultural advisors as well as implementation and exemplary farms as local centers of agricultural progress.

In the years 1981–1982, governmental decisions were made on handing over part of the district agricultural services (8,500, i.e. 40% of the contemporary status) to WOPR. The outcome of the reorganization of district agricultural services was unfavorable, since this number was considerably higher than the number of advisors employed previously (5,500). A “reorganization of the extension organization” took place, the level of higher education among advisors was reduced from 80 to 30%, a process of strong fluctuation of extension personnel capable of dealing with the new work situation was recorded [Kania and Drygas 1995]. After having taking over the instructional service, the WOPRs turned from local government offices into state institutions directly responsible for agricultural extension, and indirectly for agriculture development. The WOPR founding authority was the province governor. Each WOPR had its own farm, very diverse in terms of area: from 150 to 6,500 ha [Wawrzyniak 1991].

### **Agricultural Advisory Services in the transition to a free market economy (1990–2004)**

At the beginning of the 1990s, after overthrowing Communism, in countries of Central and Eastern Europe the processes of implementing a market economy into agriculture and privatisation of state-owned farms also resulted in the governments of these countries establishing state-run agricultural extension systems financed from budget subsidies. After several years of their functioning these systems were, earlier than in Poland, included in the process of commercialisation of extension services which became paid services, or their privatisation, i.e. transferring them onto agricultural chambers, or by the formation of private legal entities. These processes were initiated in Lithuania in 1998, Latvia in 1993, and Estonia in 1996. In my opinion, they followed the pattern of processes implemented in Western European countries, e.g. England and Wales – ADAS since 1986, Holland – DLV since 1993, Scotland – SAC's Advisory Services since 1987 [Kania 2007, AKIS in the EU... 2014].

The agricultural advisory system in Poland was directed mainly at individual farms. The state owned farms and the cooperative farms employed their own agricultural engineers and used consulting and IT services directly from companies that sold them farming production inputs, and focused on their own farm products.

The political and economic changes initiated in Poland and in all of Eastern Europe in 1989 resulted in the market reform of our agriculture, also including extension. In 1990, the WOPRs transformed into the ODRS – Provincial Agricultural Advisory Centers, which began to operate in a new form from 1 January 1991, strongly supported by the Polish-American Agricultural Extension Project [Miller et al. 1995, Bahn and Evans 1999, Kania 2005].

The significant changes in extension service reorganization included:

- separation of production farms from the Provincial Agricultural Advisory Centers, which became budgetary units not involved in direct business operations;
- socialization of advisory by appointment of the Social Agricultural Advisory Councils at the level of the country, province, and counties;
- changes among the management staff of the Agricultural Advisory Centers; new directors began to be appointed by way of competitions;
- verification of the personnel and reduction in employment of advisors (approx. 50%);
- gradual provision of additional equipment for the Agricultural Advisory Centers: technical equipment, especially computers;
- the province governor was the founding authority;
- funding of advisory services from the state budget via the Minister of Agriculture to the province governor, next to the director of the Agricultural Advisory Center.

In the first period of reorganization and improvement of agricultural extension in Poland, the governments of Ireland and the US played a significant role, as well as foreign experts, who strongly encouraged maintenance and support of extension services on the part of the state. In 1990, under the aid of the Irish government, experts from TEAGASC and the University of Agriculture in Dublin educated Polish advisors with regard to the methodology of extension work and planning of extension programs. In the years 1991–1995, Poland benefited from support of the USDA government under the Polish-American Extension Project. For 6 months, more than 100 advisors from 31 state agricultural universities worked together with Polish advisors in the Province Agricultural Advisory Centers. What did the Polish advisors learn from their American colleagues? The author's own research on reports and published articles indicate that the most significant achievements included [Miller 1995, Ragland 1995, Bahn 1997, Place et al. 2000, Andrews et al. 2001, Kania 2007]:

- creation of grass roots, individual extension plans based on the needs and expectations of farmers and inhabitants of rural areas, and not only execution of the top-down tasks of the Minister of Agriculture;
- more influence of advisors on farmers' behavior in order to make them introduce changes in the production organization and technology, to be more competitive on the market;

- convincing the heads of the Agricultural Advisory Centers of the need to cooperate with the Social Agricultural Advisory Councils, to make the farmers feel that they have an impact on the operation of the extension center;
- a feeling of satisfaction with the fact that the level of professional knowledge of the Polish advisors is not lower than that of American advisors, and that it is possible to catch up on the organization and methodology of extension work.

Business planning, as one of the most important tools of transition from centrally planned economy to a market economy, progressed from a “buzz word” among Polish Extension advisers in 1991 to more than 50 thousand business plans completed by the end of 1994 [Miller et al. 1995]. It should also be emphasized that, due to the assistance of the USDA, the training base at the province level of the Agricultural Advisory Centers was thoroughly modernized and enriched with modern technical equipment, previously owned by American advisors, donated to the Polish extension service<sup>6</sup>.

After the new administrative division of provinces which was introduced in Poland in 1999, organizational changes took place in agricultural extension as well. The number of provinces was reduced from 49 to 16. The Agricultural Advisory Centers were established in every province, with extension units in every county. By 2004, both CDR and ODRs were administrated by the Ministry of Agriculture.

During the era of economic transformation in Poland, agricultural advisory service played a key role in fostering the economic changes in rural areas. In the south-eastern part of the country, advisory work focuses mainly on small and diverse farms (in terms of production and economic), supporting farmers in non-agricultural activities generating additional income. In regions where commercial farms prevail, the advisory work focuses different technologies [Kania 2007].

## CONCLUSIONS

Agricultural advisory services have been present in Poland, in an organized form, from the mid-19th century. From that period until to 2004, many changes in the agricultural advisory system have been introduced in terms of institutional providers, organizational structure, goals and objectives.

It should clearly be emphasized that Poland was one of several countries of the former Eastern Bloc with a relatively well developed extension system and structures in place to disseminate agricultural progress. Poland’s agriculture sector was also somewhat different from those of the other Eastern Bloc countries because until 1990 more than 75% of arable land was privately owned. In fact, there were about 2 million private agricultural farms.

Changes in the organizational form of the state agricultural extension service were accompanied by a reorientation in programming. Since 1991, extension programs devoted to the issues of agricultural economics, agricultural marketing and information have become the priority. In the first period of reorganization and improvement of agricultural advisory services in Poland, the governments of Ireland and the US played a significant role as well as their extension experts who strongly supported Polish advisers in improvement advisory skills. In author’s opinion during the era of economic transformation in Poland, agricultural advisory service played a key role in fostering the economic changes in rural areas.

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<sup>6</sup> Brewer [2001], from Michigan State University wrote and I quote: “The Polish extension service was established in 1991 with the help of the USDA...” p. 101, which is obviously not true!

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## **POCZĄTKI I ROZWÓJ DORADZTWA ROLNICZEGO W POLSCE**

### **STRESZCZENIE**

Głównym celem artykułu jest zaprezentowanie rozwoju doradztwa rolniczego w Polsce, w okresie od jego początków na ziemiach polskich, aż do wejścia Polski do Unii Europejskiej (01.05.2004 r.). Dane źródłowe pozyskano z przeglądu literatury polskojęzycznej, nieznaną w literaturze anglojęzycznej, zaś dane empiryczne z badań własnych oraz realizowanego grantu badawczego. W analizie posłużono się metodą opisową, dokumentując historię organizacji doradztwa sięgającą połowy XIX wieku. W okresie międzywojennym, tj. w latach 1918–1939, doradztwo rolnicze realizowane było w Polsce przez nowo powstałe izby rolnicze, a po II wojnie światowej w wyniku ich likwidacji przez państwowy system doradztwa rolniczego, który był przedmiotem bardzo wielu zmian w strukturze organizacyjnej i realizowanych zadaniach. W pierwszym okresie transformacji rolnictwa do gospodarki rynkowej dużą rolę w reorganizacji doradztwa i podniesieniu umiejętności doradców odegrał m.in. Polsko-Amerykański Program Doradztwa Rolniczego.

**Słowa kluczowe:** agronomia społeczna, izby rolnicze, usługi doradcze, Polsko-Amerykański Program Doradztwa



## THE COMPARISON OF CHANGES IN THE IMPLEMENTATION OF PRODUCTION AND ENVIRONMENTAL AIMS OF AGRICULTURE IN SELECTED GROUPS OF VOIVODSHIPS

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### ABSTRACT

The importance of regionalization of Polish agriculture is constantly increasing, mostly due to its environmental, organizational and economic differences between regions. The process of regionalization has become especially visible after Polish accession to the European Union. The study compared the changes in the utilization of production capacity for selected voivodships, located in different parts of Poland, i.e. Dolnośląskie and Opolskie (A) and Małopolskie and Podkarpackie (B), in the years 2002–2004 and 2012–2014. The main data sources were Central Statistical Office of Poland publications and the results of an own study. The analysis showed significant differences in the production capacity of Polish agriculture and in the utilization of production potential in different regions. The differences between the analyzed groups of voivodships were mostly due to management and intensity differences of agricultural production, while habitat and natural conditions were of a minor importance. Agriculture of Dolnośląskie and Opolskie proved to be the most effective in achieving production and environmental objectives.

**Key words:** production-environmental aims, agro-environmental indicators, regional differentiation, Poland

### INTRODUCTION

The production potential of Polish agriculture is quite significant when compared with most European Union countries, especially when agricultural production areas or a number of persons employed in agriculture are compared [Mierosławska 2001, Poczta 2010]. The assessment of agricultural production potential should include numerous indicators. According to Zięta [2003], one of the most important of them, apart from the means of production, is the way those factors are combined and managed together. Utilization of production capacity of agriculture depends on many factors including: the quality of natural conditions, measured by index of agricultural production space valuation (APSV), agrarian structure, labour resources, labour and pulling force, agro-technical level, technical infrastructure of farms, as well as on the local farming traditions [Bogocz et al. 2010]. The diversity of environmental, organizational, and economic conditions of different regions of Poland contributes to the differentiation of agriculture, which is especially visible since 2004 (when Poland accessed the European Union – EU). Moreover, agricultural development rate is different in various parts of the country [Rudnicki et al. 2015, Kopiński and Matyka 2016], the same applies to rural areas development [Stany 2013]. Regional heterogeneity of Polish agriculture has a much wider, European importance [Matuszczak 2013].

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Polish accession to the EU had a significant impact on utilization of production and economic objectives of agriculture as it shaped rural policies. This resulted in changed relations of the utilization costs of each of production means and in progress in technical development. Polish accession to the EU increased also the significance of subsidies and the financial resources allocated to the various activities of Rural Development Programme [Bułkowska 2011, Runowski 2014]. External factors, which have been extensively discussed in the study edited by Wigier [2011], also have a definite impact on the effects of changes in the agriculture and food economy.

The aim of the study is to compare the dynamics of realization of production and environmental objectives of agriculture in selected voivodships in different parts of Poland.

## MATERIAL AND METHODS

Desk study of Central Statistical Office of Poland (CSO) reports [GUS 2003–2015a, b, c, d] as a primary source of information was performed. A comparative analysis of the two groups of voivodeships, namely Dolnośląskie and Opolskie (Group A) and the Małopolskie and Podkarpackie (Group B), located in the Southern Poland, belonging to two different regions, was made to obtain the standard gross margin characteristics. The comparison and evaluation of the above-mentioned groups of voivodships were performed using the principle of deliberate choice, subjective on the base of the production-economic and environmental results of Polish agriculture on the NUTS-2 level [Filipiak 2003]. Changes in individual regions between the periods of 2002–2004 and 2012–2014 (as three-year average) were taken into consideration. This approach reduces the effect of random fluctuations potentially present in analyses of annual values and allows to observe the trends.

The changes of differences between the compared groups of voivodships (A, B) were determined on the basis of differences in absolute values or percentage points (p.p.) between the tested characteristics (*x indicators*) in the different periods of research according to the formula:

$$\text{difference } x (A - B) = xA - xB$$

A comparative assessment of voivodships was performed using analytical indicators, based on the available literature [Klepacki 1997, Harasim 2013], characterizing:

- environmental and organizational conditions, described with index of agricultural production space valuation (APSV), quality index of soil, the share of soils potential threatened by erosion, and the average area of farms, structure of agricultural land use, cropping pattern, the level of livestock load, the level of persons employed in agriculture, and the value of fixed assets;
- production and economic indicators, determining the unit of crop and animal production, the level of mineral fertilization NPK, the value of gross agricultural output, the value and structure of agricultural market output, the share of areas under the direct payments, special and separate support or less favored area (LFA) subsidies;
- environmental indicators, described by the gross balance of nitrogen and phosphorus according to the methodology of the OECD Eurostat [Kremer 2013] and balance of soil organic matter according to the methodology proposed by Eich and Kundler [Fotyma and Mercik 1995].

The size of the analyzed indicators referred to the utilized of agricultural area (UAA – according to CSO definition). In this study, crop yields were calculated into cereal units (100 kg of cereal grains) [Harasim 2013], while animals – into livestock units (LU), based on the coefficients set out in the regulation of the Ministry of Agriculture and Rural Development (MARD) from 2004.

The scope of analysis includes only selected aspects of the assessment of the production capacity of agriculture. It constitutes an attempt to explain identified phenomena by analyzing the cause and effect relationships.

## RESULTS AND DISCUSSION

Among the compared groups of voivodships the better quality of natural conditions for agricultural production (APSV) was identified for Group A which includes Dolnośląskie and Opolskie (Table 1). This group was also found to have better soil quality (by approx. 12%) than voivodships of Group B. Additionally, APSV and index of soil quality in both tested areas were higher than the average for whole Poland. The advantage of voivodships in Group A could be explained by the fact that the highest values of average annual temperature in Poland (what affects the length of climate growing season) were observed in Nizina Dolnośląska, where Group A voivodships are mainly located [Krasowicz et al. 2009]. Moreover, this region, compared to voivodships of Group B, is relatively under little risk of soil wind and water erosion. In Małopolskie and Podkarpackie, the percentage of these soils in the agricultural land (AL) area is 64% (Table 1).

The average farm area in Group A is over four times higher than in Group B. The difference in the size of area farms in the years 2002–2014 was 12.4 ha of AL. Although in both groups there was an increase in the size of farms. The polarization between these two regions deepened. Between the periods 2002–2014 and 2012–2014, Group B had a 28% decrease in the size of agricultural land, while in Group A, this decline was only 11% (Table 1). In Group B, permanent grassland has a significant share (39%) in the structure of the agricultural land. Compared to 2002–2004, within recent 10 years, there has been an increase in the share of permanent grasslands by 8% in this region. However, structural changes of land use in the Group A voivodships are steady. In both groups, in the reference period, there has been a decrease in the percentage of set-aside land. Although this decrease was more rapid in Group B, the share of such land in Group A is still larger (about 4 p.p.) than in Group B.

The comparison of the two groups of voivodships shows that the crops patterns on arable land are largely adapted to the needs of the main kinds of production and to organizational and market conditions. In Dolnośląskie and Opolskie, oil crops have a significant share in the total agricultural area. These plants, next to cereals, determine the structure of the market agricultural output. Group A have a significantly higher share of sugar beet in the sown area structure than Group B. In contrast, Group B had a significantly higher share of potatoes, fodder and other crops (tobacco, vegetables) compared to Group A. The decrease in the share of potato is clearly visible between 2002 and 2014. In Group B, the share of cereals increased for the years 2002–2004 by 8 p.p. and is currently by 2 p.p. higher than in Group A which are more suitable for cereal cultivation for organizational reasons. We may conclude that in Group B, since 2002, an organization of both crops and animal of production have been more and more simplified livestock load, in the years of 2012–2014 it was 31.5 LU·ha<sup>-1</sup> AL, after an approx. 28% decrease compared to the period of 2002–2004 (Table 1). The data presented in Table 1 show a reduction of the distance in terms of livestock load between the compared groups of voivodships. It may be assumed that Group B are heading towards non-livestock agricultural production, which is characteristic for Dolnośląskie and Opolskie voivodships (Group A). The animal stock pattern in both groups was dominated by cattle. More dynamic structural changes took place in Group A. The assessment of changes in the animal stock pattern showed the decrease of the differences between the two regions.

Factors which clearly differentiate the agriculture in the compared regions include work force and capital resources. In Group A of voivodships, the level of employment in agriculture, forestry, hunting and fishing in 2012–2014 was 10% compared to the total number of employees and was by 15 p.p. lower than in Group B (Table 1). In the Małopolskie and Podkarpackie, compared to the period of 2002–2004, the share of persons employed in agriculture increased by nearly 5 p.p. This phenomenon, together with visible simplifications in the organization of agricultural production, point to the deterioration of works productivity.

The average farm of the area over 1 ha in the Group A has a much higher value of fixed assets than the average farm from Group B. Compared to the period of 2002–2004 the difference between compared groups reached approx. 37 thousand PLN per farm (Table 1).

**Table 1.** Characteristics and changes of natural and organization agriculture conditions in compared voivodships groups

Specification	Group A of voivodships		Group B of voivodships		Difference (A – B)	
	Years 2012–2014	Change <sup>a</sup>	Years 2012–2014	Change <sup>a</sup>	Years 2012–2014	Years 2002–2004
Index of agricultural production space valuation (APSV) (points)	78.3	100	69.9	100	8.4	8.4
Index of soil quality AL (points)	0.95	100	0.83	100	0.12	0.12
Share of soil strong potential threatened by windy and water erosion in AL (%)	4.6	100	64.3	100	–59.7	–59.7
Area of agriculture land (thous. ha AL)	1 409.8	89.0	1 098.9	71.7	310.9	51.3
Area of farms above 1 ha (ha AL)	16.4	130	4.0	145	12.4	9.9
The structure of agricultural land use (% in AL)						
arable land (ArL)	86.1	1.3	59.0	–9.3	27.0	16.4
permanent crops	0.7	0.2	2.5	1.1	–1.8	–0.8
grasslands	13.2	–1.5	38.5	8.2	–25.2	–15.5
Set-aside land (% in ArL)	2.9	–9.6	6.8	–13.1	–3.9	–7.4
Cropping pattern (%)						
cereals	72.4	–5.5	74.4	8.1	–2.0	11.5
oil crops	17.1	8.5	4.9	3.5	12.2	7.2
pulses	0.7	0.3	1.5	0.8	–0.8	–0.3
potatoes	2.5	–1.8	8.9	–6.5	–6.4	–11.2
sugar beet	2.8	–1.5	0.8	–0.2	2.0	3.3
fodder crops	3.2	0.4	5.6	–2.7	–2.4	–5.5
other crops	1.4	–0.4	3.8	–2.8	–2.4	–4.9
Livestock load (LU·ha <sup>-1</sup> AL)	20.9	80.6	31.5	71.6	–10.6	–17.9
Animal stock pattern (LU in %)						
cattle	55.0	8.2	63.0	4.6	–8.0	–11.7
pigs	25.6	–8.7	13.4	–2.1	12.2	19.0
other	19.4	0.5	23.6	–2.5	–4.2	–7.3
Share of employed persons in agriculture (%) <sup>b</sup>	10.4	–0.5	25.8	4.9	–15.4	–10.0
Value of fixed assets (thous. PLN·farm <sup>-1</sup> )	144.6	177.7	46.3	232.8	98.2	61.4

<sup>a</sup> for absolute values the 2002–2004 years = 100; <sup>b</sup> – also in forestry, hunting and fishing.

Source: Own study on basic CSO data and Stuczyński et al. 2000, Harasim and Matyka 2009.

A factor, which differentiates the agriculture of the compared groups of voivodships, is an intensity of production, measured by the level of use of mineral fertilizers. Data in Table 2 indicate running a high-cost crop production in Group A, and a low-cost one in Group B. In this respect, the gap between them got significantly larger (by approx. 68 kg NKP·ha<sup>-1</sup>). Compared to the period of 2002–2004, the level of production intensity in Group B has not significantly changed, whereas, in Group A, it has risen largely (by 70%). A negative phenomenon, visible in Group B, was the increase of the disproportion in the relation between N, P and K fertilizer consumption in favor of nitrogen, leading to an increased acidification of arable land [Filipek and Skowrońska 2013]. In result, this causes a low land productivity of Małopolskie and Podkarpackie, deepening the distance to Dolnośląskie and Opolskie (Table 2).

Differentiation of indexes of animal production per 1 ha of agricultural land is the result of animal stock density and their unit quantity. Unit quantity of milk per cow is significantly higher in Group A than in Group B. The gap between these groups extended further, amounting to 1,451 l·unit<sup>-1</sup>·milk<sup>-1</sup> (Table 2) in the years 2002–2004. Analyses showed no significant differences in terms of the obtained gross and market agricultural output per 1 ha. The structure of market agricultural production is the evidence of production focus and specialization in the analyzed groups of voivodships. In Group A cereals and industrial crops have a fairly significant share in this structure market agriculture output (total 60%). In Group B, other market crops (excluding vegetables) and the animal for slaughter (together about 56%) constitute major products due to the agrarian structure and the specifics of an organization of agricultural production of the polish voivodships.

There was no significant difference in terms of investment outlays per AL area unit between the two groups, although in the analyzed period (2002–2014), there outlays grew at a faster pace in the voivodships of Group B (Table 2). To some extent, the level of outlays is also affected by the level of the use of resources for agriculture under the Common Agricultural Policy (CAP) after Poland's accession to the EU in 2004. In the years of 2012–2014, the total the amount of payments incurred 1 ha AL was on average, 1,008 PLN for Group A, and 1,060 PLN for Group B, although, in the period of 2002–2004, the differences between these groups were reversed. Currently, Group A receive a higher amount of direct payments (per 1 ha), while Group B obtain larger sums from specific and separate support and from subsidies for less favored areas.

The effect of a specific organization and intensity of the production are becoming more and more visible processes of specialization and concentration of production on the level of voivodships. These changes are then reflected in the state of the environment, there are changes in agro-environmental indicators related to soil fertility and the composition and quality of ground waters. Table 3 presents selected environmental indicators, characterizing the degree of the realization of environmental aims in the compared groups of voivodships.

The compared groups of voivodships, despite significant differences in the production intensity, mainly of crops (Table 2), exhibit very low gross nitrogen balances and negative or close to “0” balances of P and K (Table 3). In the discussed period, the differences between the compared groups in terms of balances of nitrogen, phosphorus and potassium significantly decreased. The existing state result from “spontaneous” greening of agriculture in the Group B (Małopolskie and Podkarpackie) and from a very good nutrient use despite that voivodships – Group A (Dolnośląskie and Opolskie) has a very intensity agriculture production.

Compared to the period of 2002–2004, the increase in the surplus affected only the gross nitrogen balance, up to the level of 36 kg N·ha<sup>-1</sup> UAA in Group A (Table 3). However, this level does not indicate any environmental risks (at a voivodship level) [Kopiński 2016]. In contrast, the surplus of nitrogen balance in Group B, being currently a little higher than the size of the estimated deposit of atmospheric in precipitation (11 kg·ha<sup>-1</sup> UAA). The found negative balances of P and K may indicate the process of impoverishment of soils in these macronutrients, leading to the decline in fertility and consequently to soil degradation. In the analyzed period the production aims (crop yields) and environmental aims (moderate balance and a good use efficiency of outputs nitrogen) which are evaluated through the results of nutrient balances they were the best combined in Dolnośląskie and Opolskie forming of Group A.

**Table 2.** Characteristics and changes of production and economic agriculture indices of compared group voivodships

Specification	Group of voivodships A		Group of voivodships B		Difference (A – B)	
	Years 2012–2014	Change <sup>a</sup>	Years 2012–2014	Change <sup>a</sup>	Years 2012–2014	Years 2002–2004
Mineral fertilizers (kg·ha <sup>-1</sup> UAA)						
NPK total	180.1	169.2	74.6	108.3	105.5	37.6
N	101.5	186.6	42.2	133.1	59.3	22.7
P <sub>2</sub> O <sub>5</sub>	36.1	162.6	15.0	83.6	21.1	4.2
K <sub>2</sub> O	42.5	142.3	17.4	90.6	25.1	10.7
Crop output (cereal units·ha <sup>-1</sup> UAA)	55.3	123.2	34.3	112.7	21.0	14.4
Milk production (l·units <sup>-1</sup> ·year <sup>-1</sup> )	5 342	112.5	3 891	107.6	1 451	1 132
Animal for slaughter output (kg·ha <sup>-1</sup> AL)	138.0	97.2	165.6	109.6	-27.6	-9.1
Gross agricultural output (PLN·ha <sup>-1</sup> AL)	5 681	172.6	5 235	150.6	446	-184
Agricultural market output (PLN·ha <sup>-1</sup> AL)	4 586	208.8	4 286	228.7	300	323
The structure of market auricular output (%)						
cereals	38.5	5.4	12.1	6.9	26.4	27.8
industrial	21.4	6.7	5.2	2.0	16.1	11.4
other crops	9.0	0.1	28.8	1.5	-19.7	-18.3
milk cows	8.3	-2.0	16.0	-7.2	-7.7	-12.9
animal for slaughter	18.5	-7.4	27.3	-1.8	-8.8	-3.1
eggs and other animals output	4.3	-2.8	10.6	-1.3	-6.3	-4.9
Investment outlays in agriculture <sup>b</sup> (PLN·ha <sup>-1</sup> AL)	298.0	254.2	302	314.6	-4	21
The amount of payment – total (PLN·ha <sup>-1</sup> AL)	1 007.5	568.6	1 059.5	633.9	-52.0	10.0
direct payments	952.6	659.7	878.2	780.0	74.4	31.8
specific and separate support	12.6	-	106.1	-	-93.5	-
payments of LFA	42.3	129.0	75.3	138.0	-33.0	-21.8

<sup>a</sup> for absolute values the 2002–2004 years = 100; <sup>b</sup> also in forestry, hunting and fishing.

Source: Own study on basic CSO data.

In the years of 2012–2014 voivodships of Group A had a negative balance of soil organic matter amounting to 0.10 t d.m.·ha<sup>-1</sup> ArL (Table 3). This balance did not change in relation to 2002–2004. In contrast, Group B showed, after a large decrease, the surplus of soil organic matter amounting to 0.09 t d.m.·ha<sup>-1</sup> ArL. The negative balance of soil organic matter is the result of long terms of production specialization and non-livestock management in the Western Poland voivodships.

**Table 3.** Characteristics and changes of agri-environmental indicators of compared group voivodships

Specification	Group of voivodships A		Group of voivodships B		Difference (A – B)	
	Years 2012–2014	Change <sup>a</sup>	Years 2012–2014	Change <sup>a</sup>	Years 2012–2014	Years 2002–2004
Gross nutrients balance (kg·ha <sup>-1</sup> UAA)						
N	36.0	158.1	14.1	49.4	21.9	-5.8
P	-0.6	-126.5	-1.2	-28.3	0.6	-3.9
K	0.4	-9.6	-6.9	-208.7	7.2	-7.1
Efficiency N use (%)	73.2	-3.9	83.4	15.7	-10.1	9.4
Balance of soil organic matter (kg dm·ha <sup>-1</sup> ArL)	-0.10	105.2	0.09	43.9	-0.19	-0.30
Share of soil (%)						
acid and very acid	33.1	-9.9	59.2	-5.6	-26.1	-21.8
with a low and very low content of P	33.2	0.6	52.8	-2.7	-19.6	-22.8
with a low and very low content of K	25.6	-6.5	50.8	-2.4	-25.1	-21.1

<sup>a</sup> for absolute values the 2002–2004 years = 100.

Source: Own study on basic CSO data.

Table 3 shows the results of the evaluation of the state of agrochemical soil, as measured by the share of acidic and very acidic soils and of soils with a very low and low resources in phosphorus and potassium. A high percentage (over 50%) of such soils in the voivodships of Group B points, alongside significant restrictions organizational and economic in these regions, the cause of much weaker utilization of its potential crop production than in the other two voivodships compared, i.e. Dolnośląskie and Opolskie (Table 3). This is confirmed by the results of Filipiak [2003] which indicate a low productivity of land in Central and South-Eastern Poland. In the South-Eastern Poland specific feedback was created, difficult to break. However, according to Faber [2002] only after the structural reorganization of agriculture, especially in this part of Poland, it will be possible to make a better use of agricultural production space.

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### CONCLUSION

In conclusion, the simplified nature of the performed assessment should be noted. The collected data and assessment method, based on subjectively selected indicators, do not allow forming final opinions. However, the analysis indicates a quite considerable diversification of the production capacity of Polish agriculture and its use at a regional level. The differences between the analysed groups of voivodships, i.e. Dolnośląskie, Opolskie (Group A), and Malopolskie and Podkarpackie (Group B), are to a lesser extent caused by habitat and natural conditions, but result mainly from the different levels of the organization and the intensity of

agricultural production. A number of the analyzed organizational and production indicators reveals that these differences largely increased between the period of 2002–2004 and 2012–2014.

Among the compared two groups of voivodships, Group A (including Dolnośląskie and Opolskie) was more efficient in terms of production organization. By contrast, Malopolskie and Podkarpackie show a tendency to simplify plant and animal production with the simultaneous stabilization of intensity at a fairly low level. Despite these differences, both the level of investment in agriculture and the amount of the payments incurred are at a similar level in the both groups.

The characteristic feature of Małopolskie and Podkarpackie is a high number of persons employed in agriculture, and at the same time, low land productivity. In the analyzed period, Dolnośląskie and Opolskie are the most efficient in combining production (crop yields) and environmental objectives (moderate balance and good use of inputs nitrogen). It is confirmed by the assessment of agrochemical soil conditions in the compared groups of voivodships.

The conducted analysis has confirmed the existence of the different models of the utilization of agricultural production, evidenced by the divergent level of organization and intensity. This points out the need to regionalize the national agricultural policy, what in the future should be reflected, *inter alia*, in the *ex-ante* evaluation of the current Rural Development Programme as well as in the new improved version of the program.

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## **PORÓWNANIE ZMIAN REALIZACJI CELÓW PRODUKCYJNO-ŚRODOWISKOWYCH ROLNICTWA W WYBRANYCH GRUPACH WOJEWÓDZTW**

### **STRESZCZENIE**

W opracowaniu dokonano porównania zmian w realizacji możliwości produkcyjnych rolnictwa w wybranych województwach, tj. dolnośląskiego i opolskiego (A) oraz małopolskiego i podkarpackiego (B), między okresami 2002–2004 a 2012–2014. Podstawowym źródłem informacji były dane statystyczne GUS oraz rezultaty badań własnych. Przeprowadzona analiza wskazała na dość znaczne zróżnicowanie możliwości produkcyjnych polskiego rolnictwa w przekroju regionalnym. Różnice między analizowanymi grupami województw w mniejszym stopniu odnoszą się do warunków siedliskowych i przyrodniczych, a wynikają przede wszystkim z odmiennego poziomu organizacji i intensywności produkcji rolniczej. Pod tym względem różnice te uległy dość dużemu pogłębieniu. Najlepszym łączeniem celów produkcyjno-środowiskowych charakteryzuje się rolnictwo województw dolnośląskiego i opolskiego. Cele produkcyjno-środowiskowe rolnictwa najlepiej łączone są w województwach dolnośląskim i opolskim.

**Słowa kluczowe:** cele produkcyjno-środowiskowe, wskaźniki agrośrodowiskowe, zróżnicowanie regionalne, Polska





## INVESTMENT IN HIGHER EDUCATION VERSUS ECONOMIC GROWTH – A PROPOSAL FOR THE DECOMPOSITION OF THE MRW MODEL FOR POLAND

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### ABSTRACT

Higher education has become an increasingly knowledge-based sector of the present-day economy. The state faces the issues of financing higher education and assessing the effects of investment in the sector of higher education. The aim of this article is to determine the impact of investment expenditure on higher education (including the resources from the EU funds) on Poland's economic growth as measured by the GDP growth rate. The research hypothesis of the article is that the economic growth that is caused by investment in higher education with the contribution of the EU funds results in a higher GDP growth than in the case when there is no access to such resources. The results of the research indicate that increased investment in higher education, which was the result of the availability of the EU structural funds, influenced the increase in human capital in Poland and raised its impact on the GDP growth rate.

**Key words:** investment, higher education, economic growth, EU funds, MRW model

### INTRODUCTION

Higher education generates knowledge which is a unique resource that contributes to economic growth. Numerous economists emphasize the role of education in the development of human capital and its significance in economic processes [Schultz 1961, Barro-Castro et al. 2001]. Contemporary research on economic growth and its factors also indicate that there is a correlation between the level of human capital that is generated by higher education and the rate of economic growth of a country [Gyimah-Brempong et al. 2006].

The higher education sector functions in the economy as a source of knowledge that is necessary to manage technologically advanced production processes. In the course of training at university level, highly specialized abilities and scientific theories are transferred that can subsequently be applied to generate innovations in production processes. This process can be understood in at least two ways: either as the introduction of new products (product innovation) or the introduction of new methods of manufacturing, or – possibly – the implementation of goods that so far did not exist in the economy [Gomułka 1990]. However, although they are indispensable, neither students nor entities that run schools of higher education can afford such investments in development. Thus, it seems interesting to take into consideration the impact of investment in higher education through EU funds. The European Union funds for higher education typically constitute investment in financial, tangible and

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intangible, as well as untouchable<sup>1</sup>, assets of schools of higher education. In models of economic growth, investments that are defined in this way constitute a component of an economic growth factor, which facilitates the investigation of their impact on the GDP growth. The objective of the article is to investigate the implementation of EU funds in the Polish higher education sector by determining the impact of investment expenditure (including the EU funds) on economic growth measured by the GDP growth rate. The research hypothesis is that the economic growth that is caused by investment in higher education with the contribution of the EU funds results in a higher GDP growth than in the case when there is no access to such resources.

## MATERIAL AND METHODS

In order to verify the hypothesis, the article provides a proposal for a decomposition of a model of economic growth with regard to the investment expenditure on higher education with the contribution of the EU funds. The decomposition of GDP growth was conducted for the period of 1995–2013, which was determined by the availability of quantitative data that were necessary to conduct appropriate computations.

In investigations that aim at the analysis of the impact of particular factors on GDP the Solow model, or derivative models [Romer 2000, Bukowski and Zawistkowska 2006, Kokocińska 2006] are applied most frequently.

In the traditional approach, the Solow model has the form of a three-factor production function. These factors are: capital ( $K$ ), labour force ( $L$ ) and technological progress ( $A$ ). The Authors propose a development of the classical Solow production function to a four-factor function, where – apart from technological progress ( $A$ ), real capital ( $K$ ) and labour force ( $L$ ) – the impact of human capital ( $H$ ) on GDP growth is taken into consideration. When analyzing the impact of higher education with the consideration of its financing structure (including the EU funds) on economic growth, a modified MRW model, which includes the human capital component, was applied. The analysis assumed the application of a production function derived from the Solow model and an attempt at decomposition was made; for further considerations, the canonical form of the production function was taken (the Cobb–Douglas function), which presents the dependence of output on capital, work force and human capital [D’Auria et al. 2010]. Thus, the production function is given by:

$$Y = A \cdot K^\alpha \cdot L^\beta \cdot H^{1-\alpha-\beta} \quad (1)$$

where:  $Y$  – GDP;

$K$  – physical capital (gross expenditure on real capital);

$H$  – human capital, perceived as expenditure on higher education in relation to the state’s budget expenditure on higher education per one student and the share of university graduates in the workforce; this ratio is calculated as the value of investment expenditure in schools of higher education divided by the state’s budget expenditure on schools of higher education per one student; then the result obtained is multiplied by the number of university graduates in the workforce, i.e. people who are in employment directly in the economy;

$L$  – work load (workforce, i.e. the number of people in employment in the economy);

$A$  – the model’s residual component, perceived as technological progress ( $TFP$ );

$\alpha, \beta, (1 - \alpha - \beta)$  – flexibilities of  $K, L$  and  $H$ .

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<sup>1</sup> Untouchable assets are generated in the course of the development of non-infrastructure projects (soft projects) and are not accounted for on the entity’s balance sheet, as Polish balance sheet law does not provide for such an asset category. Untouchable assets are the result of a project team’s creative work, e.g. regarding the development of a new programme curriculum or a unique curriculum of a field of study or the research and publication of its results. Such project products are not accounted for in the balance sheet as intangible assets and the financial effects of the creation of such assets are shown in the profit and loss account through the revenue cost settlement of the grant.

In such an approach,  $H$  – as a factor of economic growth – includes investment expenditure on higher education (including the EU funds), which makes it possible to present the contribution of the investment to the GDP growth. The Authors' proposal of the presentation of  $H$  is given by formula

$$H = \frac{N}{S} \cdot \frac{W_{bp}}{A} \quad (2)$$

where:  $N$  – investment expenditure of schools of higher education;  
 $W_{bp}$  – state's budget expenditure on higher education;  
 $S$  – number of students;  
 $A$  – number of graduates in employment.

In order to investigate the influence of factors  $A, K, H, L$  on the value of the production function  $Y$ , the time factor  $(t)^2$  should be taken into account. Consequently, the function is given by:

$$Y(t) = A(t) \cdot K(t)^\alpha \cdot L(t)^\beta \cdot H(t)^{1-\alpha-\beta} \quad (3)$$

Having differentiated the production function by time, one obtains:

$$\frac{\partial Y}{\partial t} = \frac{\partial Y}{\partial A} \cdot \frac{\partial A}{\partial t} + \frac{\partial Y}{\partial K} \cdot \frac{\partial K}{\partial t} + \frac{\partial Y}{\partial L} \cdot \frac{\partial L}{\partial t} + \frac{\partial Y}{\partial H} \cdot \frac{\partial H}{\partial t} \quad (4)$$

After dividing both sides of the equation by  $Y$  (GDP), the following form of the production function is obtained:

$$\frac{\frac{\partial Y}{\partial t}}{Y} = \frac{\frac{\partial A}{\partial t}}{A} + \alpha \cdot \frac{\frac{\partial K}{\partial t}}{K} + \beta \cdot \frac{\frac{\partial L}{\partial t}}{L} + (1 - \alpha - \beta) \cdot \frac{\frac{\partial H}{\partial t}}{H} \quad (5)$$

It can be assumed for a discrete time variable that the time derivative of every variable equals approximately its growth and consequently:

$$\frac{\Delta Y}{Y} = \frac{\Delta A}{A} + \alpha \cdot \frac{\Delta K}{K} + \beta \cdot \frac{\Delta L}{L} + (1 - \alpha - \beta) \cdot \frac{\Delta H}{H} \quad (6)$$

Such notation implies that it is possible to investigate the direct impact of the growth factors (including  $H$ ) on variable  $Y$ .

The Authors also made an attempt to estimate on their own the production function flexibility parameters. The procedure began with the estimation of the parameter [Snowdon et al. 1994]:

$$\alpha = r \cdot \frac{K}{Y} \quad (7)$$

where:  $r$  – average annual percentage rate assumed for the economy in the period under investigation;  
 $K$  – average level of real capital;  
 $Y$  – GDP.

<sup>2</sup> In further steps for the purpose of simplification, the production function is given by formula (1)

For the estimation of parameter  $\beta$ , the following equation was taken:

$$\beta = w \cdot \frac{L}{Y} \quad (8)$$

where:  $w$  – average salary in the national economy in a given period;

$L$  – volume of workforce in the economy;

$Y$  – GDP.

In line with the assumption of the production function, the value of the exponential parameter  $H$  equals the difference:  $1 - \alpha - \beta$ .

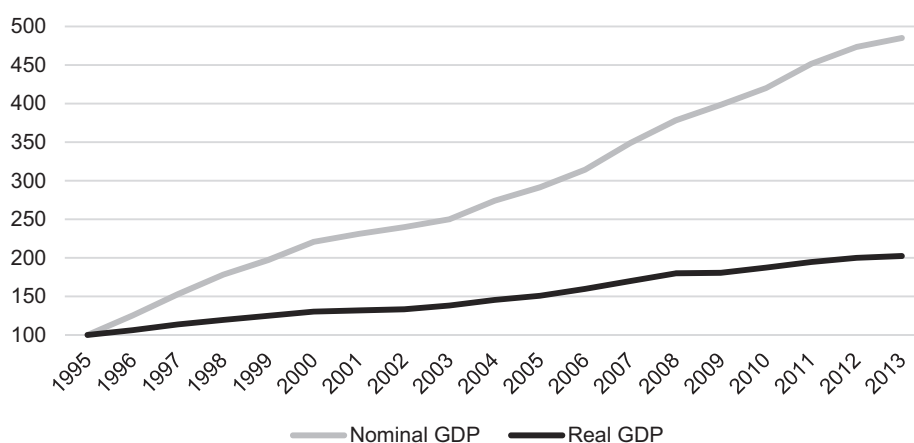
In the growth model presented, higher education is accounted for in factor  $H$  and it is identified with expenditure on higher education, including the European funds as a component of public expenditure on the sector.

## RESEARCH RESULTS

The research concerned the impact on economic growth of the European funds invested in higher education. The first stage of the research consisted in the analysis of the GDP in Poland in 1995–2013, which – with regard to the decomposition when applying the MRW model of economic growth – required an analysis of the nominal and real GDP flows in the period under investigation. Figure 1 presents nominal and real GDP flows in 1995–2013; this constitutes the first stage of the GDP decomposition. The next stage was to calculate the values of particular economic growth factors ( $K$ ,  $L$ ,  $H$ ,  $A$ ) and to estimate their growth rate.

Apart from the determination of factors  $K$  and  $L$ , the GDP growth rate decomposition requires the estimation of the human capital factor ( $H$ ). It is indispensable to study the relation between the expenditure on higher education and the number of graduates and the share of employees with higher education in the total volume of workforce in the economy. A further stage of the decomposition was to estimate factor  $H$  for Poland on the basis of formula 8.

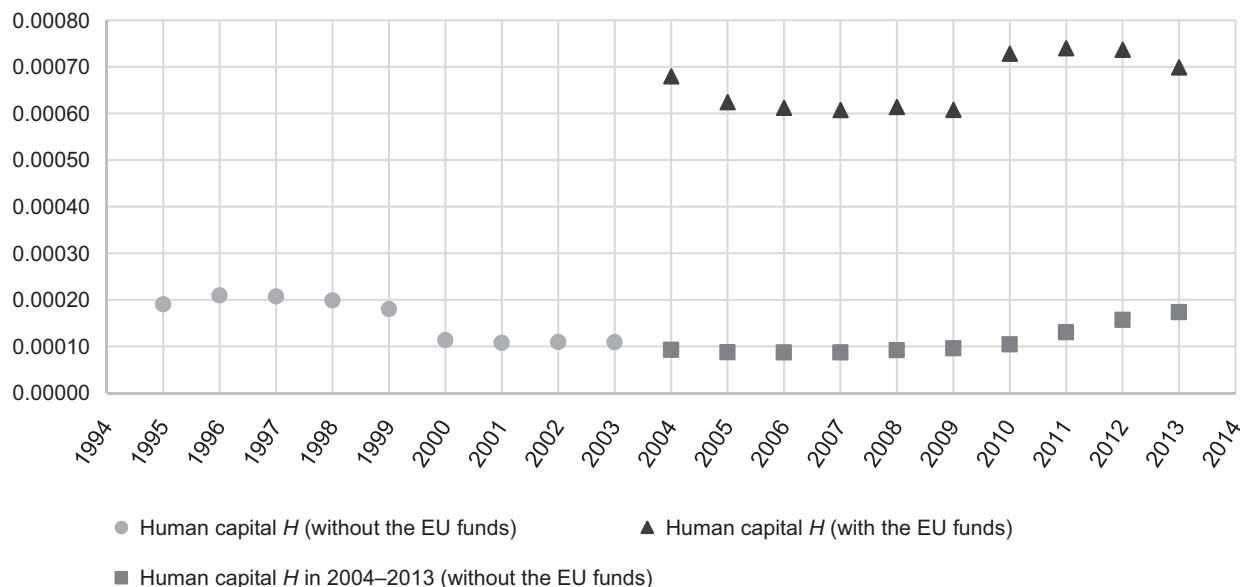
The average value of  $H$  for Poland (without the EU funds) amounted to 0.0133, while the average value of  $H$  with the EU funds was 0.0665.



**Fig. 1.** Gross domestic product dynamics in Poland in 1995–2013 (1995 = 100) (%)

Source: Authors' research based on the GUS (Central Statistical Office of Poland) Yearbooks for 1995–2013.

Figure 2 presents the development of factor  $H$  in a graphical form, which facilitates the interpretation that was conducted in two periods: for 1995–2003 the graph shows factor  $H$  before the accession of Poland to the EU and after that accession, i.e. the period when EU money was invested in higher education. The square markers on Figure 2 represents the hypothetical course of variable  $H$  in the case of the lack of the EU funding in 2004–2013.



**Fig. 2.** Factor  $H$  in Poland in 1995–2013

Source: Authors' research.

The verification of the impact of the investment of schools of higher education on the GDP growth required an investigation of a two-variant financial flow. Its estimation was possible with the application of the data from Table 1. On the basis of the economic growth measurement in Poland an empirical simulation of the economic growth with and without the contribution of the EU funds in higher education investment is presented synthetically in Tables 2 and 3 where the GDP growth rates are given together with the changes in the investment in factors ( $A$ ,  $K$ ,  $L$ ,  $H$ ). The tables also present the share of particular factors in economic growth, which facilitated the assessment of their impact on GDP in the period under investigation. Table 4 presents the results of the decomposition and their synthesis.

The division of the research period into two sub-periods was due to Poland's accession to the EU in 2004 which was a qualitative factor. It resulted in the reorientation of the Polish economy because of the total elimination of tax duties and the introduction of the free flow of capital and workforce.

The results of the research and analysis made it possible to decompose the annual GDP growth rates in Poland by such factors as capital –  $K$ , workforce (i.e. the number of people in employment) –  $L$ , human capital –  $H$ , and  $TFP$  –  $A$ . Moreover, apart from the estimation of the change in investment in particular economic growth factors, their share in GDP was also estimated.

**Table 1.** Nominal and real investment expenditure on higher education in Poland, state expenditure on schools of higher education, EU funds for higher education, number of people with higher education in employment, students and graduates of schools of higher education in Poland in 1995–2013

Year	Nominal investment expenditure in higher education	Real investment expenditure in higher education $N$	Nominal state budget expenditure on higher education	Real state budget expenditure on higher education $W_{bp}$	Averaged investment expenditure in higher education $N$	Nominal EU funds	Real EU funds	Number of people with higher education in employment		
								Students	Graduates	
	mln PLN								thousands	
1995	293.60	293.60	2 177.50	2 177.50	293.60	×	×	1 643.00	682.20	70.30
1996	503.40	426.81	3 011.30	2 553.16	426.81	×	×	1 746.00	774.60	89.03
1997	738.80	550.13	3 763.60	2 802.47	550.13	×	×	1 837.00	927.50	115.87
1998	958.90	643.46	4 283.00	2 874.06	643.46	×	×	1 989.00	1 091.80	146.32
1999	1 228.10	777.33	5 084.70	3 218.38	777.33	×	×	1 952.00	1 275.00	174.77
2000	1 575.80	930.05	5 347.10	3 155.89	538.27	×	×	2 055.00	1 431.90	215.42
2001	1 680.60	957.86	6 403.30	3 649.56	665.56	×	×	2 196.00	1 584.80	303.97
2002	1 541.40	856.26	6 868.20	3 815.34	771.76	×	×	2 386.40	1 718.70	342.14
2003	1 478.90	817.48	7 077.40	3 912.11	832.99	×	×	2 618.00	1 800.50	366.14
2004	1 785.80	947.80	8 854.20	4 699.31	867.79	10 150.54	5 387.34	2 889.00	1 858.70	384.03
2005	1 958.70	1 013.63	9 753.30	5 047.32	901.89	13 534.06	7 003.86	3 138.00	1 894.80	391.47
2006	2 036.00	1 034.36	10 010.70	5 085.81	918.60	10 150.54	5 156.86	3 321.00	1 953.80	393.97
2007	2 246.90	1 094.17	10 844.90	5 281.11	933.91	1 911.43	930.80	3 541.00	1 941.30	410.11
2008	2 394.80	1 138.51	11 191.00	5 320.31	981.49	2 796.98	1 329.71	3 811.00	1 937.00	420.94
2009	2 624.30	1 188.78	11 851.50	5 368.62	1 045.69	19 838.09	8 986.47	4 146.00	1 927.00	439.75
2010	4 950.80	2 207.31	11 792.60	5 257.73	1 093.89	10 542.87	4 700.54	4 557.00	1 900.00	478.92
2011	4 963.20	2 138.82	12 082.00	5 206.56	1 332.63	18 668.13	8 044.75	4 170.20	1 841.00	497.53
2012	4 411.20	1 863.10	12 476.20	5 269.41	1 553.52	16 949.84	7 158.89	4 201.80	1 764.00	485.25
2013	3 465.70	1 445.16	13 285.80	5 540.04	1 707.31	13 338.80	5 562.14	4 971.00	1 676.00	455.21

Source: Authors' own research.

**Table 2.** Economic growth measurement in Poland in 1996–2013, rates of change in economic growth factors and their contribution in the growth in line with the MRW assumptions (without the contribution of EU funds in the investment expenditure of schools of higher education (%))

Specification	1996	1997	1998	1999	2000	2001	2002	2003	Average 1996–2003				2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average 2004–2013
GDP change rate $\left(\frac{\Delta Y}{Y}\right)$	6.21	7.14	5.08	4.49	4.27	1.13	1.09	3.76	4.15	5.28	3.70	5.83	6.41	5.81	0.36	3.79	3.93	2.72	1.16	4.01			
TFP $\left(\frac{\Delta A}{A}\right)$	1.50	-0.03	-0.43	2.68	5.33	5.76	5.04	4.02	2.98	3.03	0.32	-0.18	-1.62	-2.08	2.61	5.23	1.31	2.93	2.53	2.11			
K expenditure change $\left(\frac{\Delta K}{K}\right)$	4.31	6.28	4.55	2.24	0.57	-4.25	-2.80	0.59	1.44	1.80	2.43	4.76	6.16	6.01	-2.84	-1.16	3.09	-0.38	-1.18	1.68			
L expenditure change $\left(\frac{\Delta L}{L}\right)$	0.11	0.73	0.82	-0.51	-1.72	-0.49	-1.27	-0.98	-0.41	0.32	0.83	1.14	1.78	1.83	0.53	-0.36	-0.53	0.09	-0.26	0.12			
H expenditure change $\left[\frac{(1 - \alpha - \beta)\Delta H}{H}\right]$	0.29	0.16	0.13	0.08	0.09	0.11	0.12	0.13	0.14	0.13	0.12	0.11	0.08	0.06	0.06	0.07	0.07	0.07	0.07	0.08	0.11		
Contribution of TFP in GDP growth	24.10	-0.48	-8.45	59.54	124.85	508.98	461.18	106.87	159.58	57.27	8.67	-3.13	-25.21	-35.76	726.95	138.05	33.19	107.87	217.01	138.97			
Contribution of K in GDP growth	69.45	87.98	89.66	49.86	13.42	-375.14	-256.18	15.59	-38.17	34.08	65.51	81.69	96.22	103.28	-789.92	-30.54	78.57	-14.11	-101.23	-43.43			
Contribution of L in GDP growth	1.69	10.27	16.21	-11.26	-40.33	-43.28	-116.32	-26.00	-26.13	6.13	22.47	19.56	27.72	31.51	147.53	-9.40	-13.46	3.50	-22.51	0.22			
Contribution of H in GDP growth	4.75	2.24	2.58	1.85	2.05	9.44	11.31	3.54	4.72	2.52	3.35	1.89	1.27	0.98	15.45	1.89	1.70	2.74	6.73	4.24			

Source: Authors' own research.



**Table 3.** Economic growth measurement in Poland in 1996–2013, rates of change in economic growth factors and their contribution in the growth in line with the MRW assumptions, with the contribution of the EU funds in the investment expenditure of schools of higher education (%)

Specification	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average
GDP change rate $\left(\frac{\Delta Y}{Y}\right)$	3.70	5.83	6.41	5.81	0.36	3.79	3.93	2.72	1.16	3.75
<i>TFP</i> $\left(\frac{\Delta A}{A}\right)$	1.93	1.93	1.27	0.77	0.96	4.46	2.85	2.55	1.69	2.05
<i>K</i> expenditure change $\left(\alpha \frac{\Delta K}{K}\right)$	1.32	2.52	3.14	3.01	-1.34	-0.53	1.39	-0.17	-0.51	0.98
<i>L</i> expenditure change $\left(\alpha \frac{\Delta L}{L}\right)$	0.00	1.14	1.78	1.83	0.53	-0.36	-0.53	0.09	-0.26	0.47
<i>H</i> expenditure change $\left[(1 - \alpha - \beta) \frac{\Delta H}{H}\right]$	0.45	0.24	0.22	0.20	0.21	0.22	0.23	0.24	0.24	0.25
Contribution of <i>TFP</i> in GDP growth	52.17	33.17	19.84	13.21	266.91	117.65	72.44	94.04	145.47	90.54
Contribution of <i>K</i> in GDP growth	35.65	43.21	49.02	51.82	-371.69	-14.09	35.26	-6.23	-43.56	-24.51
Contribution of <i>L</i> in GDP growth	0.02	19.56	27.72	31.51	147.53	-9.40	-13.46	3.50	-22.51	20.50
Contribution of <i>H</i> in GDP growth	12.16	4.05	3.42	3.46	57.26	5.84	5.77	8.69	20.60	13.47

Source: Authors' own research.

**Table 4.** Synthesis of economic growth measurement in Poland in 1996–2013 in line with MRW (%)

GDP growth factors under investigation	GDP growth increase/decrease of the factor	Contribution of the factor to GDP growth (when growth = 100)	GDP growth resulting from increase/decrease of the factor	Contribution of the factor to GDP growth (when growth = 100)	GDP growth resulting from increase/decrease of the factor	Contribution of the factor to GDP growth (when growth = 100)
	1996–2013	1996–2013	1996–2003	1996–2003	2005–2013	2005–2013
GDP growth rate $\left(\frac{\Delta Y}{Y}\right)$	4.01	100.00	4.15	100.00	3.75	100.00
Residual factor, <i>TFP</i> $\left(\frac{\Delta A}{A}\right)$	2.52	117.72	2.98	159.58	2.05	90.54
Investment expenditure on fixed assets in the economy (without the expenditure on higher education) $\left(\alpha \frac{\Delta K}{K}\right)$	1.23	-25.25	1.44	-38.17	0.98	-24.51
Number of people in employment in the national economy $\left(\beta \frac{\Delta L}{L}\right)$	0.07	-1.44	-0.41	-26.13	0.47	20.50
Human capital factor with the EU funds $\left[(1 - \alpha - \beta) \frac{\Delta H}{H}\right]$	0.19	8.97	0.14	4.72	0.25	13.47
Human capital factor without the EU funds $\left[(1 - \alpha - \beta) \frac{\Delta H}{H}\right]$	0.11 <sup>a</sup>	4.24 <sup>a</sup>	0.14 <sup>a</sup>	4.72 <sup>a</sup>	0.09 <sup>a</sup>	3.85 <sup>a</sup>

<sup>a</sup> Hypothetical value without the implementation of the EU funds – in this case the GDP growth resulting from the *TFP* increase was 2.60% in 1995–2013; in 2005–2013 the GDP growth resulting from *H*-hypothetical was 0.09% – in this case factor *A* would be 2.21% and its contribution to the growth equaled 90.54%.

Source: Authors' own research.

The analysis of Poland's economic growth in 1996–2013 resulted in the following conclusions:

1. In the full period investigated the growth rate of real GDP was positive and its average value for the period was 4.01%; in 1996–2003 and after 2004 (i.e. in the sub-period after the accession to the EU) the average values were 4.15 and 3.75%, respectively.
2. On the average, human capital ( $H$ ) in the period under investigation caused the increase of the GDP growth by 0.19%; Tables 2, 3 and 4 include an economic experiment that consisted in estimating a hypothetical factor  $H$ , i.e. without the contribution of the EU funds for 2004–2013. The GDP growth rate was only 0.11% due to the value of the  $H$  growth rate, i.e. it was lower by 0.08 p.p. than the average value for 1996–2013 with the consideration of the EU funds flow. The  $H$ -hypothetical for 2005–2015 resulted in GDP growth by only 0.09% and the contribution of this factor to the GDP would be 3.85%. Human capital ( $H$ ) that was estimated for 2005–2013 with the consideration of the EU grants to the investments of schools of higher education caused an average increase of the GDP growth by 0.25% and its contribution to the GDP growth was 13.47%. Thus, the contribution of  $H$ -hypothetical to growth is lower than the contribution of realized  $H$  by almost 11 pp, which implies that the EU grants contributed significantly to the increased contribution of actual  $H$  to the GDP growth rate.
3. The role of traditionally conceived capital ( $K$ ) is becoming increasingly less significant in present-day economies as regards its function as a GDP growth rate factor. The contribution of  $K$  to the GDP growth rate in the period under investigation ( $H$  without the EU funding) was negative while there was a growing contribution of workforce, human capital and  $TFP$ . The average contribution of  $K$  in the period in question ( $H$  without the EU funding) was negative and amounted to –43%, and when analyzing the GDP measurement with the application of factor  $H$  that considered the EU fund flow, the contribution of  $K$  to growth increased to –24% (2005–2013). The impact of the number of people in employment on GDP growth fluctuated; in the whole period under investigation the impact of workforce on the GDP growth was 0.07% and the contribution of this factor to the GDP growth was negative and amounted to –1.44%, in 1996–2006 the impact was –0.44% and the contribution –26.13%, while in 2005–2013 it was 0.47 and 20.50%, respectively.

As regards a detailed analysis of the research results, it should be pointed out that the contribution of human capital to economic growth, both with and without the consideration of EU funds, fluctuates relatively insignificantly (in comparison to other factors). The average contribution of  $H$  to growth ( $H$  measured without the EU fund flow) was on the level of 4.24%.

When the EU funds were considered in the investment expenditure of the schools of higher education ( $H$  with the implementation of the EU funds), the contribution of  $H$  in the GDP growth was 8.97% (in 1996–2013); however, in this case two periods should be distinguished:

- 1996–2003, that is, the pre-accession period when the average contribution of  $H$  in the growth was 4.72%;
- 2004–2013, that is, the period when the investment expenditure on higher education was increased by the value of the EU funds; the average contribution of  $H$  in the growth was then 13.47%.

## CONCLUSIONS

The research on the impact of particular factors on the economic growth indicated that the contribution of the EU funds to the investment expenditure in the schools of higher education caused a bigger impact of the factor on the GDP growth than in the cases when there was no the EU funding (the difference was 4.73 p.p.). Thus, in the view of the coming limitation of the EU funds, the following recommendations concerning the development of higher education can be presented:

1. Budget transfers to higher education should be treated as investments; the return on these investments should be reflected by: an increase in the investment expenditure change in line with the GDP growth rate or an

increase (or at least the maintenance) of the contribution of human capital to the economic growth on the present level.

2. The investment effectiveness of budget transfers to schools of higher education should be assessed by the employment rate among people with higher education which is understood as the ratio of people with higher education in employment to the whole population with higher education. This is important, as such a relation gives the answer to the question about the contribution of graduates to the production of goods and services, i.e. to GDP growth.
3. In the view of the coming limitation of the EU funding as a significant source of investment in schools of higher education it is important to ensure a constant relation of budget transfers for higher education to GDP at the minimum level of 1%; that will facilitate the maintenance of the investment level and will influence the level of human capital as a significant economic growth factor, especially considering a further transformation of the Polish and European economies. This process, i.a. constant GDP growth is to be maintained, requires the supply of a highly qualified workforce. Poland's experience, particularly in 2004–2013, indicates that both the structure of professional activity of people with higher education and their share in the total level of employment met the requirements of the economy and supported the increase of the significance of human capital in the economic growth (the average  $H$  for the period is 13.74%).

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## INWESTYCJE W SZKOLNICTWO WYŻSZE A WZROST GOSPODARCZY – PROPOZYCJA DEKOMPOZYCJI MODELU MRW DLA POLSKI

### STRESZCZENIE

Szkolnictwo wyższe stało się jednym z sektorów współczesnej gospodarki, która w coraz większym stopniu jest oparta na wiedzy. Jednym z dylematów państwa staje się finansowanie szkolnictwa wyższego oraz próba oceny skutków inwestycji czynionych w sektorze szkolnictwa wyższego. Celem artykułu jest określenie wpływu nakładów inwestycyjnych w szkolnictwie wyższym (w tym pochodzących z funduszy unijnych) na wzrost gospodarczy Polski mierzony tempem PKB. Hipoteza badawcza pracy zakłada, że wzrost gospodarczy wskutek poniesienia nakładów inwestycyjnych przez szkolnictwo wyższe, z udziałem funduszy unijnych, powoduje większy wzrost PKB niż w sytuacji braku dostępu do tych funduszy.

Wyniki otrzymanych badań dowodzą, iż zwiększone nakłady inwestycyjne szkół wyższych, spowodowane dostępnością funduszy strukturalnych Unii Europejskiej wpłynęły na wzrost poziomu kapitału ludzkiego w Polsce i zwiększyło jego oddziaływanie na tempo PKB.

**Słowa kluczowe:** inwestycje, szkolnictwo wyższe, wzrost gospodarczy, fundusze UE, model MRW

## YOUTH VERSUS OLD AGE – CONSUMPTION DETERMINANTS

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### ABSTRACT

The age of household members is an important determinant for expenditures. The aim of the present study is to determine expenditure structure and also the hierarchy of consumption determining factors in Polish both young and older households. The research material comes from unpublished Household Budget Survey of Central Statistical Office of Poland for 2012. Canonical correlation analysis was applied as a research method. The most important determinants of expenditures turned out disposable incomes per capita and household size. In spite of transformations taking place in the last years, financial aspect still plays deciding role in consumer spending, particularly in spending on services. The study on consumption determinants at different age groups leads to better understanding of consumer behavior circumstances and thereby ensuring a good quality of life for the people of different age.

**Key words:** households, consumer, consumption factors, seniors, Poland

### INTRODUCTION

The generation attitude is one of multiple factors deciding on consumption. Demographic features, including the age of household members are important criteria of consumer's typology. As the consumers get older they have more and more new needs, which become deciding factors in household budget distribution.

The aim of the present study is to determine expenditure structure and also the hierarchy of consumption determining factors in Polish both young and older households.

The age of household members is an important determinant for expenditures [Derrick and Lehfeld 1980, Wagner and Hanna 1983, Soberon-Ferrer and Dardis 1991, Schaninger and Danko 1993, Wilkes 1995]. Most of households pass from one stage of the household life cycle (based on age) to another in which their incomes, financial situation, consumption models, buying patterns [Wells and Gubar 1966], expectations and sense of style are changing.

It was indicated that young people in the first stages of their professional life strive for accumulation their savings and durable goods so as to take advantage of them in older age [Attanasio and Weber 1994, Attanasio et al. 1999, Jappelli 1999, Aguiar and Hurst 2013].

However, the behaviors of single young people concentrated on their expenditures on clothes, cosmetics, tourism, hobby development etc. are different from the behaviors of young married couples for whom apartment/house buying and furnishing becomes necessary. When children appear in the household, new needs also appear (food, clothing, toys and other children goods together with suitable furnishing) [Rudnicki and Bywalec 2002].

In the elder age households there are increasing expenditures for prophylaxis, drugs and medical care for adults. The members of this group show an increased interest in hobbies, travel, recreation [Gutkowska et al.

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2001], but with retirement and perhaps with the death of the spouse, people pay more attention to food, medicines and medical service expenditures.

## DATA AND METHODOLOGY

The research material comes from Household Budget Survey of Polish Central Statistical Office of Poland for the year 2012. The database is comprised of 37,375 households.

This study reviews the households which head were as old as:

- 30 or younger (minus 30), approximately 10% total number of households;
- 70 or older (70 plus), approximately 15% total number of households.

A head of household is defined as the person who gets the highest wage and salary income of all household members.

In this study, canonical correlation analysis was applied as a research method. The method is a way of identification of the linear relationships between two sets of multiple variables, using a variance–covariance matrix of the variables. Classical correlation analysis shows the relationship between two random vectors  $\mathbf{Y}$  and  $\mathbf{X}$ . The purpose is to find such two weight vectors  $\mathbf{l}$  and  $\mathbf{m}$ , which can show maximal correlation in linear combinations  $\mathbf{l}'\mathbf{Y}$  and  $\mathbf{m}'\mathbf{X}$ , called canonical variates [Krzyśko and Waszak 2013].

The analysis could be applied only after the conversion of quality features into zero–one (0–1) indicator variables. This effort was made for the following variables:

- dwelling place class;
- education degree of the household head;
- socio-economic group;
- gender differentiation of household heads;
- biological household type.

The following variables were applied to create the model:

- 13 categories of expenditures on consumption goods and services in PLN per capita, including expenditures on food and non-alcoholic beverages, alcoholic beverages and tobacco products, clothes and footwear, for services of owner-occupied housing, routine household maintenance, housing, utilities, and fuels, furnishing, household equipment, and routine household maintenance, health, transportation, communication, leisure, education, food service and accommodations, miscellaneous goods and services (personal hygiene, prostitution), other personal goods (e.g. jewellery), financial services and insurance, services not classified above, pocket money, other expenses (gifts from the household, other expenditures not classified anywhere, expenditures abroad);
- qualitative predictors: dwelling place class (four 0–1 variables: towns with the number of inhabitants: 500,000 and more, 200,000–499,000, less than 20,000 and villages), education degree of the household head (three 0–1 variables: elementary, high school or without education, vocational secondary education, university education), biological household type (households without dependent children, other households), socio-economic group (blue-collar workers, white-collar workers, self-employed, farmers, retirees, pensioners), gender differentiation of household heads (female);
- quantitative predictors: number of people in a household, number of disabled people in a household, age of the household head, disposable income per capita in a household, number of rooms in a flat/house, living area occupied by a household.

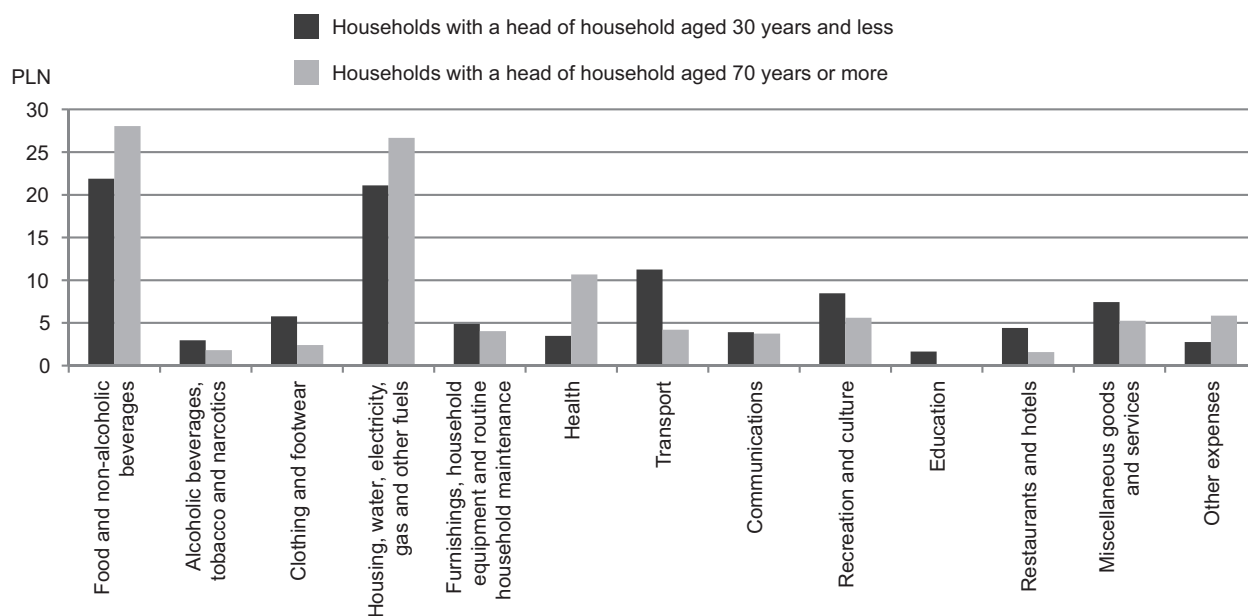
The variance extracted measures the average number of variances captured in a suitable set by all the canonical variables. Total redundancy means the sum of redundancies for the whole number of canonical variables. Its value is the information about average variance percent explained in one variable set against the other variable set, basing on all the canonical variables [Stanisz 2007].

It was assumed that statistically significant ( $P < 0.05$ ) canonical roots (the group of correlated original variables ordered hierarchically according to their contribution in the new variable) would be discussed. For canonical roots interpretation the following factors have been applied:

- canonical loadings – simple linear correlations between the canonical variables and independent variables in every set;
- canonical weights – that make possible the understanding what is the specific contribution of each variable in every set into individual weighed sum. The larger the value, the larger is the negative or positive contribution of the variable into weighed sum [Stanisz 2007].

## EMPIRICAL RESULTS

The income allocation is connected with changing consumer needs, depending on age. The structure of expenditures at young people households shows larger shares of expenditures for stimulants, clothes and footwear, furnishing and homemaking, transport, culture and leisure, education and hotel and catering service sector in comparison to the ones with older head of household. In the age group 70 and over expenditures for basic needs for food and non-alcoholic beverages and home maintenance costs were higher on a percentage basis than at young people households (Fig.).



**Fig.** The structure of Polish household expenditure in the young and elderly in 2012

Source: Own work on the basis of survey of household budgets (unpublished data of CSO). Central Statistical Office of Poland is not responsible for the data and conclusions contained in the publication.

Canonical correlation analysis, for households both with younger and older heads, included 13 canonical roots for each of these groups, from which 12 were statistically significant ( $P < 0.05$ ) for heads of household aged of 30 or less and 6 for heads of household aged of 70 or over.



### **Expenditure determinants for household heads aged 30 or less**

For household heads aged 30 or less, the feature-based variability measured by total variance regarding independent variables was 65.4% and regarding dependent variables – 100%. Instead, concurrency of changes for both independent and dependent features, in other words total redundancy was 9.2% regarding independent variables and 16.1% regarding dependent variables. Correlation value for the 1<sup>st</sup> canonical root was 0.776; for the 2<sup>nd</sup> – 0.317 and for the 3<sup>rd</sup> – 0.295. The subsequent roots contributed less and less in explanation for variability in expenditures at young people households, they only explained the variability not explained by earlier defined, roots. Correlation value for the 12<sup>th</sup>, the last significant canonical root was 0.038.

The most important relation – in the 1<sup>st</sup> canonical root – was between expenses of home maintenance, hotel and catering service, leisure and culture and disposable income per capita as well as household size. With reference to the analysis of the 2<sup>nd</sup> canonical root for households whose heads were aged 30 or less indicated that with smaller household size in the same biological type of household other than household expenses are connected to food and non-alcoholic beverages. The 3<sup>rd</sup> canonical root showed the following relation: in the households localized at villages, whose heads have higher education degrees, having larger housing area, higher expenses for home maintenance, food and non-alcoholic beverages, i.e. for basic goods and other goods and services.

### **Expenditure determinants for household heads aged 70 or over**

In the context of households whose heads were at least 70, variability measured by total variance regarding independent variables was 63.4% and regarding dependent variables was 100%. Whereas, concurrency of changes for both independent and dependent features, in other words total redundancy was 6.5% regarding independent variables and 10.9% regarding dependent variables.

Correlation value for the 1<sup>st</sup> canonical root was 0.732, for the 2<sup>nd</sup> – 0.346 and for the 3<sup>rd</sup> one – 0.251. The subsequent roots contributed less and less in explanation for variability in expenditures at young people households, although they were specific and explained the variability not explained by earlier defined roots. Correlation value for the last significant canonical root was 0.114.

Upon both the canonical weights and factor structure, at the 1<sup>st</sup> canonical root, the most important relation was between disposable income per capita, household size, household location in the largest cities and expenditures for communication, leisure and culture as well as food and non-alcoholic beverages. The values of both the canonical weights and factor structure for the 2<sup>nd</sup> canonical root indicated that at households of people aged 70+ with more family members and with larger disposable income per capita and having the male head, the expenditure structure may be connected with larger expenditures for alcoholic beverages, tobacco products as well as leisure and culture. It was shown, on the base of both the canonical weights and factor structure for the 3<sup>rd</sup> canonical root, that less expenditures or communication are connected with households of people aged 70+, located in villages and having the head with elementary education level.

## **DISCUSSION**

The level and structure of household consumption depends on several factors [Gutkowska et al. 2001, Piekut 2008], therefore a lot of independent variables were considered for creation a model describing the consumer expenditure level in relation to household feature.

The percentage of explained expenditure variability, which is the sign that consumer needs and behaviors are complex phenomenon, depending on numerous other factors. The diversity of these determinants make consumer market behaviors random and not predictable [Gutkowska and Piekut 2014]. Nevertheless, each of these features contributed in explanation of expenditure variability.

The most important expenditure determinants for both young and older people households were: disposable income per capita, household location and household head education level.

The specific force of disposable income per capita in households was emphasized also in other papers [Piekut 2008, Gutkowska et al. 2012, Radziukiewicz 2012]. However, it was indicated [Gutkowska and Ozimek 2005, Bernini and Cracolici 2015] that household income level depends also on several other determinants, e.g.: household location, presence of children in the family, socio-economical group.

The household size is the other feature besides incomes, deciding on consumption expenditures. The larger is the people number in the household, the less value of food expenses per capita. This is the effect of economizing with the scale of managing the household finances; this phenomenon is observed also with other goods consumption, e.g.: household maintenance and furnishing, clothes, footwear (handing over some clothes and footwear to younger siblings) [Gutkowska et al. 2001].

However, Zalega [2012] observed that household size is not the main indicator in demand. Socio-cultural factors influence consumer demands in greater degree. Intellectual development of consumers and their education level act on both physiological and cultural needs. The higher is household members' education level, the larger are aspiration in a particular household [Zalega 2011]. Other factors diversifying consumption models include gender, health condition, fitness, dwelling place, state of the infrastructure as well as people origin and occupation [Bąk 2012].

At young people households rising incomes per capita is accompanied by greater expenditure on housing maintenance and on hotel and catering service sector. Greater expenditures on mentioned purposes may be also expected in the households consisting of smaller number of people, placed in the largest cities.

However, at older people households, rising incomes per capita is accompanied mainly by greater expenditure on communication, culture and leisure as well as food and non-alcoholic beverages. Whereas for young people, after rising incomes more important are housing needs and hotel and catering service, for older people – communication and leisure services and also food.

Greater expenditure on food and non-alcoholic beverages at older people households were noticed also in other studies [Burzing and Herrmann 2012]. Additionally, it was observed that retirement is connected with larger expenses of food consumed at home, with decreasing expenditures on eating out.

Both the hotel and catering and leisure services are partially connected with tourism. Rapoport and Rapoport [1975] and Lawson [1991] stated that age is the main determinant of expenditure on tourism. Empirical studies show that high incomes positively influence decisions on traveling [Alegre et al. 2009, Eugenio-Martin and Campos-Soria 2011, Radziukiewicz 2012] and this effect is greater, if the people have medium or high income [Fish and Waggle 1996, Nicolau and Más 2005].

Bąk [2012] noticed that active use of leisure time by Polish seniors is still not very popular. Elderly people prefer listening to music and radio or watching television to playing sports or jaunting. There are also barriers in participation in cultural events, especially for elderly people with smaller incomes.

It was noted in the research *Diagnoza społeczna 2013* (ang. *Social Dignosis 2013*) that the greatest percentage of the people made to resignation from selected forms of participation in cultural levels was in the poorest households. On the other hand, most of resignations from vacation trips happened in pensioners' households [Czapiński and Panek 2014]. However, Piekut [2013] indicated that improving financial situation and increasing life expectancy will cause increasing free time and consumers will try to get the optimal management of time.

The measurements of canonical weights and factor structures for the 2<sup>nd</sup> root indicated that for young households greater expenditure on food and non-alcoholic beverages and also on housing maintenance may be connected with fewer households, included in the type; "other households". It is known, from analysis of expenditures on food, surveyed among German consumers [Burzing and Herrmann 2012], that these expenditures get higher, when the incomes rise up and smaller with retirement. However, it was not demonstrated that these expenditures are sensitive to difference at age.

With reference to older people households, it may be expected that the smaller is the female headed household, the smaller expenditures on alcoholic drinks and tobacco, leisure, culture and transportation and the greater for home maintenance. Darrow with collaborators [1992] demonstrated that larger expenditures on alcoholic drinks may be expected at younger unmarried women. It is worth noting that female marketing behaviors are specific, and number of factors deciding on female marketing behavior is larger than the male ones [Kieźel and Smyczek 2012].

Basing on measures for the 3<sup>rd</sup> root it may be stated that at young people households placed at villages, with greater number of rooms, larger living area and older head of the household, larger expenditures on home maintenance, food, non-alcoholic beverages and other goods and services may be expected.

At older male headed households placed at villages, in which the head has elementary level of education, smaller expenditures on communication may be expected. The connection between expenditures on communication and older age with low education level of household head was confirmed also by analysis carried out among Koreans over 65 years old [Siwuel and Song Hyun 2010].

A lot of studies point out that question of identity for the particular generation is accompanied by the phenomenon of specific consumption patterns [Beck 1991, Bauman 1998, Ransome 2005]. Consumers, who were young just after the second world war shaped different consumption patterns from modern young consumers, living among “consumer society” [Kramper 2000].

As the society gets older, the structure of consumer spending changes. Therefore it is necessary to adjust supply of goods and services to older people [Bąk 2012] and it is noted that in future, elder people needs will have to be respected to a greater extent. It is also pointed out that probably together with lengthening life, the range of age and behavior pattern typical for elder people today will be shifted on the axis of life. Additionally, longer productive career will result in slow-down marketing changes [Migdał-Najman and Szreder 2013].

## CONCLUSIONS

Based on above analysis the following conclusions may be alleged. The most important determinants of expenditures turned out disposable incomes per capita and household size. In spite of transformations taking place in the last years, financial aspect still plays deciding role in consumer spending, particularly in spending on services.

At young people households together with rising disposable incomes increase also expenditures connected with home maintenance as well as with hotel and catering and leisure and cultural service, whereas for older people – expenditures connected with communication and leisure services and also food and non-alcoholic beverages.

As for less numerous young households, expenditures on home maintenance, food and non-alcoholic beverages are specific, which is the consequence of finance managing scale. Larger expenditures on food and non-alcoholic beverages are specific for young people living in villages, with larger houses and whose head has high education level.

As for less numerous older households, less expenditures on alcoholic drinks and tobacco products, leisure and culture and transportation, especially female headed household. It was also noticed that for older male headed households localized in villages less expenditures on communication could be expected.

The study on consumption determinants at different age groups leads to better understanding of consumer behavior circumstances and thereby ensuring a good quality of life for the people of different age. This analysis is only a small piece of the problem goods and services expenses at households. Apart from the determinants taking here into consideration in studying of household budgets, there are also a lot of other ones connected with expenditures at households.

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## **MŁODZI KONTRA STARSI – DETERMINANTY KONSUMPCJI**

### **STRESZCZENIE**

Wiek domowników jest ważnym czynnikiem decydującym o wydatkach. Celem niniejszego opracowania jest określenie struktury wydatków, a także wskazanie na hierarchię czynników determinujących konsumpcję w polskich gospodarstwach domowych. Materiał badawczy stanowiły niepublikowane, indywidualne dane z badania budżetów gospodarstw domowych Głównego Urzędu Statystycznego za 2012 rok. Metodą badawczą była analiza korelacji kanonicznej. Najważniejszymi determinantami wydatków okazały się dochód rozporządzalny na osobę i wielkość gospodarstwa domowego. Pomimo przemian zachodzących w ostatnich latach aspekt finansowy nadal odgrywa decydującą rolę w wydatkach konsumentów, w szczególności w wydatkach na usługi. Badanie uwarunkowań konsumpcji w różnych grupach wiekowych prowadzi do lepszego zrozumienia sytuacji zachowań konsumentów i tym samym zapewnienia dobrej jakości życia dla osób w różnym wieku.

**Słowa kluczowe:** gospodarstwa domowe, konsument, determinanty konsumpcji, seniorzy, Polska

## THE DETERMINANTS OF HOUSEHOLD SAVINGS IN POLAND

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### ABSTRACT

The relevant literature provides an array of factors determining the propensity of households to save. There is no unanimity among researchers as to the direction of statistical relationships among some variables such as, e.g. household income, the place of residence or concerns regarding the worsening of financial circumstances, and a household's propensity to save. The aim of this article is to verify the statistical relationships between the amount of savings of Polish households and their attributes, such as: income, biological type of the family, and the size of the place of residence. The author of the article analyses the responses provided by Polish households with regard to the size of their savings measured as a multiple of their income. The data under analysis were collected during a panel study *Diagnoza społeczna 2015* (ang. *Social Diagnosis 2015*). Higher earnings were accompanied by higher levels of savings. It was more common for households from bigger cities to have higher earnings. Taking into consideration the biological type of the family, childless marriages and people, who lived alone, declared having the highest savings.

**Key words:** savings, household income, size of the place of residence

### INTRODUCTION

Cultural factors can largely influence the propensity to save [Carroll et al. 1994, 1999]. This causes people from various nations in the same environment to have a different propensity to accumulate savings [Carroll et al. 1994]. Different nations may behave dissimilarly depending on whether there are factors encouraging saving or spending money, e.g. high versus low urbanization of a region [Grigoli et al. 2014]. Therefore, statistical relationships found in one country may not be projected onto another. In the literature, there is no consensus about the direction of the relationship between some demographic variables and the amount of savings held by households. Income is most commonly provided in the relevant literature among the economic variables determining the propensity of households to save [Loayza et al. 2000, Dynan et al. 2004, Devaney et al. 2007, Garcia et al. 2011, Traut-Mattausch and Jonas 2011, Beckmann et al. 2013, Nalm 2013, Kolasa and Liberda 2014, Le Blanc 2015, Kostakis 2015]. The purpose of this article is to verify the statistical relationships between the size of savings and the selected attributes of Polish households. In the course of the study, the following hypotheses were put forward:

- $H_1$ : There is a statistically significant relationship between household income and the size of their savings.
- $H_2$ : There is a statistically significant relationship between the biological type of the family and the size of their savings.
- $H_3$ : There is a statistically significant relationship between the size of the place of residence and the size of savings.

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In order to identify the statistical relationships, the non-parametric chi-square test of independence was used; whereas correlation analysis with the use of the V-Cramer coefficient was adopted to quantify the relations. The author of the article analyses the responses provided by Polish households, which were collected during a panel study *Diagnoza społeczna 2015* (ang. *Social Diagnosis 2015*). The paper starts with a review of the literature elaborating on the factors determining savings in households. Next, the methodology section offers a description of the research sample. Subsequently, the research results are presented. The next part contains conclusions drawn from the analyses that the author has carried out.

## LITERATURE REVIEW

The author of the pioneer concept concerning the propensity of households to save was J.M. Keynes. He defined savings as the difference between income and consumption expenditure [Keynes 2003]. According to Keynes, the percentage share of savings in income increases along with the increase in income. A rise in real income does not contribute to a rise in consumption by the same absolute amount. Taking into consideration the *ceteris paribus* rule, an increase in real income results in an increase in an absolute sum of savings. Whereas a sudden drop in income may cause consumption to exceed income [Keynes 2003]. Another key theory concerning household savings is the relative income hypothesis proposed by J.S. Duesenberry who turned his attention to the phenomenon of competition in a society, which is aimed at reaching a higher standard of living. In contrast to Keynes's hypothesis, Duesenberry claims that the propensity to save is not dependent on the level of absolute household income but on the standard of living in a given environment [Duesenberry 1949]. A slightly different concept was offered by M. Friedman [1957]. He formulated the hypothesis of permanent income assuming that certain part of households' consumption is not dependent on current income but on the income expected to be received in the future. Behaviors related to consumption and saving may also depend on the life cycle [Modigliani and Ando 1957, Ando and Modigliani 1963]. The theory of the life cycle claims that people strive to even out the level of consumption throughout their whole life. Thus people usually save money during the period of being professionally active in order to be able to use savings to compensate for a decrease in income during retirement and maintain the standard of living at a similar level as the one enjoyed during the period of being professionally active [Modigliani and Ando 1957, Ando and Modigliani 1963].

The direction of the relationship between the size of income and savings is dubious. Some researchers have found a one-way relationship between the size of income and the propensity to save [Beckmann et al. 2013, Kostakis 2015]. Whereas Le Blanc et al. [2015] have discovered a reverse relationship between the size of income and the probability of having no savings as well as between the size of income and a higher risk of having unpaid bills. Dynan et al. [2004] have found a strong positive relationship between the savings rate and life income. Simultaneously, they have discovered a weak but still positive relationship between marginal propensity to save and life income. Traut-Mattausch and Jonas [2011] studied the relationships between financial satisfaction, income, and behaviors related to saving. The results show that higher income and financial satisfaction have a positive influence on saving. The statistical relationship between financial satisfaction and behaviors related to saving is stronger in people with lower savings than in those with higher ones [Traut-Mattausch and Jonas 2011]. According to Le Blanc et al. [2015], higher income is connected with a higher probability of taking on new financial liabilities, such as, e.g. loans. According to Loayza et al. [2000], the influence of the level of income on the propensity to save is higher in developing countries than in the developed ones. Whereas, Salotti [2010] claims that an increase in wealth in the developed countries had a negative influence on the propensity to save between 1980 and 2005.

In some countries, there is a tendency among households to reduce the proportion of savings in disposable income [Larionova et al. 2014]. Possession of real estate does not exert influence over the propensity to save. While having durable goods, such as a car, negatively influences the propensity to save [Kulikov and Staehr

2015]. Rószkiewicz [2014], who studied the determinants of saving among Polish households, found that the perception of income and the financial circumstances are the fundamental factors influencing saving and creating financial reserves. Attanasio and Brugiavini [2003] discovered that the rate of saving grows, if people are worried that their standard of living is going to slump during retirement. Mody et al. [2012] concluded that in developed economies, uncertainty regarding income earned from work is significantly correlated with greater households' savings. Whereas according to Fisher and Montalto [2011], uncertainty regarding income and the propensity to save are negatively correlated. Other factors offered as determinants of the propensity to save are: wealth, proximity of financial institutions, and financial stimuli [Chowa et al. 2012]. Economic uncertainty results from the perception of various types of risk. One of the factors exerting influence on the propensity to save is the risk of unemployment [Adema and Pozzi 2015]. Another psychological variable determining the propensity to save, which is often cited in the relevant literature, is the perceived life expectancy [Garcia et al. 2011]. Certain behaviors in childhood, e.g. saving or earning money, positively influence the propensity to save in adulthood [Brown and Taylor 2016].

Other factors that are commonly cited in the relevant literature, which exert influence on household savings, are the type of the family (the civil status of the party saving money); having kids [Glazer 2008, Kostakis 2015]; or family size [Nalin 2013]. Glazer [2008] analyses the possibilities in terms of saving among single people and married ones. He suggests that single people are able to save the amounts they want to save more commonly than married people [Glazer 2008]. Spouses often have different propensities to save. Hence it is more difficult for them to save the amount they want to save than it is for single people. An exception is a situation where a given person finds a partner who has the same propensity to save. Kostakis [2015] draws similar conclusions. According to him, married people save less. Another demographic factor determining the propensity to save is the level of urbanization. However, the direction of this relationship is not clear-cut [Grigoli et al. 2014].

The analysis carried out by Canova et al. [2005] demonstrates that at the very bottom of the hierarchy of motives for saving, there are specific motives, such as: saving for a better home, new car or holidays. At the very top, there are psychological purposes which are highly abstract, such as self-assessment, self-satisfaction. As we move towards the higher positions in the hierarchy of saving goals, particular aims gradually turn into more abstract ones. Whereas analysis of the perception map of saving goals reconstructed by Szopiński shows that Poles consciously or subconsciously define their investment aims bearing in mind the time criterion as well as the character of events that they are financially securing against. In turn, when choosing the form of saving, Poles use the criteria of risk and time for which they need to allocate their funds for [Szopiński 2012]. Another dimension of making a decision with regard to saving goals may be concerned with, e.g. the allocation of funds for savings or health care. Examples of such decisions concerning allocation of resources are available in the relevant literature.

## **MATERIAL AND METHODS**

The empirical material employed for the purposes of the present study was obtained within the framework of a research project *Diagnoza społeczna* (ang. *Social Diagnosis*) carried out in 2015 by the Council of Social Monitoring operating at the University of Finance and Management in Warsaw. It was a panel study which made use of two questionnaires. The first served as a source of information about the composition of households and the living conditions in which they operate; it was completed by an interviewer during an interview with a representative of a household who possessed the largest amount of information on its condition and members. The questionnaire provided the researchers with data on the composition of households and the conditions in which they operate as well as on the socio-economic characteristics of the individual members. Another questionnaire, which was intended to be filled out independently by all the available members of a household under examination, who were at least 16 years old, served to collect information on the quality of life of the particular person. For the purposes of the analyses presented in this article, only responses to selected questions provided



by individuals were used. The data were collected in March and April 2015 for the Council of Social Monitoring by professional interviewers from the Central Statistical Office of Poland (GUS). The number of households that underwent analysis amounted to 26,766 and the number of household members was 84,478. Households were selected on the basis of two-stage stratified sampling. Before sampling, the households were stratified according to voivodeships and next within the voivodeship-based category, they were stratified further according to the class of the place of residence, i.e. a large city (with a population of over 100 thousand residents), small town (with a population of less than 100 thousand residents), and a village. First-stage sampling units in the urban strata in individual voivodeships were statistical regions (encompassing at least 250 apartments) and in the rural strata, these were statistical circuits. In the second stage, two apartments were systematically drawn from a randomly arranged list of apartments, independently from each strata established in the first stage. In order to carry out analysis of the factors determining saving, the following variables were selected: household's monthly net income, biological type of the family, and the size of the place of residence (Table 1). Analysis does not take into account the responses of the respondents who did not provide answers to questions about income, biological type of the family, and the amount of savings. Analysis was conducted on the answers provided by 4,125 respondents.

**Table 1.** Description of the research sample

Specification	Value (%)
Place of residence	
City with over 500 thousand residents	10.0
City with over 200 thousand residents but no more than 500 thousand	10.1
Town with over 100 thousand residents but no more than 200 thousand	7.9
Town with over 20 thousand residents but no more than 100 thousand	19.5
Town with up to 20 thousand residents	12.4
Village	40.1
Available household income	
up to 2 000 PLN	12.1
2 001–3 000 PLN	18.2
3 001–4 000 PLN	21.1
4 001–5 000 PLN	18.9
above 5 000 PLN	29.8
Biological type of the family	
Childless marriage	26.2
Marriage with 1 child	17.2
Marriage with 2 children	15.2
Marriage with 3+ children	6.0
Single-parent family	9.0
Multifamily	8.1
Single-person, non-family	18.3

Source: Personal calculations based on Council for Social Monitoring [2015].

Over 30% of the respondents declared having savings of up to the monthly income of the household (29.2%); above the monthly income but no more than the total three-month income (27.1%); higher than three-month income – up to half-year income (17.9%), above the half-year income – smaller than one-year income (11.0%), higher than one-year income of a household (3.7%), and three-year income (1.7%). People, who declared having savings higher than three-year income, were included in the group declaring savings higher than one-year income. Information about the amount of savings was not provided by 9.4% of the respondents.

## RESULTS

Table 2 presents a juxtaposition of the relationships and the strength of the relationships between the family and financial circumstances of a household and the size of savings that they had in 2015. Hypothesis 1 has been supported. Since  $P < \alpha$ , there is a statistically

significant relationship between income and the size of savings. The same is the case with hypotheses  $H_2$  and  $H_3$  that have been confirmed as well. In the case of relationships identified with the chi-square test, it has turned out that none of the attributes has a decisive effect without the involvement of the others. In each case under analysis, the V-Cramer coefficient has reached lower limits. None of the attributes was strongly correlated. The size of savings is influenced by a set of attributes. The socio-economic attributes considered separately, assuming that no other socio-economic attributes exist, have a negligible influence over the size of savings.

**Table 2.** Juxtaposition of the statistical relationships between selected socio-economic variables of households and the size of savings that they had in 2015

Variables	Chi-square test value	Critical level of significance ( $P$ )	$df$	V-Cramer coefficient	Outcome of verification of hypotheses
Income	250.549	0.000	20	0.123	supported
Biological type of the family	72.229	0.000	30	0.059	supported
Size of the place of residence	100.121	0.000	25	0.070	supported

Source: Personal calculations based on Council for Social Monitoring [2015].

Analyzing the statistical relationship discovered between income and savings, it is visible that the highest percentage of people, who declared having savings of up to the monthly income was in the group of people earning up to 2,000 PLN (Table 3). The situation is different in groups declaring higher levels of savings measured as a multiple of monthly income. A one-way relationship between declarations of the size of income and declarations of a higher level of savings measured as a multiple of monthly income is observable. People belonging to the groups declaring the possession of savings equal to a six-month income or more dominate in the group of households with an income exceeding 5,000 PLN monthly.

**Table 3.** Percentage distribution of the responses regarding the size of savings in each income group

Size of savings	Available household income				
	up to 2 000 PLN	2 001–3 000 PLN	3 001–4 000 PLN	4 001–5 000 PLN	above 5 000 PLN
Up to one-month income	41.8a	31.9b	29.9b	22.8c	20.1c
Above one-month but below three-month income	27.8a	27.4a	28.4a	28.1a	24.5a
Above three-month but below half-year income	12.8a	15.6b	19.3b,c	21.9c	20.2b,c
Above half-year but below one-year income	6.1a	9.0b	7.8a	12.9b,c	17.9c
Above one-year income	1.9a	4.0b	5.2b	5.9b,c	9.4c
It's hard to say	9.6a,b	12.1b	9.4b	8.3a,b	7.9a
Total	100	100	100	100	100

Each letter denotes a subset of the category of income group in which the proportions of the columns are not much different from one another at the level 0.05.

Source: Personal calculations based on Council for Social Monitoring [2015].

Analyzing the relationship between the size of savings and the biological type of the family, one can notice that the biggest differences in the percentage of the respondents are present in the group declaring the possession of savings of up to one-month household income and in the group declaring having savings higher than a yearly household income. In these groups, the proportions of columns are significantly different from each other at the level 0.05 (Table 4). In the remaining groups, the proportions of the respondents are not significantly different from each other. Marriages with three or more children dominated in the group of people who declared the possession of savings of up to one-month income. Whereas the smallest percentage in this group was represented by childless marriages. In the group of people declaring that they had savings higher than yearly income, the dominant portion was comprised of childless marriages and one-person households.

**Table 4.** Percentage distribution of the responses regarding the size of savings, taking into consideration the biological type of the family in the household

Size of savings	Type of family						
	childless marriage	marriage with 1 child	marriage with 2 children	marriage with 3+ children	single-parent family	multifamily	single-person, non-family
Up to one-month income	25.4a	27.3a,b	28.1a,b,c	38.8c	35.4b,c	33.3a,b,c	29.4a,b,c
Above one-month but below three-month income	27.0a	28.2a	26.2a	26.7a	31.2a	28.8a	25.2a
Above three-month but below half-year income	19.1a	18.1a	16.7a	15.1a	15.0a	19.3a	18.4a
Above half-year but below one-year income	12.1a	10.8a	12.9a	9.5a	7.0a	9.1a	11.3a
Above one-year income	6.9a	5.8a,b	5.3a,b	5.2a,b,c	1.1b,c	1.4b,c	6.4a
It is hard to say	9.4a	9.8a	10.8a	4.7a	10.3a	8.1a	9.3a
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Each letter denotes a subset of the category of income group in which the proportions of the columns are not much different from one another at the level 0.05.

Source: Personal calculations based on Council for Social Monitoring [2015].

Households residing in villages and in small towns with fewer than 20 thousand residents dominate among the households that declare the possession of savings of up to one-month income (Table 5). Households residing in villages dominate among the ones declaring having savings higher than one-month income but smaller than three-month income. Among the households with savings exceeding one-year income, the dominant group was comprised of residents of cities with the population of over 500 thousand.

**Table 5.** Percentage distribution of the responses regarding the size of savings, taking into consideration the size of the household's place of residence

Size of savings	Type of place of residences					
	city with over 500 thousand residents	city with over 200 thousand residents but no more than 500 thousand	town with over 100 thousand residents but no more than 200 thousand	town with over 20 thousand residents but no more than 100 thousand	town with up to 20 thousand residents	village
Up to one-month income	24.0a	28.3a,b	30.2a,b	26.7a,b	33.0b	32.3b
Above one-month but below three-month income	23.1a	21.8a	28.1a,b	27.9a,b	25.8b	31.0b
Above three-month but below half-year income	20.9a	18.3a	18.4a	18.2a	18.1a	15.7a
Above half-year but below one-year income	13.1a,b	16.4b	11.5a,b,c	11.1a,b,c	8.2a,c	8.4c
Above one-year income	9.0a	6.6a,b	5.4a,b	4.3b	5.2a,b	3.9b
It is hard to say	10.0a,b	8.7a,b	6.4b	11.8a	9.7a,b	8.6b
Total	100.0	100.0	100.0	100.0	100.0	100.0

Each letter denotes a subset of the category of income group in which the proportions of the columns are not much different from one another at the level 0.05.

Source: Personal calculations based on Council for Social Monitoring [2015].

## CONCLUSIONS

The obtained results concerning the influence of income on household savings are consistent with the results of other researchers [Dyran et al. 2004, Beckmann et al. 2013, Kostakis 2015]. They do not, however, confirm the results of Le Blanc et al. (2015). Author's analysis confirms that income exerts a positive influence on savings. Whereas analyzing the size of savings from the perspective of the biological type of the family, it turns out that the highest savings (measured as a multiple of income) were declared by childless marriages and single people, which does not confirm the observation of Kostakis [2015], who claims, that married people save less than single ones. The conducted analysis confirms the findings of research that states that the direction of statistical relationship between the size of the place of residence and the size of savings is dependent on time and place [Grigoli et al. 2014]. In the case under examination, the size of the place of residence has a positive influence over the size of savings. The presented findings provide information for people responsible for banks' deposit policies. The conducted analyses demonstrate that residents of smaller towns declare the possession of lower savings. Additional analyses of data obtained in the study *Social Diagnosis 2015*, which were performed by the author of this article, show that in smaller towns it is less common for people to have current saving and checking accounts or saving accounts in banks. A deposit is the most frequently selected method of allocating savings of Polish households [Council for Social Monitoring 2015].

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## **CZYNNIKI DETERMINUJĄCE OSZCZĘDNOŚCI POLSKICH GOSPODARSTW DOMOWYCH**

### **STRESZCZENIE**

W literaturze podawane są różne czynniki determinujące skłonność gospodarstw domowych do oszczędności. Pośród badaczy nie ma zgodności dotyczącej kierunku wpływu zależności między czynnikami takimi jak np. dochód, miejsce zamieszkania lub obawy dotyczące pogorszenia sytuacji finansowej a skłonnością gospodarstwa domowego do konsumpcji. Celem artykułu jest weryfikacja zależności między wielkością oszczędności polskich gospodarstw domowych a zmiennymi: dochód, typ biologiczny rodziny oraz wielkość miejsca zamieszkania. Autor artykułu poddaje analizie odpowiedzi polskich gospodarstw domowych dotyczące wielkości ich oszczędności mierzonych jako wielokrotność ich dochodu. Dane do analizy były zebrane w ramach badania panelowego *Diagnoza społeczna 2015*. Wyższym zarobkom towarzyszyły wyższe poziomy oszczędności. Gospodarstwa z większych miast deklarowały większe oszczędności. Biorąc pod uwagę typ biologiczny rodziny, najwyższe zarobki deklarowały bezdzietne małżeństwa oraz osoby żyjące samotnie.

**Słowa kluczowe:** oszczędności, dochód gospodarstwa domowego, wielkość miejsca zamieszkania



## PERFORMANCE OF KAZAKHSTAN'S AGRIFOOD MARKET

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### ABSTRACT

This paper focuses on foodmarket performance and analysis of Kazakhstan experiences with developing agriculture. In the paper the theoretic aspects of industry market performance, background of agriculture with emphasis on agrifood market is given. Examples from Kazakhstan's experiences with development of the agrifood sector, and data from Kazakhstan Committee on Statistics are used. The result of analysis indicate that Kazakhstan has to develop the non-primary sector of the food supply chain in order to make it more competitive in global competition. Steps in this direction have already been taken by the agricultural policy of Kazakhstan. However, it is recommended that various issues must be addressed by the government, including the improvement of product quality and the creation of national brands, infrastructure development, creation of conditions for improving the technical support of agricultural production. Agriculture as the main activity of the rural population needs support. In this case indicators of agrifood market performance should be assessed.

**Key words:** market performance, agricultural policy, effectiveness, agrifood market

### INTRODUCTION

The main trends of world development in the agrifood sector are the globalization of trade, vertical integration, the increasing demand of product safety and product quality and the increasing demand for organic products.

The rapid transformation of the agrifood industry in developing countries has gained a lot of research interest in recent years [Reardon et al. 2009]. A wide range of studies has investigated the effects through enabling access to credit, inputs, information and secured prices [Danilowska 2016]. There is a growing literature on agrifood supply chain transformations for Eastern European countries, such as for example: Poland, Hungary, Moldova and Bulgaria [Falkingham 2005, Gorton et al. 2006, Cungu et al. 2008, Dries and Swinnen 2010, Van Herck et al. 2012]. The role of small-scale producers in agricultural production and food security in the country discusses [Bobojonov et al. 2015]. Yet there are several literatures, emerging which discuss the challenges associated with supply chain constraints [FAO 2010, Petrick and Oshakbaev 2014].

Kazakhstan is one of the countries where agrifood sector has undergone enormous changes since independence in 1991. There were sharp drop in production, processing and formal retail trade during the first decade and their fast recovery in the second decade. Nowadays Kazakhstan belongs to the top 10 exporters of wheat and wheat flour and due to its good economic performance and relative political stability, has gained an internationally recognized position among the Common Wealth of Independent States (CIS) countries [Liefert et al. 2010, Petrick and Oshakbaev 2014].

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Even though the share of agriculture in total GDP declined from 34% in 1990 to 8.1% in 2015, agriculture is still of great importance in Kazakhstan. The percentage employed in agriculture is 18.9% of the Kazakh population [Kazakhstan... 2016] and there is a large share of subsistence-oriented producers involved in meat, dairy and horticulture production. However, existing studies in the region mainly discuss the challenges according to observations from several case studies and quantitative impact of agrifood sector transformation is yet to be investigated.

The effectiveness in terms of the Harvard paradigm is the result of the interaction of a number of parameters and has different forms of manifestation.

The effectiveness of the function of any industry market can be represented as a function that of a whole set of variables. These include: assessment the industry performances of firms functioning in the international market; assessment of various aspects of the market development at the level of inter-sectoral linkages; assessment the performance of industry market functioning; an overall assessment of the industry market performance; an integrated assessment of the industry market performance from the government's position. The total performance of the industry market is a function of the integrated variables enumerated [Porter 1980]. Thereby, the agrifood market performance is analyzed on different levels by multilevel approach. Agrifood market is assessed in terms of the world economy. Expansion or attenuation a one or another market industry of the national economy could change the country's position geopolitically. At the national level, productivity is investigated in terms of the inter-industry linkages. The industry's share of production in GDP and GNI, the rate of their impact on the stability of the national economy as a whole are determines.

For the government, the industry market is a source of tax revenue. The evolving effectiveness of the agrifood market takes into account the changes that need to be pushed forward by the public administration system, which should also consider the social effects of development.

Effectiveness is assessed from the perspective of the activities of individual companies and industry market agents. The changing in the consumer surplus is important indicator of the industry market functioning. It is associated with a change in domestic demand in the national economy.

Therefore, public policy is based on expectations of growth in aggregate demand of the population, the growth of citizens' self-esteem; reduce production costs on the basis of rational use of limited resources. Therefore, it is important to record the change of the free time in the society, the growth of household spending on leisure and creativity.

The total impact of the functioning of the industry market is a function of these variables integrated. It represents the final performance indicator industry market. Undoubtedly, settled performance monitoring allows implementing a balanced agricultural policy both from the state and from civil society.

The study contributes to the existing literature as analyze agrifood market performance in Kazakhstan and discuss the role of agriculture. The objective of study is to analyze the current condition of agrifood market in Kazakhstan, discover main problems of development and elaborate perspective tools to ensure sustainability.

## **MATERIAL AND METHODS**

The analysis involved data of statistics agency of the Kazakhstan Republic and was done using mainly quantitative and qualitative information, and descriptive statistics. In the analysis, method comparative analysis was implemented. Annual data from Kazakhstan for the period 1995–2015 is obtained from the Committee on Statistics of Kazakhstan.

The current status of the agrifood market of Kazakhstan was analyzed. Attention is paid to the social factors of agricultural development. All this is carried out due to objective studying of levels, structure and tendencies of economic development of the agribusiness in Kazakhstan.

## RESULTS AND DISCUSSION

### Background of Kazakh agriculture

Kazakhstan is geographically the 9<sup>th</sup> largest country in the world and the proportion of agricultural land is 34.3%. The population of the republic is relatively low – 17.7 million people, of whom 43.3% is rural. The share of the employed population in the economy of the agricultural sector is about 18%. The population of Kazakhstan settled on its vast territory is very unevenly distributed [*Kazakhstan...* 2016].

Through economic reform, Kazakhstan tries to overcome the raw-material orientation of its economy, largely inherited from the Soviet system. The agrarian sector of the country is playing an active role in this process. The agrarian policy of Kazakhstan aims to develop a globally competitive specialization in non-primary sectors. Given the role of food security in ensuring the independence of the country, and that about half of the population lives in rural areas, the state and development of the agriculture is great importance for the sustainable development of the country.

The agriculture in Kazakhstan is one of the most promising sectors of the economy. One percent growth of agricultural products provides an additional increase in output of industrial infrastructure by 2.5%, of the processing industry by 1.4%, of transportation services by 0.33%, of trade by 2.7% [Overchuk 2001].

However, there are various issues that must be addressed by the government, including the improvement of product quality and the creation of national brands, infrastructure development, improvement the quality of rural labor resources in agribusiness and the creation of conditions for improving the technical support of agricultural production.

The agricultural sector is crucial of national food security and development of export potential, and therefore has paramount political importance. The issues of food security are included in the list of national interests. Their decision is related to the sustainable development of agriculture and agribusiness. Export potential of agriculture in the country is very high, especially for the production of grain and flour. In conditions of essential dependence of the country on export of raw materials, realization of export opportunities of agrifood can make a significant contribution to the development of the economy.

The agricultural production is also very important for the social and economic rural development, for example through creation of employment in remote areas and areas with difficult climatic conditions. There is high need for greater equality across regions, to ensure the territorial integrity of the state, and the rational use and protection of unique natural and biological resources. Kazakhstan has a large area and uneven settlement of the inhabitants.

However, the agribusiness of the country still has some disadvantages – low rates of structural and technological modernization of the industry, unsatisfactory level of development of market infrastructure, small-scale agricultural production, instability of the financial sector, lack of private investment in the development of the industry and the shortage of skilled personnel etc. [Bobojonov et al. 2015].

During the reforms domestic agriculture could not reach a new qualitative level. Certain products still have not reached pre-reform levels of production. For example, in 2014 the production of meat (slaughter weight) in farms of all categories was 59.2% of the 1991 level. The scale of the agricultural production is also reduced; the crop area declined by 38.6% between 1991 and 2015, the number of animals also reduced during this period: cattle by 35%, sheep, goats, pigs and poultry by 50%. Agricultural productivity remains low, the yield of grain, which is the main export product was 12.7 cwt per 1 ha in 2015, while in developed countries it fluctuates from 20 to 45 cwt per ha [*Agriculture, forest and fish...* 2016].

The main object of the present industrial and innovative state policy is the development of a globally competitive specialization of Kazakhstan in the manufacturing sectors of economy for sustainable economic development. In order to diversify and increase the competitiveness of Kazakhstan's economy in the long

term the *Master Plan on Forced Industrial-Innovative Development of Kazakhstan for 2015–2020* [2014] has been adopted and is being implemented.

In this regard, a large and important task is raising the agricultural sector of the economy to a qualitatively new level of development and thereby improving competitiveness, which is especially important in light of the country's integration with Russia and Belarus, and the subsequent entry into the World Trade Organization.

The growth of Kazakhstan's exports, the most part of which, as before, are mineral resources (oil, gas, metals), certainly mitigates the country's crisis and assists the implementation of the structural reforms. However, it leaves the national economy vulnerable to the global economic downturn and to the decline of the energy prices. Moreover, the dependence on imports for many vital goods including food remains.

It becomes evident that to further increase the pace of the extraction of raw materials while maintaining an expensive and inefficient production structure will threaten the country with a gradual transformation into a raw materials appendage of the world economy. The only way to mitigate this is by upgrading of economic structure, the transition on the innovative resource-saving path of development in all sectors of the economy, including agriculture. First steps in this direction have already been made, but given the scale of the lag, they must repeatedly accelerate, in order to maintain the existing scientific and educational potential, to restore cooperative communication, to provide a competitive regime, and an effective partnership in science and technology, to create conditions for the transformation of innovation in a powerful lever of the economic recovery.

### Performance of Kazakh agrifood market

Although in recent years, Kazakhstan, like other CIS countries, has higher economic growth than the most developed countries, including the United States and the majority of the countries of the European Union, the quality of that growth still remain unsatisfactory. In recent years the volume of Kazakhstan's trade in the total world trade has grown rapidly (Table 1). Last two years there is a decline in these indicators. Although in 2015 the foreign trade turnover of country exceeded the level of 1995 by 10 times. However, currently the exports of Kazakhstan mainly consist of commodities of the raw group: 72.4% – mineral raw materials and fuel, 15.4% – ferrous and non-ferrous metals [Committee on Statistics of Kazakhstan 2016].

**Table 1.** Trends in international trade turnover of Kazakhstan in 2011–2015

Indicator	2011	2012	2013	2014	2015
Total turnover (m USD)	121 241.7	132 807.2	133 506.0	120 755.3	75 911.6
Export (m USD)	84 335.9	86 448.8	84 700.4	79 459.8	45 725.6
Export of agrifood (m USD)	–	898.1	911.5	930.7	794.9

Source: Statistics agency of Kazakhstan [2016].

Assessment of agrifood market in terms of the world economy shows the sharp in agrifood export for last two years and evidences the change the Kazakhstan's position geopolitically. The share of agrifood export in international trade turnover account 1.01%.

The share of agriculture in the GDP of Kazakhstan for the past 25 years has decreased from 34 to 4.7% in 2015 (Table 2), while employed labor force in rural areas accounted for 18%. This is a confirmation of the low labor productivity in the sector and low primary incomes of the rural population. The reduction of the prices on agricultural products by more than 50% and the growth of price indices for industrial goods considerably accelerated the decline in the share of agriculture too.

**Table 2.** Trends in food production of Kazakhstan in 2011–2015

Indicator	2011	2012	2013	2014	2015
Share of agriculture in the GDP (%)	4.7	4.0	4.4	4.2	4.7
Share of food production in the GDP (%)	2.82	2.69	2.62	2.71	2.63
Share of food production in industrial output (%)	5.2	5.1	5.4	6.0	7.3
Share of milk in industrial output (%)	0.8	0.8	0.9	1.2	1.3
Share of meat in industrial output (%)	0.6	0.7	0.7	0.8	1.0

Source: Statistics agency of Kazakhstan [2016].

Currently, one of the main factors hampering the development of food production in Kazakhstan is the persistently low level of industrial processing and incomplete utilization of the capacities of processing enterprises. The fact that the share of agriculture in GDP is twice as high, than the share of the food industry speaks the non-use capacity of the raw materials base of the agribusiness. So, the share of food production in total industry in 2015 was 2.63% of GDP [*Agriculture, forest and fish...* 2016].

It should be noted that growth in agricultural production is constant, but despite this, the share of industrial processing of agricultural raw materials is very low, and the finished product has a weak competitiveness, which is due to the lack of new technology in many processing companies.

In 2015, production of meat expressed as carcass weight increased by 4.6% compared to 2009. The share of industrial processing in the total meat production amounted to 24.2%. The use of the average annual capacity of the meat processing plants was 65% [*Agriculture, forest and fish...* 2016].

Dairy products market in Kazakhstan is currently experiencing considerable difficulties. In the republic there is shortage of raw milk: according to statistics, only 15% of the milk produced is sent for further processing in to sour milk, cheeses and other products. The system of collecting small quantities milk has led to a deterioration of its quality and higher prices of the final product.

The share of milk produced by households is 45.7% of its total volume. While the share of agricultural enterprises account for 23.2% and farms – 31.1%. However, there are changes in the structure of output compared to 2011. Thus, the share of small household products decreased by 11.1 point. Therefore, in recent years there is a growing demand for cheaper Russian and Belarusian dairy products.

The average percentage of imports into the Kazakh market for milk and dairy products is 35–40%, but for some product categories it can be much higher: cheese and cottage cheese – 80%, butter – 75%, condensed milk – 90%. The volume of dairy production in the Kazakhstan Republic in 2015 amounted to more than 0.7 million t, of which about 70% are milk and cream, and 26% others dairy products.

In order to support Kazakhstan producers of dairy products the program *Agribusiness 2020* is implemented, according to which by 2020 large farms, where the number of livestock more than 1,000 cows, should build as well as 20 small farms has been developed. It is expected that Kazakhstani goods could compete with products from Russian and Belarusian both in terms of volume and price after the implementation of this program [*The program...* 2013].

The development of milk processing is hampered by delays and incomplete utilization of production capacities of most of the specialized companies. The reasons of this situation are a violation of the economic relationship between raw material suppliers and processors, the low quality of raw materials, imperfect system of contracts between enterprises and the low purchase prices on the products of agricultural producers.

A more positive situation emerged in the grain processing sphere. Today (2015) in the republic the capacity of the mills is 8,423,600 t per year; nearly 3 times higher than the domestic demand for flour and therefore

most flour is exported. In 2015, more than 55% of grain produced in the Kazakhstan Republic was industrially processed for flour, the mills working at 45% of their capacity. The share of flour exported from the production volume amounted to 61% in 2015. There is potential in the country for the export of pasta. However, the infrastructure of the grain production requires attention: the technological level of the transport and the grain elevator infrastructure lag behind the increased capabilities of national grain production. The active procurement of the grain carriers, construction of the grain elevators, including the terminal type near the port and the international transport corridors are required.

The next factor adversely affecting the development of the food industry regarding a processing of agricultural raw materials and an increasing the competitiveness of production is the very low level of implementation of international quality and safety management standards, namely ISO 9001 and ISO 22000, and of the HACCP system in the food industry. As a result, quality of the products is not so consistent and of reliable quality as imported food. This is currently due to lack of modern technologies for processing, packaging and storage (there is a shortage of storage facilities for fruits, vegetables, refrigeration for meat, milk, and slaughter houses, etc.). Moreover, the agricultural raw materials supplying of the food industry also largely do not meet high standards of quality. Process management must be organized in a way to ensure compliance international standards. At the same time, the new technology for processing of the agricultural raw materials can significantly reduce the loss of product during its storage and processing and provide long-term maintaining their quality.

Production of high-quality agricultural products in accordance with the requirements of technical regulations and standards is one of the target indicators of the The program for the development of agro-industrial complex in the Republic of Kazakhstan for 2013–2020 years, adopted in 2013 [*The program... 2013*] and it is implemented currently. Within the mentioned program a package of measures provides to establish a system of quality control, scientific and personnel support agricultural industries, informational and marketing provision of the farmers.

It should be noted that at present, a major obstacle in the transition to an intensive economic model in the agricultural sector is low level of the government support. The experience of developed countries, in which the agribusiness system was controlled by the state for a long time, clearly confirms that in a market economy the viability of agricultural enterprises, the efficiency of agricultural production and the relative stability of social realms in rural areas significantly depends on government regulation.

The improvement of access for agricultural producers to credit is one of the important areas of state support in agriculture. The agricultural lending market in Kazakhstan is characterized by high transaction costs and low allocative efficiency of resources. The unstable financial situation of borrowers and lack of insurance of the bank sector leads to tighter credit conditions: high interest rates, a limit of the loan length and an overestimation of the requirements for collateral. This in turn reduces the demand for loans and limits a supply on credit resources.

Agriculture is not included in the main areas of funding the domestic banks, its share in total bank loans is very small – 2.4% in 2015. The agriculture banks set the highest interest rate – about 16%, when an average level is 14.5%. Moreover, the banks distribute loans mainly among medium and large agricultural producers, which accounted for 95% of loans. The share of small farms is only about 4–5%, while they produce almost half of the gross agricultural output [Bisenova 2011].

Thus, in the agricultural sector with its high level of operational risks and financial instability, the implementation of the credit system is more complex than in any other industry, and therefore often budgetary funds are used as credit. The problem of providing rural producers with long-term loans in order that they invest in fixed capital, the need for which is enormous, requires the implementation of major public-private long-term investment.

The main operator of the state micro-credit programs of the rural population is the joint-stock company (JSC) *Fund for Financial Support of Agriculture*, which is a subsidiary of JSC's National Holding KazAgro.

Since 2011, the Foundation carried out six lending programs, in particular: *Rural microcredit* is aimed at the micro agricultural producers and rural residents, *MCO* is intended to finance micro-credit organizations, *Sybag* is for the purchase of breeding stock and bulls for reproduction young meat breed cattle, *Eginzhay* is for lending during the spring, *Tabigiorta* is to support projects for the development of ecological tourism and the implementation of alternative energy sources, for development of forestry, fishing, hunting, and leasing of the complexes of a greenhouse.

The radical-liberal market reforms in the agricultural sector of Kazakhstan in the 1990s led to the degradation of the social sphere of the agricultural sector. As a result of the reorganization, there was a complete collapse of many components of rural infrastructure leading to about 700 villages abandoned just over the years 2000–2009. The standard of living of the rural population is lower than the urban population. About 12% of the rural population lives below the poverty line, while in urban areas this figure is 4.1%, it is more than three times less. Thus, the successful solution of social problems and improving the welfare of the people necessitates more attention to the problems of agricultural sector. Agribusiness as the main activity of the rural population and a preservation of rural areas as background of their habitat needs support.

## CONCLUSIONS

International food and agricultural markets have changed dramatically over the last several decades due to technological change, increased international trade, industry integration, consolidation and regulation, and issues such as increasing disposable incomes, food safety and environmental concerns. The agrifood system has evolved from producing and selling primarily homogeneous agricultural commodities to focusing more on value-adding, differentiation and coordination with other firms in the food chain. In order to remain competitive, some agribusiness firms are developing more of a marketing orientation, focusing increasingly on product development to meet heterogeneous consumer preferences and distinct market segments. The dynamic and increasingly global nature of food systems increases the need for sophisticated skills in market analysis, market planning and marketing management. This course approaches global food and agricultural marketing from a managerial perspective. The unique technical aspects of food and agricultural production, processing, distribution, wholesaling and markets are integrated with business marketing principles and strategy. Business marketing principles are then applied with strategic marketing extensions, and a focus on the final consumer of food products.

The sustainable balanced development of the national economy in the coming decade should achieve through accelerated diversification and increasing competitiveness. An important segment of diversification is the development of agriculture.

The development of national competitive advantages of domestic production needs to create high-commodity farms, industrial associations, to develop downstream products, to develop a modern product storage systems, to regulate a prices on socially important food products, to insure food quality on all parts of product promotion, as well as to create long-term inter-regional relations between the producing regions and the consuming regions.

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## PRZEMIANY NA RYNKU ROLNO-ŻYWNOŚCIOWYM W KAZACHSTANIE

### STRESZCZENIE

Praca koncentruje się na przemianach na rynku żywności oraz doświadczeniach Kazachstanu w rozwoju rolnictwa. Przedstawiono teoretyczne aspekty przemian na rynku przemysłu spożywczego, ze szczególnym uwzględnieniem rynku rolno-żywnościowego. Przedstawiono przykłady doświadczeń Kazachstanu w rozwoju sektora rolno-spożywczego. Wykorzystano dane z Krajowego Komitetu Statystyki. Analiza wykazała potrzebę dalszego rozwoju kolejnych ogniw w łańcuchu dostaw żywności w celu zwiększenia konkurencyjności na rynku globalnym. Kroki w tym kierunku zostały już podjęte przez politykę rolną Kazachstanu. Zaleca się jednak, aby rząd wspierał różne kwestie, w tym poprawę jakości produktów i tworzenie marek krajowych, rozwój infrastruktury, stworzenie warunków do poprawy wsparcia technicznego produkcji rolnej. Rolnictwo jako główna działalność ludności wiejskiej wymaga wsparcia. W tym celu należy wykorzystywać wskaźniki efektywności w odniesieniu do rynku rolno-żywnościowego.

**Słowa kluczowe:** przemiany na rynku, polityka rolna, efektywność, rynek rolno-żywnościowy

## SUSTAINABLE CONSUMPTION OF RURAL AND URBAN HOUSEHOLDS IN POLAND

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### ABSTRACT

Sustainable consumption is the consumption of goods and services satisfying fundamental needs, increasing life quality, reducing resource use, degradation and pollution along the whole lifecycle of product or service. The aim of the study is to examine whether the consumption of urban households is more sustainable compared to rural ones and to identify directions of changes in this regard. The analysis was realised on the basis of *Household Budget Survey* conducted by the Central Statistical Office of Poland (CSO) in the span of 2006–2015. The results show that urban and rural households in Poland shift their consumption patterns towards less sustainable as well as urban households' consumption pattern in some areas is less sustainable than urban ones.

**Key words:** sustainable development, sustainable consumption, rural and urban areas, households

### INTRODUCTION

Sustainable consumption may be defined in two ways. In a narrow sense, it is defined as effective and efficient consumption, i.e. the restriction of consumption of resources and waste, whereas in its broader definition it is also considered to contribute to a better life quality, including better health, and reduced consumption of natural resources [Jaros 2014].

Kielczewski [2007] defines sustainable consumption in two ways. Firstly, it is defined as a set of rational purchasing choices leading to the consumer's equilibrium and to sustainable development goals. The second definition pays attention to the fact that current consumer choices should not reduce choices of future generations. A factor that contributes to sustainable consumption is a growing awareness of consumers of the product itself and its origin, production methods or a manufacturer's social responsibility [Wasilik 2014].

Sustainable consumption may be considered as a response to consumptionism. According to the sustainable consumption idea, ecological behaviour and social aspects should limit the excessive consumption [Kramer 2011]. Sustainable consumption may be considered as a counterweight to the excessive consumption and it is manifested by avoiding or restricting those aspects that are disadvantageous or unhealthy for the environment and for consumers themselves [Olejniczuk-Merta 2015]. This is particularly significant in the event when consumers possess many more goods compared to their ancestors but, on the other hand, they feel a desire for increasing their consumption, in other words "modern societies are possessed by their continuous lust for purchasing goods" [Zalega 2015]. The purchased products are used not until they wear and tear but until their new versions are put into market, which gives rise to a sequence of unneeded (from the social point of view) purchases [Zalega 2015].

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Unsustainable consumption occurs when it is in a continuous state of non-satisfaction and when it forces consumers to satisfy their desires, lusts or whims rather than their real needs. While it is possible to make consumption more sustainable at the level of a person, it is doubtful whether such change may be made at the level of a society [Jaros 2012].

The United Nations Environment Programme (UNEP) defines sustainable consumption and production as “the consumption of goods and services satisfying fundamental needs, contributing to a better life quality and minimizing the consumption of natural resources and toxic substances and reducing emissions of waste and contaminations during a life cycle of a product or of a service in order not to jeopardize the possibility to satisfy the needs for next generations” [UNEP 2010].

The idea of sustainable consumption is a fundamental element of sustainable development, assuming that the quality of life is determined by the present development of civilization [Kramer 2011].

Sustainable consumption combines an array of social, economic and political practices leading to socially desirable goals, most notably [Kramer 2011]:

- reducing direct ecological consequences of production processes, use and utilization of goods and services;
- enabling all people to satisfy their fundamental consumption needs (food, water, healthcare, education and shelter);
- enhancing opportunities for sustainable development in the countries of the South (sustainable consumption is important not only for developing countries of Southern Hemisphere but for the whole Globe);
- developing the consumption of goods and services that positively affect health and life quality of people, most notably women and children;
- developing and employing devices and solutions designed for saving water and energy;
- developing public transport and eco-friendly transport;
- developing ecological goods and services adapted for the environmental protection requirements;
- promoting life styles with greater emphasis on the social cohesion, local traditions and non-material values.

Sustainable consumption is considered in many aspects: economic, ecological, social, psychological, demographic, spatial and time [Kielczewski 2008]. The contemporary consumers more and more often understand the impact of human – nature relationships on the quality of life. According to the principles of sustainable development, sustainable consumption is defined as the permanent consumption that enables the continuous reproduction of the consumed objects. Its contrary is the impermanent consumption that poses a risk of overloading the natural environment. Ecological trends in consumption manifest themselves in striving to minimize the use of natural resources and the production of waste and contamination within the entire life cycle of the product [Żelazna-Blicharz 2013].

The shift of consumption patterns by households towards more sustainable ones may be caused by various factors:

- consumers’ tiredness;
- negative experience;
- consumers’ awareness;
- consumers’ activation.

While the first two factors are manifested by individual values and preferences (consumers are tired of a surfeit of products in the market and they intentionally resign from certain products adversely affecting consumers), the last factors stem from social values (consumers are activated – they resign from purchasing and consuming goods contrary to the views of a certain group of people, consumers’ awareness – they resign from or limit the consumption of goods that adversely affect the environment and are contrary to the principles of social responsibility). Kryk states that it is impossible to talk about the superiority of one issue over others, only if they lead to the purpose of reaching more sustainable consumption [Kryk 2013].

It is also important to stress that the idea of sustainable development, including its component (sustainable consumption), is regarded in Poland marginally and public awareness is low [Cudowska-Sojko 2012]. The barrier in adopting more sustainable consumption in Poland is also consumers' fear of being perceived poor, weirdo and eco-fanatic [Burgiel and Zralek 2015]. Patterns of responsible and ecological consumption are still not popular with the society. The real introduction of sustainable consumption requires the state to take supportive actions, chiefly in the form of economic incentives [Kryk 2011]. It is also worth indicating that consumption patterns are also a consequence of the patterns of conduct, tradition and habits developed in their minds, i.e. institutions [Wilkin 2016].

The objective of this study is to analyse on the basis of the Central Statistical Office of Poland's *Household Budget Survey*, whether urban and rural households shift their consumption patterns towards a more sustainable direction. A hypothesis has been formulated that rural households are characterized by less sustainable consumption compared to urban households and current consumption patterns of rural and urban households becomes less and less sustainable. This demonstrates that in the awareness of rural and urban consumers the idea of consumptionism triumphs over their striving for sustainable consumption.

## MATERIAL AND METHODS

As previously noted, sustainable consumption is one of the elements of sustainable development. The guidelines of the European Union specify 10 thematic areas of indicators of sustainable development, most notably sustainable production and consumption [GUS 2015]. Sustainable consumption is measured by means of an array of indicators.

The Central Statistical Office of Poland's (CSO) *Sustainable Development Indicators for Poland* study specifies the following indicators of sustainable development measuring consumption patterns [GUS 2015]:

- the structure of passenger cars by age groups;
- the consumption of electricity in households per one resident;
- the structure of average monthly expenditures on one person in households by their kinds.

The structure of passenger cars by age groups is essential for sustainable development as passenger cars are, on the one hand, a source of pollution, noise and waste but, on the other hand, they consume great amounts of energy. The age of cars affects their technical conditions, their potential to cause accidents and the amount of pollution.

The consumption of electricity in households per one resident is a result of changing the lifestyle and moving households away from more sustainable consumption patterns.

The structure of households' consumption expenditures illustrates their life quality. At the same time, the diversified structure of consumption expenditures is associated with welfare. The resignation of low-income households from meeting their needs of a higher level and sometimes from their basic necessities of life is a symptom of marginalization of part of the society [GUS 2015]. As for sustainable consumption it is beneficial to increase the share of expenditures on the least environmentally damaging purposes, such as: leisure, culture and communication [Jaros 2014]. Analysing the structure of food consumption, it should be noted that the structure of food consumption may be shifted towards more sustainable consumption provided that the consumption of meat is reduced and the consumption of fruit, vegetables, legume, starch products and fish is increased [Rejman et al. 2015].

It is also noteworthy that the previous publication of the entitled *Sustainable Development Indicators for Poland* [GUS 2011] comprised a different set of indicators necessary to monitor sustainable consumption patterns:

- the number of passenger cars per 1,000 people;
- the consumption of electricity in households per one resident;
- the consumption of vegetables per one person in household.

By comparing both sets of indicators used to monitor sustainable consumption patterns, it may be noticed that the set of indicators recommended in 2015 is more detailed. Not the number of cars but their age was taken into account. As for households' consumption expenditures, not only the consumption of vegetables but also the share of other expenditures on consumption goods and services was considered. The set of indicators from 2015 focus on the age of cars because older cars produce more pollutions than newer ones.

In the Local Data Bank of the Central Statistical Office of Poland the indicators of sustainable development included in the "consumption patterns" group comprise the following indicators:

- the annual consumption of utilities in households per one resident;
- the number of passenger cars per 1000 people;
- the average consumption of meat per one person;
- the average consumption of vegetables per one person.

The set of indicators included in the Local Data Bank contains indicators akin to those published in the *Sustainable Development Indicators for Poland* [GUS 2011]. In lieu of the consumption of electricity, that report analyses the consumption of utilities in households, including gas and water. The consumption of meat (its reduced consumption is desirable) was also taken into account because substituting meat by vegetables is the sign of more sustainable consumption pattern.

The report on the performance of the Sustainable Development Strategy in the European Union distinguished two indicators required to analyse the sustainable patterns [European Commission 2015]:

- the consumption of energy by households;
- the final consumption of energy.

On the other hand, the Eurostat analyses the sustainable consumption patterns by using the following indicators:

- the consumption of energy by households;
- the final consumption of energy by industries;
- the number of passenger cars per 1,000 people.

By summarizing the review of the applied sustainable consumption indicators, it may be noticed that the sustainable consumption indicators are still being modified and are non-homogeneous and the argument formulated by Jaros that "in Poland it would be useful to uniform the indicators of sustainable consumption and production" [Jaros 2014] is still present.

Making the use of the data available for rural and urban households and stemming from the *Household Budget Survey* [GUS 2011, 2015] – a set of indicators that enable assessing whether the consumption of rural and urban households becomes more sustainable has been recommended by the author. Those indicators are as follows:

- providing households with passenger cars – a greater number of passenger cars signifies less sustainable consumption;
- providing households with bicycles (excluding children's) as more bicycles possessed and used by households is a display of more sustainable consumption;
- the structure of consumption expenditures of households (an increase in the share of expenditures on less environmentally damaging purposes, mainly services is desirable):
  - the share of expenditures on recreation and culture;
  - the share of expenditures on communication;
- the monthly consumption of certain foodstuffs per one person:
  - the average monthly consumption of meat per one person (in kilograms) (it is desirable to reduce this indicator);
  - the average monthly consumption of vegetables (without potatoes) (in kilograms) per one person (it is desirable to increase this indicator);

- the average monthly consumption of mineral and spring water (in litres) per one person (the declined consumption of spring water is a display of more sustainable consumption, whereas this interpretation for mineral water is not so explicit but – according to *Household Budget Survey* – it is impossible to separate those categories);
- the average monthly consumption of sugar, honey, jam, chocolate and confectionary (in kilograms) per one person (the reduced consumption of sugar and other confectionary is a symptom of shifting the consumption structure towards more sustainable one).

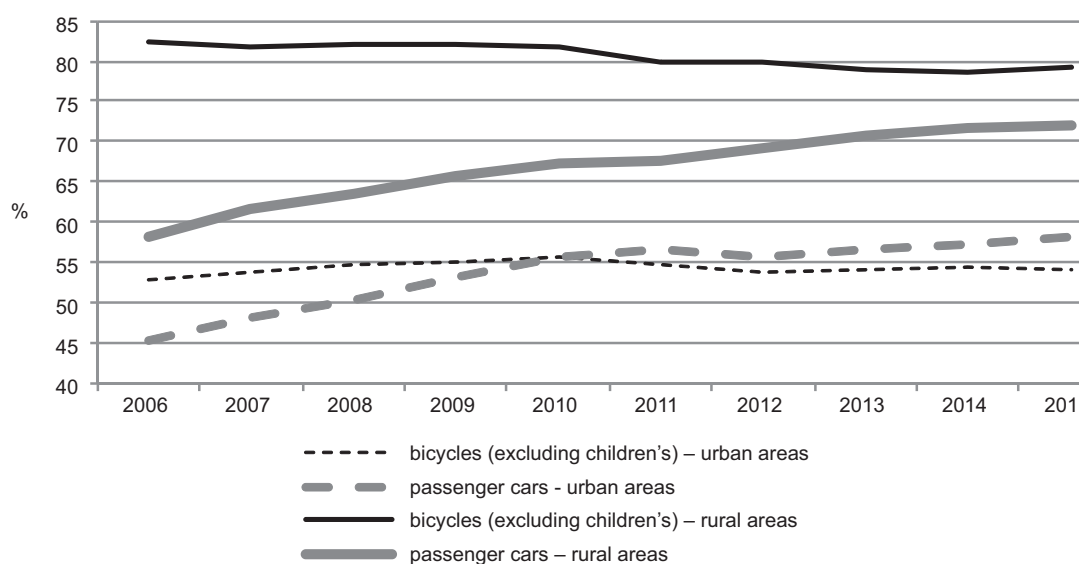
The Central Statistical Office of Poland’s data stemming from the *Household Budget Survey* refer to the years 2006–2015 as this study does not divide households grouped according to their place of residence for earlier periods.

The indicator that determines the approach of households to more sustainable consumption patterns per rural and urban households is also included in the sustainable development indicators tab on the Central Statistical Office of Poland’s website in the regional module. This is the consumption of electricity per one resident – it is desirable to reduce this indicator.

## RESULTS AND DISCUSSION

Rural and urban households differ from each other in terms of their incomes [Utzig 2014] and the performed consumption patterns [Utzig 2016]. As for the means of transport in households (Fig. 1), both cities and villages witness an increase in the percentage of households having passenger cars (by 12.9% in urban areas and by 13.9% in rural areas).

On the one hand, it may be considered as a symptom of shifting consumption to less sustainable one but on the other hand it is taken as an indication of striving for the better life quality. In the analysed period the percentage of households with passenger cars was greater in rural areas compared to urban areas. However, those differences should not be interpreted only through the prism of sustainable consumption as rural households are less able to use public transport, hence the possession of passengers cars becomes a necessity for them.

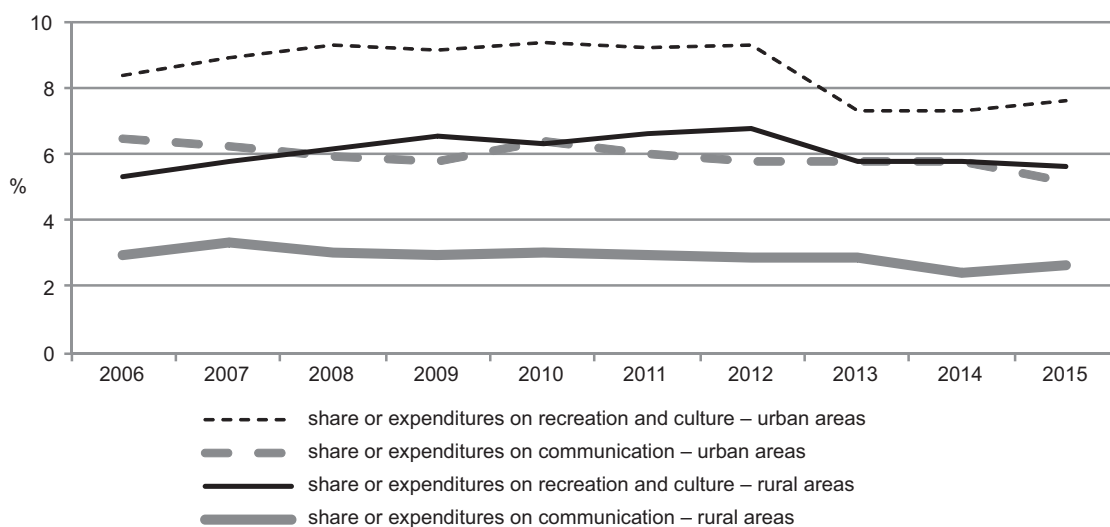


**Fig. 1.** Percentage of households with means of transport in 2006–2015

Source: Own work on the basis of the *Household Budget Survey* for the years 2006–2015.

The percentage of rural households with bicycles (excluding children's) equalled to around 82% in the years 2006–2010, around 80% in the years 2011–2012, and around 79% in the years 2013–2015. Whereas, in the analysed period the percentage of urban households with bicycles (excluding children's) slightly increased by 1.1 per cent and reached its maximum level in 2010 (55.8%). The percentage of rural households with bicycles is higher compared to urban ones, which may also be imposed by the necessity to meet transport needs.

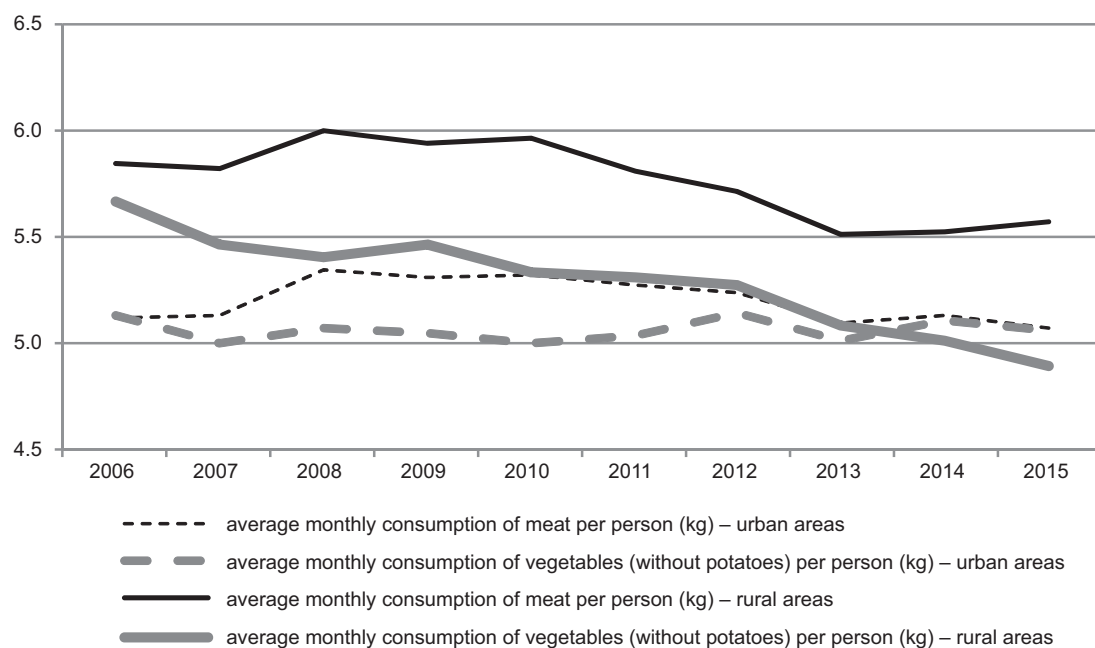
The share of expenditures on recreation, culture and communication in the years 2006–2015 in rural households was lower than in urban ones (Fig. 2). Before 2013 expenditures on Internet services were categorized as recreation and culture and since 2013 they have been included in the category of communication. In urban and rural households the share of expenditures on recreation and culture was slightly increasing until 2012 and subsequent years witnessed its decline. Changes in the share of expenditures on communication in total consumption expenditures are marginal. In the analysed period the share of expenditures on communication in rural households slightly declined by 0.3% and in urban households – by 1.2%. The total shares of both categories of expenditures in urban households dropped from around 15% to almost 13% and in rural households they grew from 8.3 to 9.7% in 2012 and then declined to 8.2%.



**Fig. 2.** Share of selected expenditures in total expenditures on consumption goods and services in households in 2006–2015  
Source: Own work on the basis of the *Household Budget Survey* for the years 2006–2015.

Rural and urban households vary from each other in terms of food consumption patterns. Rural households' consumption of most foodstuffs, except for fish and fruit, may be justified by the nature of rural work requiring high energy expenditures and providing easy access to own farm products or feeding animals with some food-stuffs which in the *Household Budget Survey* may be indicated as consumed by household members [Świstak and Laskowski 2016].

Shifting the consumption towards its more sustainable pattern is reflected by an increase in the consumption of vegetables to the detriment of a decrease in the consumption of meat. According to the data shown in Figure 3, it may be stated that rural households' consumption is sustainable to a less extent than urban ones' (greater consumption of meat and lesser consumption of vegetables per person in rural households). While urban households observed minor changes in the consumption in the years 2006–2015, rural households reduced the consumption of vegetables (excluding potatoes) per person by almost 0.8 kg monthly.



**Fig. 3.** Average monthly consumption of selected foodstuffs per person in the household in 2006–2015

Source: Own work on the basis of the *Household Budget Survey* for the years 2006–2015.

The observed monthly decline in the consumption of meat by households may result from post-recession factors such as high meat prices, low meat quality, fears of eating infected meat or genetically modified meat. One of the last factors considered by consumers is insufficient information on the origin of meat [Kosicka-Gębska and Gębski 2013].

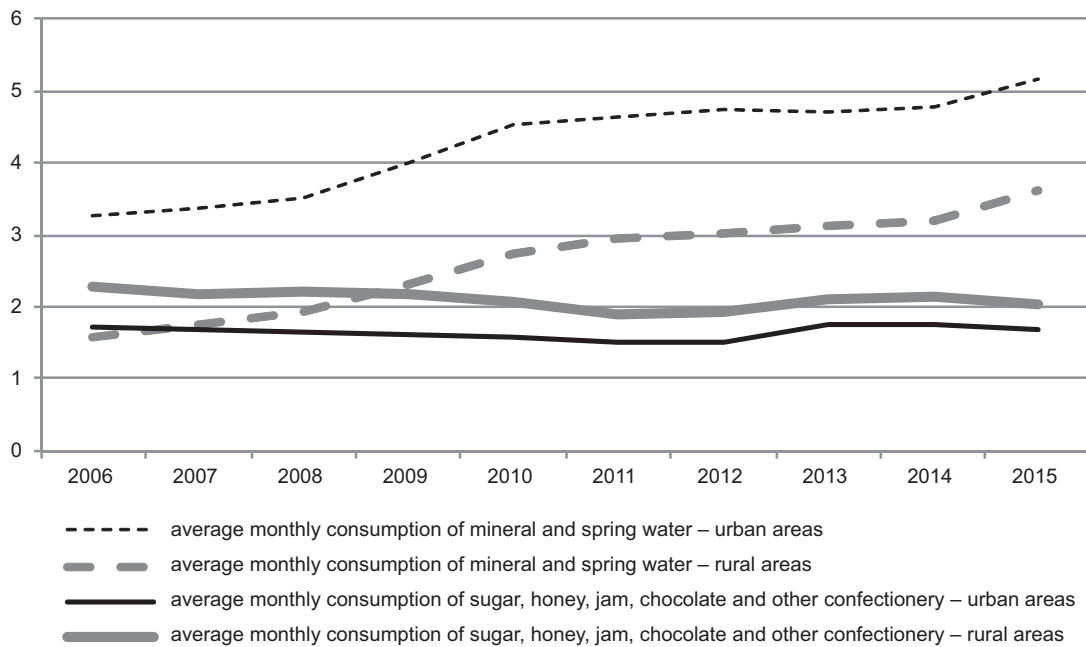
Empirical research proves that despite being aware of sustainable consumption and of adverse impact of food production, processing and consumption on the environment, when purchasing foodstuffs the determinant factors for consumers were taste, quality, nutritional benefits and food safety. In particular, consumers are not willing to consume fewer meat products in favour of plant products or to purchase less bottled water [Kaczorowska and Kowrygo 2016].

The striving for more sustainable consumption should, on the one hand, be manifested by a decrease in the use of bottled water but, on the other hand, by a reduction in the consumption of confectionery. The average monthly consumption of spring and mineral water per person (in litres) and of sugar, honey, chocolate and other confectionery (in kilograms) is shown in Figure 4.

Both rural and urban households increased the average consumption of mineral and spring water and decreased the consumption of sugar, honey, jam, chocolate and other confectionery. Therefore, no implicit conclusion on approaching to or receding from the sustainable consumption pattern by households is drawn. It is also noteworthy that rural households consume less bottled water but use more sugar, honey, jam, chocolate and other confectionery compared to urban households.

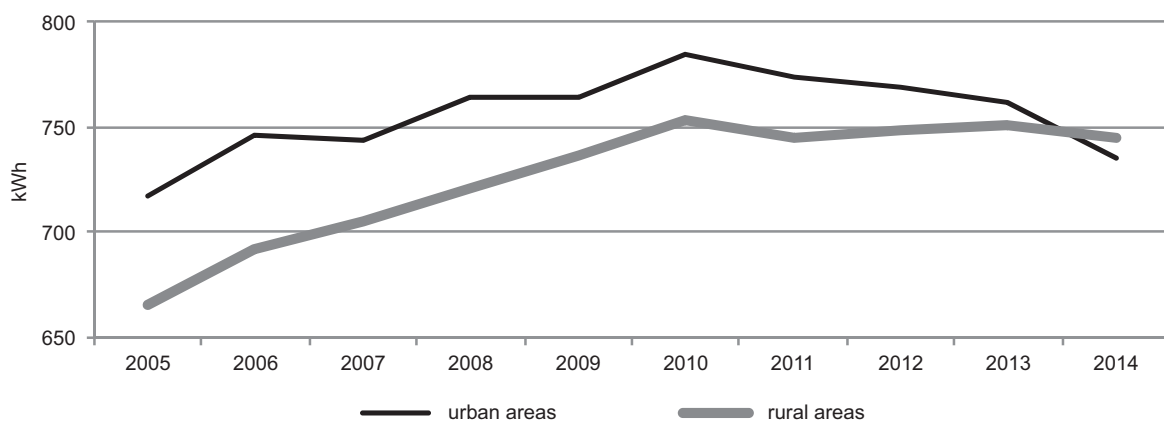
The trend in the value of electricity consumption per one resident per rural and urban areas in the years 2005–2014 is shown in Figure 5.

The consumption of electricity by households spans the entire use of electricity to heat up premises and water and to power all electrical equipment. In general, it is observed that per resident energy consumption increased to 2010. The decrease in the consumption of energy that began in 2011 may be interpreted as a positive phenomenon bringing households closer to more sustainable consumption patterns.



**Fig. 4.** Average monthly consumption of selected foodstuffs per person in the household in 2006–2015

Source: Own work on the basis of the *Household Budget Survey* for the years 2006–2015.



**Fig. 5.** Annual consumption of energy per one resident in 2005–2014

Source: Indicators of sustainable development of the Central Statistical Office, retrieved from [http://wskaznikizrp.stat.gov.pl/prezentacja.jsf?symbol\\_wsk=005003002515&poziom=lokal&jezyk=pl](http://wskaznikizrp.stat.gov.pl/prezentacja.jsf?symbol_wsk=005003002515&poziom=lokal&jezyk=pl) [accessed: 22.09.2016].

From the beginning of the analysed period to 2013 the consumption of energy per one resident in urban households exceeded the analogous consumption in rural households. In 2014 rural households consumed more electricity per person compared to urban households.

## CONCLUSIONS

To verify the hypothesis whereby rural households are characterized by less sustainable consumption compared to urban ones and both groups of households shift their consumption towards less sustainable consumption, individual indicators used to evaluate the level of sustainable consumption have been compared and analysed. The results are as follows:

- some manifestations of shifting the consumption of households towards less sustainable are indicated:
  - the percentage of households with passenger cars increased in both types of household;
  - the average monthly consumption of mineral and spring water per person increased in both types of household;
- some manifestations of the fact that consumption pattern in rural households is less sustainable than in urban household are also indicated:
  - the percentage of households with passenger cars is higher in rural households than in urban ones;
  - the average consumption of meat is higher in rural households than in urban households;
  - the average consumption of sugar, honey, jam, chocolate and other confectionery is higher in rural households than in urban ones;
- but some manifestation of the fact that consumption pattern in rural households is more sustainable than in urban ones are also indicated:
  - the percentage of households with bicycles is higher in rural households than in urban ones;
  - the average consumption of mineral and spring water is lower in rural households than in urban ones.

It is difficult to give an unambiguous answer to the question whether the consumption of rural households is more sustainable compared to urban ones. Certainly, there are areas where such consumption occurs but it is difficult to determine how much it is determined by tradition, habits and external conditions.

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## **ZRÓWNOWAŻONA KONSUMPCJA WIEJSKICH I MIEJSKICH GOSPODARSTW DOMOWYCH W POLSCE**

### **STRESZCZENIE**

Zrównoważona konsumpcja oznacza wykorzystywanie usług i towarów zaspokajających podstawowe potrzeby, które prowadzi do osiągnięcia lepszej jakości życia, przy jednoczesnym ograniczaniu zużycia zasobów naturalnych, zniszczeń i zanieczyszczeń podczas cyklu życia produktu lub usługi. Celem opracowania jest zbadanie, czy konsumpcja miejskich gospodarstw domowych jest bardziej zrównoważona niż wiejskich, oraz zidentyfikowanie kierunków zmian w tym zakresie. Analiza została przeprowadzona na podstawie danych pochodzących z badania GUS *Budżety gospodarstw domowych za lata 2006–2015*. Wyniki pokazują, że wiejskie i miejskie gospodarstwa domowe w Polsce przesuwają swoje wzorce konsumpcji w kierunku mniej zrównoważonego, jak również, że wzorce konsumpcji wiejskich gospodarstw domowych są w pewnych obszarach mniej zrównoważone niż miejskich.

**Słowa kluczowe:** rozwój zrównoważony, zrównoważona konsumpcja, obszary wiejskie i miejskie, gospodarstwa domowe

## LINEAR-DYNAMIC PROGRAMMING AS A BASIS FOR SETTING THE DIRECTIONS OF DEVELOPMENT FOR FIELD FARMS AGAINST CHANGES IN THE COMMON AGRICULTURAL POLICY IN MEDIUM-TERM PERSPECTIVE

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### ABSTRACT

The purpose of the article is an attempt to determine, in the 2019 perspective, the economic situation of farms specialising in cereals, oilseeds and protein crops, with the economic size of 4–25 (very small), 25–50 (medium-small), 50–100 (medium-large) and 100 thousand EUR and more (large), operating on lower soils with the soil classification index (SCI) of up to 0.7, with an emphasis on changes in the Common Agricultural Policy (CAP) 2014–2020 as compared with the CAP 2007–2013. This was made using a model-based method (linear-dynamic programming method). These models adopted the maximisation of agricultural farm income as a criterion for optimisation. It was determined that the growth in income of these farms will be limited in case unfavourable pricing conditions on the market of biotechnological products and production measures last until 2019. This will mean that, in 2019, very small cereal farms will have no funds to pay the cost of farmer and his family's labour at the parity level and the cost of development, while medium-small cereal farms will have no funds for development. Only medium-large and large cereal farms will retain the possibility to pay the cost of farmer and his family's labour at the parity level and the cost of further development.

**Key words:** field farms, farm models, linear-dynamic programming, Common Agricultural Policy

### INTRODUCTION

Along with introducing the principles of market economy after 1989, and especially after Poland's integration with the European Union (UE), the processes of specialisation and production concentration in agriculture intensified. The share of farms specialising in specified directions of production and the area of farms increased. This was caused by “differentiating” forces working throughout the last several decades on the market and inducing farms to specialise and concentrate their production<sup>1</sup>. An example is a significant share of farms

<sup>1</sup> According to T. Brinkmann, agriculture is influenced by two types of forces: “differentiating” and “integrating”. Differentiating forces exist in the environment of farms, mainly on the market, and induce to specialise and concentrate production, while “integrating” forces are working within farms and encourages multilateral production, emphasising a more complete use of production factors as a result of using internal relations and dependencies [Brinkmann 1935].

specialising in field cultivations<sup>2</sup>. In 2010 and 2013 the share of these farms in the overall number of farms amounted in Poland to 52% and 53%, respectively. These farms in Poland used adequately 31.4% and 45.5% of agricultural area. Type of farms specialised in field cultivations comprises two subtypes: farms specialising in cultivation of cereals, oilseeds and protein crops (type A), hereinafter referred to as cereal farms, and farms specialising in cultivation of various plants [type B]<sup>3</sup>. Poland is dominated by type A, the share of which in the number of plant farms amounted in 2013 to 93.5%, while type B farms comprised the remaining 6.5% [GUS 2015].

Taking into account an increasingly important role cereal farms play in the Polish agriculture, it is interesting how these farms will cope in worse natural conditions in the 2019 perspective. This is an important issue since the average soil classification ratio in Poland is 0.8 [GUS 2012]. Nearly 44% of agricultural area is located in agricultural farms situated on weak or very weak soils. In such an unfavourable situation, farmers who want to gain satisfactory income from agricultural production in a long-term perspective should represent, above all, high production culture compliant with requirements of the natural environment. But is this even possible when production means for agriculture become more expensive and changes in prices on the market of agricultural products are unexpected and often unfavourable? In this situation the next question arises – whether and how one can compensate the negative effects of further deterioration of price conditions in cereal farms taking into account changes in the CAP 2014–2020 as compared with the CAP 2007–2013.

The purpose of the study is thus an attempt to determine, in the 2019 perspective, the economic situation of cereal farms with the economic size of 4–25 (very small), 25–50 (medium-small), 50–100 (medium-large) and 100 thousand EUR and more of standard output (SO) (large) located on weaker soils with the soil classification index (SCI) of up to 0,7 and covered by the Polish FADN system in 2014<sup>4</sup>. This was made using a model-based method (linear-dynamic programming method<sup>5</sup>). These models adopted the maximisation of agricultural farm income as a criterion for optimisation.

## MATERIAL AND METHODS

Linear programming (LP) is a field of mathematical programming, in which the dependence between expenditures and effects, as well as limiting conditions and objective function are linear. It is used to solve decision-making problems, abiding principles of rational management assuming obtaining a maximum of effects with given resources and expenses, or minimisation of outlays at the assumed result [Lange 1964, Weinschenck 1967, Rychlik 1974, Urban 1978, Ziętara 1981, Mańko 1987].

Methodical bases of the linear programming were developed by L. Kantorowicz before World War II. They were published in 1939, in a book entitled *Mathematical methods of organising and planning of production*. Polish edition was published in 1960 [Kantorowicz 1960]. It found its practical application in the period of World War II in arranging marine convoys with military equipment across the Northern Atlantic from the USA to the Soviet Union. These convoys were attacked by German submarines. The point was to determine optimum

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<sup>2</sup> According to the typology of farms in accordance with the FADN methodology.

<sup>3</sup> These types of farms are marked with different symbols in the FADN typology. In order to simplify the analysis “A” and “B” names were adopted.

<sup>4</sup> The Polish FADN distinguishes six economic sizes of agricultural farms. In this article, however, the number of analysed groups was reduced by combining groups of farms with the least (up to 8 thousand EUR of SO and 8–25 thousand EUR of SO) and the greatest economic volume (100–500 thousand EUR of SO and more than 500 thousand EUR of SO). A premise for this approach was a small size of the group with the economic size of up to 8 thousand EUR of SO and a size of the group with more than 500 thousand EUR of SO in the Polish FADN database, not sufficient for the analysis.

<sup>5</sup> A five-year integrated linear-dynamic model was used.

proportions between freight and battle ships, with the objective function of minimising losses. After the war, linear programming was adopted in business activities, for the first time in the USA [Marszałkiewicz 1986] and then in Europe, including Poland, to develop various kinds of plans in companies of economic sectors. In practice, there are different kinds of plans, depending on the adopted criteria of division, such as: time, nature, attitude to time horizon, subjective, material and areas [Manteuffel 1967, Ackoff 1973].

A basic criterion adopted in most cases is a time criterion, according to which the following plans are distinguished: daily (daily instruction), weekly, monthly, quarterly, campaign, annual, mid-term and long-term. Plans, from daily to annual inclusively, are often defined as short-term plans. Their subject is planning and implementation of work processes and production processes, acquisition and turnover of production, incurring outlays and implementation of tasks resulting from long-term plans. In industrial companies, apart from the annual plan, the greatest role is played by monthly and quarterly plans. On the other hand, in agricultural companies daily, weekly and campaign plans are of much importance. A mid-term planning horizon comprises the period of 2–5 years [Ziętara 1989].

Another criterion is the nature of plans. Tactical, operational and strategic plans are distinguished according to this criterion. It is connected with the previous one, differences relate to the content of plans. An annual plan is an operational plan.

An important criterion is also attitude to time. According to this criterion, there are static plans (one permanent planning period) and dynamic (rolling) plans including more planning periods (years).

A static approach was used, first of all, when preparing preliminary designs of economic instruments, which were mid-term plans insofar as their nature is concerned. On the other hand, a dynamic approach was used when developing annual plans. The linear-dynamic programming method was used for developing this kind of plans.

Other types of plans, distinguished according to the material, subjective and area criterion play no significant role from the point of view of the applied planning methods.

Linear programming, regardless of variable practical application, is used in scientific research, in particular with regard to testing anticipated results of specified solutions in the regulatory sphere. In a centrally planned economy, such as Poland until 1989, attempts were made at the turn of 1960/1970 to determine the optimum structure of sowings on the national scale using the linear programming [Leopold and Wdowiak 1968]. These results had cognitive values. In the Federal Republic of Germany linear programming is used in science in a broader perspective. In the 1970s a linear model was developed for the entire agriculture, which was used to study potential consequences of planned solutions in the regulatory sphere, e.g. reactions of farms of different scale to the planned support for agriculture in the form of preferential credits. The results obtained constituted the bases for making decisions under the agrarian policy [Bauersachs and Henrichsmeyer 1979]. Currently, this method is also used to define the effects of planned projects, both in the macro and micro scale. An example may be a publication entitled *Hydrothermal carbonisation profitability taking into account costs of transport* [Eberhardt and Odenig 2011]. The authors, using linear programming (GAMS model) described the profitability of carbonisation of straw, wood and energy willow for three carbonisation plants of various sizes and various costs of transport of raw materials and finished products to the power plant (depending on the distance). They demonstrated that this type of investments would be unprofitable without state's aid in the form of higher prices for CO<sub>2</sub> certificates. Another most current example is an article by E. Berg in which he presented relations with the natural condition in the context of mathematical programming [Berg 2012]. In the optimization model of agricultural farm he considered the risk related to changes in the condition of natural environment expressed by the level of precipitation, and ways to limit it by introducing sprinkling machines. He compared the proposed approach with a traditional one. A special attention should be paid to the proposed methodical approach.

In the Polish literature the linear programming method was used to the broadest extent in scientific research by E. Majewski and his team [Majewski et al. 1999, 2005, 2009].

Five-year integrated linear-dynamic models were used in this analysis<sup>6</sup>. The basis for construction of models were cereal farms located on weaker soils with the classification index of up to 0.7, covered by the Polish FADN system in 2014. For this year farm models were developed based upon actual data (resources, production structure, costs, revenues and performance) in order to verify their functioning. A very high degree of conformity (difference in farm income was lower than 8%). The next step was to optimise the production structure at prices and costs recorded in 2014 in conditions of the CAP 2007–2013. Performance of farms in 2014 was a basic solution for determining development directions of cereal farms in the period 2015–2019.

In the studied period, account was taken of changing prices of production means purchased by farmers and selling prices of agricultural products according to long-term trends (1995–2015). Changes in soil resources by means of lease and purchase were also accepted. It was assumed that purchase of land is possible in the case the farm has its own and external funds for development. Own funds constitute a surplus of agricultural farm income over the costs of own labour determined according to net labour rates in the national economy. In turn, external measures are short and long-term credits. Simultaneously, a limitation was introduced in the form of the need to maintain non-negative organic matter balance in the soil. Coefficients of soil reproduction and degradation of organic matter were adopted in a study entitled *Crop rotation in ecological agriculture* [Jończyk 2005]. A ratio of main harvest to harvest of plants straw collected by combine harvester was adopted in accordance with a suggestion of Harasim [2006]. On the other hand, the maximum share in the structure of sowings of particular plant species was established on the basis of methodology proposed by Kuś [1995]. The possibility of selling surpluses of straw was also accepted by Ziętara and Zieliński [2012]<sup>7</sup>.

The analysis took into account changes in the CAP 2014–2020 in relation to the CAP 2007–2013. In the period 2015–2019 direct payments covered a uniform area payment, payment under agricultural practices favourable for the climate and the environment (a so-called greening payment) and an additional payment. One also included a payment for less favoured areas management (LFA payment). In this case, pursuant to determinations of the Ministry of Agriculture and Rural Development (MRiRW), it was assumed that this payment will subject to new degressivity thresholds at the level of farm [MRiRW 2015].

## RESULTS

The analysis demonstrated changes in the amount of resources of land used agriculturally in cereal farms in the target year (2019) as compared with the starting year (2014) and their scope depended on the economic size of farms.

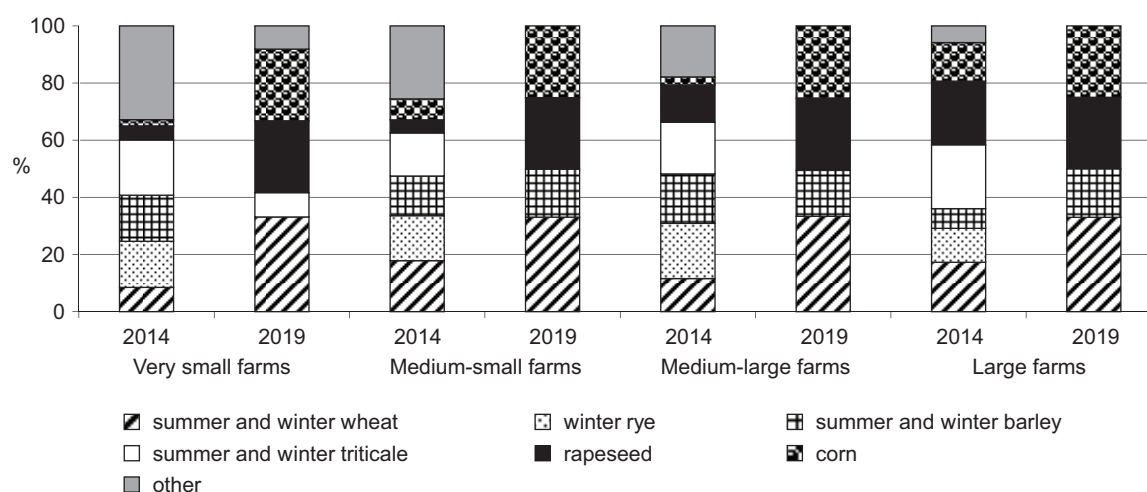
In the studied period the condition of resources of land used agriculturally in very small cereal farms will increase by way of lease and purchase from 22.3 to 25.8 ha, i.e. by 15.7%. Within the structure of plant production

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<sup>6</sup> The authors were, however, aware of its constraints, emphasising in a methodical chapter the meaning and possibilities for the use of linear-dynamic modeling. Therefore, in order to reduce their impact on the results of the analysis a relatively short projection period was used, while decision variables and limiting conditions contained in the matrix were determined based on the most recent, reliable data of the Central Statistical Office of Poland, Institute of Soil Science and Plant Cultivation – National Research Institution in Puławy and the Institute of Agricultural and Food Economics – National Research Institution. Moreover, developed models were each time subjected to the expert analysis based on a probable direction of changes in the agriculture sector in 2019.

<sup>7</sup> When preparing this analysis, the authors were trying to take advantage of the theory of economics, in particular the theory of environmental economics. It is because environmental economics addresses two main issues covering borderline areas related to economics and protection of natural environment. The first of them focuses on use and protection of natural resources. The second issue is associated with discussions of the methods of correcting human activities adversely affecting the environment, commonly referred to as external effects.

the share of winter wheat from 5.4 to 33.0%, winter rapeseed from 4.9 to 25.0%, and lupine and corn for grains, accordingly from 4.5 to 8.1% and from 2.2 to 25.0%. In turn, the share of winter triticale cultivation will decrease from 16.6 to 8.9% (Fig. 1)<sup>8</sup>. Labour resources determined on the basis of Polish FADN system for 2014 will amount in 2019 to 1.3 FWU<sup>9</sup>. In the period 2014–2019 in very small cereal farms, in spite of an increase in the area of arable lands and changes in the structure of plant production, agricultural income will remain almost unchanged (Table). This income will amount in 2019 to 18,286,6 PLN and is by 0.1% higher than in 2014 (18,262.7 PLN). An important cause of this situation will be unfavourable pricing conditions on the market of agricultural products and production measures lasting until 2019. In the examined period, the value of production will increase by 50.9%, whereas direct costs will be by 108.7% larger. Indirect costs will increase by 15.7%, and direct subsidies by 13.2%. Therefore, income of these farms in the target year will not be sufficient to pay the



**Fig. 1.** The structure of plant production in cereal farms depending on the economic size in 2014 and 2019

Source: own study on the basis of Polish FADN system and linear-dynamic programming.

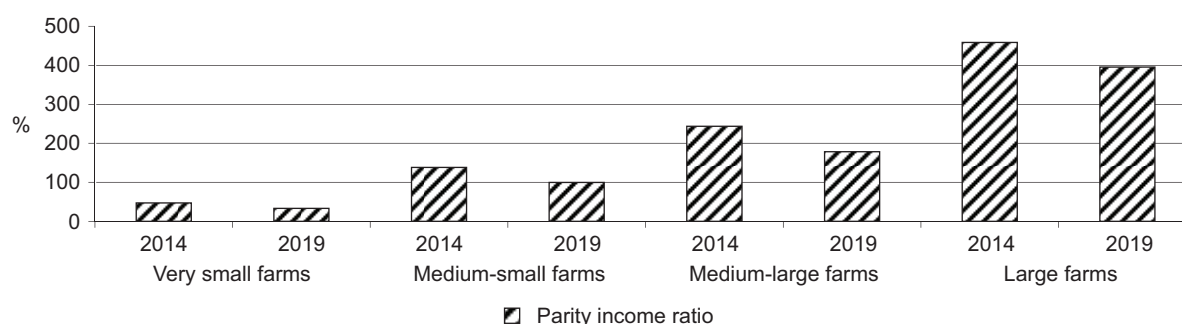
**Table 1.** Agricultural farm income from cereal farms depending on the economic size in 2014 and 2019

Specification	Type of farm							
	very small		medium-small		medium-large		large	
	2014	2019	2014	2019	2014	2019	2014	2019
Agricultural farm income (PLN)	18 262.7	18 286.6	62 811.5	64 112.3	132 928.3	137 487.6	277 854.1	338 440.3

Source: Own study on the basis of Polish FADN system and linear-dynamic programming.

<sup>8</sup> Agricultural farms holding accounts for the Polish FADN and located on weak soils within the structure of plant production have species of arable crops with higher soil requirements (spring and winter wheat and winter rapeseed). In these farms an important cause of this situation is high production culture, consistent with requirements of the natural environment. Straw ploughing, use of green fertilisers and natural fertilizers coming from the purchase provide for an increase in soil fertility.

<sup>9</sup> Family work unit (1 FWU = 2,120 h of work during the year) [Polish FADN 2014].



**Fig. 2.** Relation of agricultural farm income per one family work unit (FWU) to average salary in the national economy in the analysed cereal farms depending on the economic size in 2014 and 2019

Source: Own study on the basis of the Polish FADN and linear-dynamic programming.

costs of farmer and his family's labour at the parity level<sup>10</sup> and<sup>11</sup> (Fig. 2). Thus, these farms will not have funds for development as well, which will result in depreciation of their assets.

In the studied period the resources of land used agriculturally in medium-small cereal farms will increase from 50.4 to 64.1 ha, i.e. by 27.2%. In turn, plant production will be optimised by an increase in the share of wheat from 13.1 to 33.0%, winter barley from 1.0 to 8.9%, winter rapeseed from 4.6 to 25.0% and corn from 7.3 to 25.0% and by decrease in the share of spring barley from 12.9 to 8.1% (Fig. 1). Own labour inputs of farmer and his family will amount in 2019 to 1.5 FWU.

In 2019 agricultural income in medium-small cereal farm will amount to 64,112.3 PLN and will be 2.1% larger than in 2014 (Table). The value of production, direct and indirect costs will also increase, accordingly by 68.8, 123.5 and 27.2%. In turn, the value of granted direct subsidies will drop by 3.0%. In this farm an important cause of decrease in the value of granted direct subsidies will be their EUR/PLN exchange rate adopted in 2019<sup>12</sup>, lower than in 2014, and the system of new degressivity thresholds of LFA payments determined in the CAP 2014–2020 unfavourable for farms larger in terms of area as compared with the CAP 2007–2013. Despite the above, considering the fact that unfavourable pricing conditions will last until 2019, income of this farm does not endanger the consumption of farmer and his family at the parity level, but will be insufficient for further increase in the value of fixed assets (Fig. 2).

In 2014 agricultural activities in medium-large cereal farms were carried out on 91.3 ha of arable land (AL), on the other hand, in 2019 it will be carried out on 131.9 ha of AL. Within the structure of plant production the share of wheat, rapeseed and corn will increase to the level of environmental constraints proposed by Kuś [1995] – Figure 1. In turn, own labour inputs of farmer and his family will amount in 2019 to 1.8 FWU. In 2019 income

<sup>10</sup>It was determined on the basis of parity revenue ratio, being a relation of agricultural farm income per one family work unit (FWU) to average salary in the national economy. The average salary in the national economy in 2019 was determined in the analysis on the basis of trends of changes in remuneration from the years 1995–2015. The rate of parity payment in 2019 was adopted at the level of 20.19 PLN per 1 h of work.

<sup>11</sup>In the analyses the category of agricultural income per 1 FWU was compared with the average salary in the national economy. Aware of differences in the scopes of both categories, the authors recognised as reasonably practical to introduce this type of comparison for cognitive purposes. It should be remembered that the comparison of both categories, in spite of its defects, is, next to the income from management, an important premise for informing on the justified character of agricultural activities in the agricultural farm. It is because it informs on the capacity to pay the cost of work of farmer and his family at the parity level and having measures for further development.

<sup>12</sup>It was assumed that in 2019 the EUR/PLN exchange rate will be an average from the years 2010–2014.

of medium-large cereal farms will increase by 4 559.3 PLN, namely by 3.4% as compared with the amount of income from 2014 (Table 1). The value of production will increase by 74.3%, direct costs by 129.3%, indirect costs by 44.5% and subsidies by 3.8%. However, the analysis demonstrated, that, even if unfavourable pricing conditions will last until 2019, income achieved by medium-large cereal farms will be sufficient to pay the costs of farmer and his family's labour at the parity level and the costs of further development (Fig. 2). On the other hand, larger differences in implemented income will occur in large cereal farms. In 2019 income of these farms will amount to 338,440.3 PLN and will be larger than in 2014 by 60,586.2 PLN, i.e. by 21.8% (Table). An important, but not sole cause of this positive state of affairs in these farms will be increase in the area of arable land from 211.3 ha in 2014 to 300 ha in 2019. It will be positively influenced also by optimisation of the structure of plant production, which will provide for increase in the share of plants of higher yield and, as a result, higher direct surpluses, such as wheat, rapeseed and corn, to the level of environmental limitations. As a consequence, with large area of the most profitable activities in plant production, possibilities for improving economic situation may be expected in these farms. In 2019 income of these farms will be sufficient to pay the costs of farmer and his family's labour at the parity level and the costs of further development (Fig. 2).

## CONCLUSIONS

The subject of analysis was an attempt to estimate the effects of prolongation of unfavourable pricing conditions on the market of agricultural products and means of production to 2019 in relation to the amount of agricultural income realised in cereal farms located on weaker soils (WBG up to 0.7) taking into account changes in the CAP 2014–2020 as compared with the CAP 2007–2013. A point of reference was the situation of average cereal farms with the economic volume of 4–25 (very small farms), 25–50 (medium-small), 50–100 (medium-large) and 100 thousand EUR and more of SO (large) located on weaker soils and holding accounts for the needs of the Polish FADN in 2014.

On the basis of the conducted surveys, it can be concluded that in the examined period:

- In very small cereal farms, the effect of prolongation of negative trends typical of economic management conditions until 2019 will only be a small increase in their income. What's important, this growth will be positively influenced by an increase in the area of arable lands and an increase in direct subsidies granted. In 2019, however, they will not have an income large enough to pay the costs of living of farmer and his family at the parity level and the costs of development. Perspectives of their further continuation will thus be endangered.
- In medium-small and medium-large cereal farms the duration of unfavourable pricing conditions on the market of agricultural products and means for production until 2019 will limit an increase in their income. In medium-small cereal farms this income will remain however, at the level not posing a threat to the consumption of farmer and his family at the parity level, but will be insufficient for their further development. A better situation in this respect will be that of medium-large farms which will obtain in 2019 an income which will still be sufficient to pay the costs of work of farmer and his family at the parity level and the costs of further development.
- Income of large cereal farms will increase to the greatest extent. A positive cause of this situation will not only be a significant growth in the area of arable land, but also the optimisation of plant production structure, which will provide for an increase in the share of plants with higher direct surpluses, such as wheat, rapeseed and corn to the level of environmental constraints. These farms, in spite of the pricing recession on the market of agricultural products and means for production lasting until 2019, will thus be able to pay the costs of farmer and his family's labour at the parity level and increase the value of fixed assets they own.

A positive verification of suitability of models encourages to extend the scope of analysis of these issues by other production types of farms. Examples of use of farm models by E. Majewski and his team strengthen this belief.



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## **PROGRAMOWANIE LINIOWO-DYNAMICZNE JAKO PODSTAWA OKREŚLENIA KIERUNKÓW ROZWOJU GOSPODARSTW ROŚLINNYCH WOBEC ZMIAN WSPÓLNEJ POLITYKI ROLNEJ W PERSPEKTYWIE ŚREDNIOTERMINOWEJ**

### **STRESZCZENIE**

Celem artykułu jest próba ustalenia w perspektywie 2019 roku sytuacji ekonomicznej gospodarstw specjalizujących się w uprawie zbóż, roślin oleistych i białkowych o wielkości ekonomicznej 4–25 (bardzo małe), 25–50 (średnio małe), 50–100 (średnio duże) oraz 100 tysięcy EUR i więcej SO (duże) i funkcjonujących na glebach słabszych o wskaźniku bonitacji gleb (WBG) do 0,7 z uwzględnieniem zmian we wspólnej polityce rolnej (WPR) na lata 2014–2020 względem WPR na lata 2007–2013. W tym celu wykorzystano metodę modelową (metoda programowania liniowo-dynamicznego). W modelach tych jako kryterium optymalizacji przyjęto maksymalizację dochodu z gospodarstwa rolnego. Ustalono, że trwanie do 2019 roku niekorzystnych warunków cenowych na rynku produktów rolniczych i środków do produkcji ograniczy wzrost dochodu w tych gospodarstwach. W 2019 roku w gospodarstwach zbożowych bardzo małych oznaczać to będzie brak środków na opłacenie pracy rolnika i jego rodziny na poziomie parytetowym oraz na rozwój, a w gospodarstwach zbożowych średnio małych brak środków na rozwój. Tylko gospodarstwa zbożowe średnio duże i duże zachowają możliwość opłacenia pracy rolnika i jego rodziny na poziomie parytetowym oraz dalszego rozwoju.

**Słowa kluczowe:** gospodarstwa roślinne, modele gospodarstw, programowanie liniowo-dynamiczne, wspólna polityka rolna



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