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Comparison of Agriculture Biotechnology and its Spatial Diversification among Different Countries of the World

Abstract. The importance of biotech crops have risen dramatically in the last two decades since their first commercialization. The area of those crops is increasing fast. Soybeans, maize, canola and cotton represent almost 100 percent of area cultivated with biotech crops globally. The number of countries growing biotech crops is also increasing, however currently the United States, Brazil and Argentina are responsible for the largest share of biotech crops among all countries. In 2016, those countries accounted for more than 81% of total world biotech crop area. Judging the potential to introduce new biotechnology, currently the country with the highest number of biotechnology companies is the US followed by Spain and France. In terms of spending on R&D the US is followed by France, Switzerland and South Korea. It must be noted that the highest number of biotech companies and the highest spending is concentrated in the US. Agricultural biotechnology constitute only a small percentage of all biotechnology R&D expenditures.

Key words: agriculture biotechnology, biotech crops, biotechnology, research and development, genetically modified crops, R&D expenditures, countries

JEL Classification: O13, Q16

Introduction

In the latest report published by the United Nations – World Population Prospects 2017, the world's population is estimated to increase to 9.7 billion in 2050 (UN, 2017). The latest data from UNICEF indicates that already undernutrition contributes to nearly half of all death in children under 5 and is widespread in Asia and Africa. This translates into the unnecessary loss of about 3 million young lives a year (UNICEF, 2017). To support this level of population growth, ensure prosperity and prevent famine, more and better food will need to be produced. Some of this advancement will have to come from higher productivity through adaptation of biotechnology in agriculture. According to Food and Agriculture Organization (FAO) outlook on world agriculture: towards 2015/2030, the benefits of agricultural biotechnology arise from its potentially large contribution to productivity gains and quality improvements. Productivity gains encompass essentially all factors of agricultural production: higher returns on land and livestock, labour and capital or simply lower input requirements per unit of outputs. Biotechnology holds the promise of boosting productivity and thus raising rural incomes, in much the same way as the green revolution did in large parts of Asia during the 1960s to 1980s. It could kick-start a new virtuous cycle of productivity growth, increased output and revenues (FAO, 2003). A report by OECD

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states that from less than 1% today, in total biotechnology could contribute up to 2.7% of the GDP in OECD countries by 2030, and considerably more in non-OECD countries. However many barriers stand in the way of the development and commercialization of biotechnologies. These include technological challenges as well as regulations, adequate investment, human resources, social acceptance, and market structures (OECD, 2009). However, it's interesting to know which countries are at the front line in developing agricultural biotechnologies. This article explores statistical data in production of biotech crops as well as distribution of biotechnology R&D among different countries of the world. The analysis is based on data from International Service for the Acquisition of Agri-biotech Applications, FAOSTAT and OECD Health, in the time frame between 1996 and 2016. The data was developed by utilizing a comparative analysis. A deduction method was used for the assessment of events. For the purpose of this article, terms such as, biotech, GM, GE are used interchangeably.

Agricultural Biotechnology

As published in Agricultural Biotechnology Support Project (ABSP) briefs supported by USAID, agricultural biotechnology is a collection of scientific techniques used to improve plants, animals and microorganisms. Based on the understanding of DNA, scientists have developed solutions to increase agricultural productivity. Starting from the ability to identify genes that may confer advantages on certain crops, and the ability to work with such characteristics very precisely, biotechnology enhances breeders' ability to make improvements in crops and livestock. Biotechnology enables improvements that are not possible with traditional crossing of related species alone [PBS & ABSPII, 2004]. FAO supports the argument, by stating specifically that modern biotechnology takes various forms. These include:

1. tissue culture, in which new plants are grown from individual cells or clusters of cells, often bypassing traditional cross-fertilization and seed production;
2. marker-assisted selection (MAS), in which DNA segments are used to mark the presence of useful genes, which can then be transferred to future generations through traditional breeding using the markers to follow inheritance;
3. genomics, which aims to describe and decipher the location and function of all genes of an organism;
4. genetic engineering, in which one or more genes are eliminated or transferred from one organism to another without sexual crossing. A genetically modified organism (GMO), also referred to as a living modified organism (LMO) or transgenic organism, means any living organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology (FAO, 2003).

Analysis

Since the first biotech crop was commercialized in 1996, the global area of biotech crops has seen more than 100 fold increase. According to International Service for the Acquisition of Agri-biotech Applications (ISAAA), in 1996 there was 1,7 million hectares of biotech crops in the world, whereas in 2016 that area increased to 185 million hectares.

Examining the data published by FAOSTAT, there is currently 4,9 billion hectares of agricultural area in the world in total, therefore 185 million hectares of biotech crops might not seem like much, however, according to ISAAA, biotech crops are considered as the fastest adopted crop technology in the history of modern agriculture [ISAAA, 2016]. However, it can be noticed, that in recent years the impressive growth has been leveling off, mostly due to high saturation in the production area of main crops such as Soybean and Maize in major producer countries.

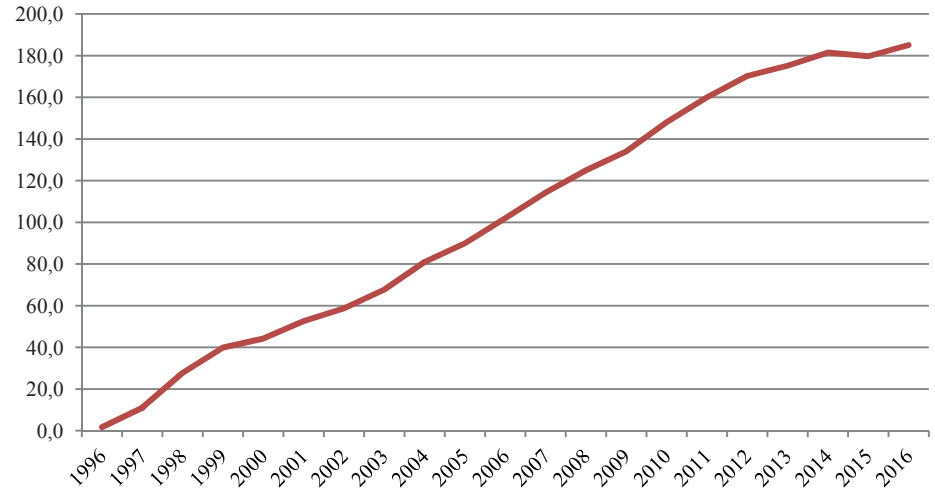

Fig. 1. Global area of biotech crops from 1996 to 2016 (millions of hectares)

Source: own study based on the data from International Service for the Acquisition of Agri-biotech Applications (ISAAA).

Looking at the distribution of biotech crops across different countries in the world it can immediately be noticed that the United States, with the area of 72,9 million hectares of crops, is responsible for the largest share of biotech crops among all countries. Brazil is the second largest biotech crop holder with 49,1 million hectares and Argentina third, with 23,8 million hectares. At the same time in 2016, the first three countries accounted for more than 81% of total world biotech crop area. Other countries, such as Canada (11,6) and India (10,8) are the only other holders of biotech crops with area of more than 10 million hectares. Further down the list, countries like Paraguay (3,6), Pakistan (2,9) or China (2,8) hold much less in terms of area of biotech crops. It's worth noticing that according to ISAAA, Spain is the biggest producer of genetically modified crops in Europe with area of around 100 thousand hectares. From ISAAA publication, Spain was by far the largest European Union grower with 80% of the EU total Bt maize crop area (ISAAA, 2013). Smaller amounts of the same crop are produced in Portugal, Slovakia and Czech Republic. Germany and France are the biggest countries in Europe banning genetically modified crop cultivation on its territories.

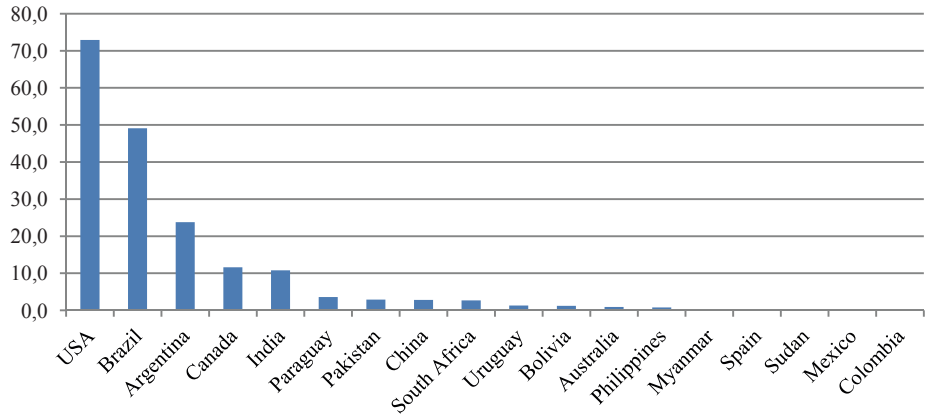

Fig. 2. Global area of biotech crops in 2016 by Country (millions of hectares)

Source: own study based on the data from International Service for the Acquisition of Agri-biotech Applications (ISAAA).

As presented in the table, Soybean, Maize and Cotton account for 95% of all genetically modified crops cultivated around the world. Out of those three, Soybean represents 50% of all crops, Maize 33%, Cotton 12% and Canola 5%. Other important GMO's include Escherichia coli K 12 used in cheese-making and carnations used for production of different varieties of flowers. Almost all biotech crops grown commercially worldwide are genetically modified for one or both of two main traits: herbicide tolerance (an estimated 59% of biotech crops planted in 2011) or insect resistance, i.e. Bt crops, (15%) while 26% have both traits. Commercial release of GM forest trees has been reported in one country, China, and trials with GM trees are taking place in the US. No GM livestock have been commercially released for agricultural purposes (FAO, 2012). However in 2015, fast growing, genetically engineered AquAdvantage Salmon had been approved by Food and Drugs Administration (FDA, 2017). According to FAO, current GM traits such as herbicide tolerance and insect resistance are planned to be extended to other varieties, notably sugar beet, rice, potatoes and wheat, while new releases of virus resistant varieties are expected for fruit, vegetables and wheat. Fungus-resistant crops are also in the pipeline for fruit, vegetables, potatoes and wheat. In addition, efforts are being made to create new traits with greater tolerance to drought, moisture, soil acidity or extreme temperatures (FAO, 2012). There is a lot of noise and suspicion in official publications as to whether or not GM crops increase yields and reduce pesticide usage. However, the documented studies of GM crops according to meta-analysis that aggregates and examines the results of 147 existing research studies looking at GM from Wilhelm Klümper, Matin Qaim, two agricultural economists at Germany's University of Göttingen, found that on average, GM technology adoption has reduced chemical pesticide use by 37%, increased crop yields by 22%, and increased farmer profits by 68%. Yield gains and pesticide reductions are larger for insect-resistant crops than for herbicide-tolerant crops. Yield and profit gains are higher in developing countries than in developed countries (Klümper et. Al, 2014). Other authors also report biomass yield improvement (Rojas, 2010). On the other hand, a study conducted in the United States by Xu, Hennessy, Sardana and Moschini, state that for maize it was

found that biotech varieties have increased realized yields, with a stronger gain in the Central Corn Belt. For soybeans, biotech crops appear to have slightly reduced yields. However, the combined effects of yield trend and biotech crops adoption are predicted to fall short of the growth rate envisioned by industry projections (Xu et. Al, 2013).

Table 1. Global area of biotech crop production in 2016 (millions of hectares)

Rank	Crops	2016	%
1	Soybean	91,4	50
2	Maize	60,6	33
3	Cotton	22,3	12
4	Canola	8,6	5
5	Alfalfa	1,2	<1
6	Sugar beet	0,5	<1
7	Papaya	<1	<1
8	Others	<1	<1
	Total	185,1	100

Source: own study based on the data from International Service for the Acquisition of Agri-biotech Applications (ISAAA).

As published by the ISAAA report, economic benefits of planting biotech crops were 15.4 billion USD of which 7.5 billion USD was for developing and 7.9 billion USD for industrial countries. The six countries that economically gained the most from biotech crops in 2015 were: the USA (6.9 billion USD), India (1.3 billion USD), China (1 billion USD), Argentina (1.5 billion USD), Brazil (2.5 billion USD), and Canada (0.9 billion USD) (ISAAA, 2016).

Biotechnology companies

Having analyzed the major biotech crops producing countries, as well as, the area of crops around the world, a question has to be stated what entities are involved in research and development of those crops, and which countries have the biggest potential to introduce new biotechnologies to agriculture. To approach the problem, a comparison of the number of biotech companies around the world was conducted including a list of dedicated biotech companies. Biotechnology firms use biotechnology to produce goods or services and/or to perform biotechnology R&D. Dedicated biotechnology firms devote at least 75% of their production of goods and services, or R&D, to biotechnology. From a survey compiled by OECD Health, it's already visible that the country with the highest number of biotechnology companies is the United States with 11554 biotech companies including 934 dedicated. On the second position comes Spain with 2742 biotech companies including 628 dedicated. And in the third place comes France with 1950 biotech companies including 1284 dedicated. In nominal terms, France has the highest number of dedicated biotech firms. All the other 26 countries from the OECD survey have less than 1000 biotech firms. It's also worth mentioning, that the first three leading countries possess 221% more biotech firm than the rest 26 countries, mostly due to the high concentration of such companies in the United States. Advanced technology clusters, ease of funding and further financing,

strong intellectual property laws, social acceptance for failure and creative environment in academic circles are among myriad of factors influencing development of the biotech industry in the United States.

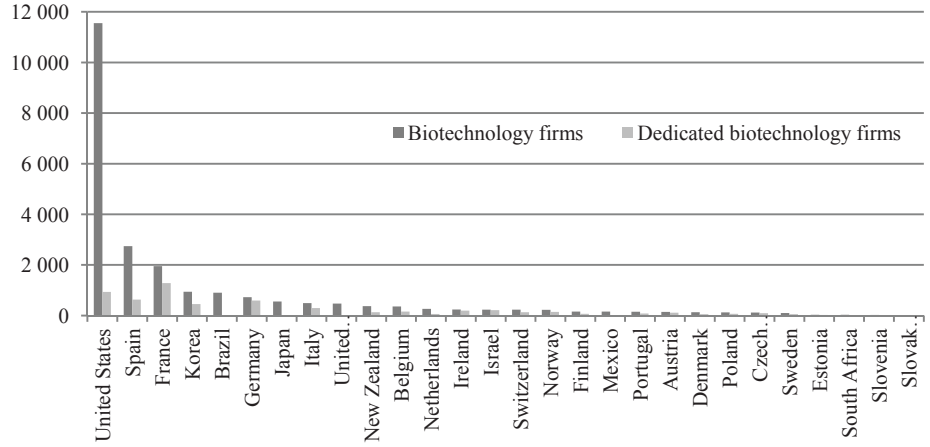

Fig. 3. Number of biotechnology firms and dedicated biotechnology firms in 2014

Source: own study based on data from OECD Health.

Looking more closely at the data, it can be noticed that some countries possess greater potential in biotechnologies by having companies strictly dedicated to biotech research and development.

Table 2. Percentage of dedicated biotechnology firms for specific countries

Rank	Country	% dedicated	Rank	Country	% dedicated
1	Israel	92,7	13	Poland	54,8
2	Slovak Republic	86,7	14	Slovenia	54,2
3	Germany	81,7	15	Sweden	52,9
4	Ireland	81,4	16	Korea	48,5
5	Austria	81,1	17	Finland	44,6
6	Estonia	80,6	18	Belgium	43,4
7	Czech Republic	79,7	19	Denmark	43,3
8	France	65,8	20	New Zealand	36,6
9	Norway	63,1	21	South Africa	33,3
10	Italy	61,1	22	Netherlands	24,8
11	Switzerland	57,5	23	Spain	22,9
12	Portugal	55,0	24	United States	8,1
	Average				56,4
	Median				54,9

Source: own study based on the data from OECD Health.

The highest ranks Israel, which despite having in total 233 biotech companies 92,7% are dedicated to research and development. Second comes the Slovak Republic which has the lowest number of biotech companies among the countries included in the survey, however 86,7% are dedicated to R&D in biotech. Third is Germany with 81,7% of dedicated companies out of 726 in total. Surprisingly, the lowest number of dedicated biotech companies in percentage terms comes from the United States with 8,1%. However, in nominal terms it still constitutes a substantial number of 934 companies.

The number of entities involved in genetic engineering does not tell the whole story as to how the sector compares is in each country. One must still look at the expenditures devoted to biotech research and development. The table is showing the total biotechnology R&D expenditures in millions of USD PPP per country, as well as, biotechnology R&D expenditures as a percentage of Business Expenditures on R&D (BERD). It can easily be seen that the lion's share of total biotechnology R&D expenditures are carried out by the firms in the United States which amounts to 38,5 billion USD. France with its second position on the list spends only 3,2 billion USD, and Switzerland being on the third position spends 2,5 billion USD. Interesting insight is presented from the data on biotech R&D expenditures as a percentage of Business Expenditures on R&D which can serve as a proxy measure for how much resource is devoted by a country to research on biotechnologies as compared to other technologies. The data shows that the country with the highest percentage of biotech R&D spending as a percentage to BERD is Switzerland. Other countries with high percentage of biotech R&D expenditures as a percentage to BERD include Denmark (22%), Ireland (17,2%), Estonia (13,2%) and The United States (12%).

Table 3. Biotechnology R&D expenditures in the business sector in 2014

Rank	Country	Total biotechnology R&D expenditures, MM USD PPP	Biotech R&D as a percentage of BERD	Rank	Country	Total biotechnology R&D expenditures, MM USD PPP	Biotech R&D as a percentage of BERD
1	US	38 565,3	12,0	15	Canada	308,4	2,5
2	France	3 267,9	9,1	16	Russia	223,0	0,9
3	Switzerland	2 560,0	27,8	17	Poland	189,1	4,5
4	Korea	1 414,4	2,5	18	Czech Rp.	183,4	5,0
5	Germany	1 344,0	1,8	19	Austria	177,7	2,0
6	Japan	1 230,1	1,2	20	Norway	152,2	4,9
7	Denmark	1 082,2	22,0	21	Australia	120,5	1,0
8	Spain	801,4	7,9	22	Finland	111,3	2,1
9	Belgium	660,8	11,3	23	Portugal	88,5	5,0
10	Italy	603,8	3,9	24	SA	69,6	3,0
11	Netherlands	420,2	6,9	25	Slovenia	69,2	6,0
12	Sweden	411,7	4,2	26	Mexico	35,4	1,1
13	Israel	400,5	5,7	27	Estonia	30,6	13,2
14	Ireland	380,9	17,2	28	Slovakia	10,5	3,2
	Median					344,6	

Source: own study based on the data from OECD Health.

The research into the role of biotechnology in agriculture around the world wouldn't be complete without knowing how much of the biotechnology R&D spending goes to various biotech applications. A comparable data collected by OECD Health on this issue is limited to only a few countries. Nevertheless, from the following table it's easily observable that most expenditure on biotechnology is allocated for the healthcare applications with the average of 64,2% and median of 73,9%. The second highest allocation goes to Industrial processing with the average of 14,6% and median of 6,6%. The third application goes to food and beverages with the average of 5,7% and a median of 3,9. Biotechnology R&D expenditures for agricultural application come only on the fourth place with average rate of expenditures 5,6% and a median of 3,2%. Despite limited comparable data, an overall picture shows that R&D expenditures for health applications are much higher on the list of priorities in all surveyed countries than agricultural applications. Therefore most R&D resource will go to pharmaceutical applications rather than crops. To make a comparison as to the relative size of the crops market vs pharmaceutical market, according to IMS Health, global pharmaceutical production market was valued at 1 trillion USD in 2014. According to FAOSTAT, global agricultural crops market was valued at 2,5 trillion USD in 2016. Despite a much larger size of the crops market over the pharmaceutical market, companies prefer to pour resources into health related biotechnology research and development rather than food related, avoiding public outcry and suspicion in many developed countries.

Table 4. Percentage of biotechnology R&D by application in 2014

Country	Health	Agriculture	Food and beverages	Natural resources	Environment	Industrial processing	Bio informatics	Other
Poland	54,6	15,5	NA	0,0	24,3	3,0	0,9	1,7
Portugal	25,2	12,9	18,1	2,6	7,1	18,1	5,2	11,0
Australia	72,2	11,9	NA	NA	9,3	6,6	NA	NA
Canada	76,4	9,4	NA	NA	4,3	9,9	NA	NA
Belgium	91,4	6,8	0,4	NA	0,3	1,1	NA	0,0
France	68,1	3,9	3,9	0,2	0,4	10,2	0,2	13,1
Slovenia	5,4	2,5	NA	NA	3,6	88,5	NA	NA
Italy	89,6	1,7	0,6	0,0	0,1	6,7	0,3	0,9
Korea	75,5	1,6	7,7	0	0,9	1,8	2,9	10,0
Germany	82,3	1,4	NA	0,4	1,1	3,2	1,2	10,4
Estonia	37,0	0,0	9,0	19,0	0,0	23,0	8,0	4,0
Austria	92,5	0,0	0,0	0,0	0,0	2,9	0,0	4,6
Average	64,2	5,6	5,7	2,8	4,3	14,6	2,3	6,2
Median	73,9	3,2	3,9	0,1	1,0	6,6	1,1	4,6

Source: own study based on the data from OECD Health

Conclusion

Despite the perception about ubiquity of genetically modified crops around the world, it was found that biotech crops in agriculture constitute only a small percentage of global crop area, albeit fast growing. It was also found that the benefits of biotechnology are currently reaped by the developed industrial countries as opposed to the developing countries which are mostly in need of productivity increase in agriculture. In 2016 most area of biotech crops was shared among three countries: United States, Brazil and Argentina. Major crops include Soybeans, Maize and Cotton. The highest number of biotech companies can be found in the United States, in 2014 it was 11 554. In Europe in the same year the highest number of biotech firms can be found in Spain (2742), France (1950) and Germany (726), however not all companies calling themselves "biotech" are actually dedicated to biotechnology research and development. The highest percentage of such can be found in Israel, Slovakia, Germany, Ireland, Austria and Estonia. In terms of expenditures on research and development, the United States is the global leader with more than 38 billion USD in 2014, the second largest country in terms of biotech expenditure was France with the amount of around 3,2 billion USD. There is no comparable data on China from OECD. Failure is a common characteristics of the biotech industry. It's worth noting that, due to the favorable climate for start-up companies, advanced technology clusters, ease of funding, and social acceptance for failure among others, the highest number of biotech companies and the highest spending is concentrated in the US. At the same time it was found that Switzerland and Denmark spend the highest proportion of R&D funds on biotechnology as compared to R&D in other areas. It's important to notice that agricultural biotechnology constitute only a small percentage of all biotechnology R&D expenditures. In 2014 most of the biotech R&D funding went to pharmaceutical applications with the median of 73,9% and industrial processing 6,6%. The median for agricultural biotechnology was 3,2%. Almost all biotech crops grown commercially worldwide are genetically modified for one or both of two main traits: herbicide tolerance or insect resistance. Efforts are being made to create new traits with greater tolerance to drought, moisture, soil acidity or extreme temperatures. In 2015, a fast growing, genetically engineered AquAdvantage Salmon had been approved by Food and Drugs Administration.

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Rural Tourism as a Factor Stimulating the Development of Border Areas – The Case of Lubelskie Voivodeship

Abstract. This article aims to evaluate the level of tourism potential for the communities located in the eastern border region of the Lubelskie Voivodeship in Poland. The analysis was based on a three-factor model consisting of separate interrelated components of tourism potential i.e. tourist attractiveness, tourist function and tourist traffic. Using a multidimensional comparative analysis, a Tourist Attractiveness Index, Tourist Function Index and Tourist Traffic Index were composed. This enabled to identify the territorial units for which rural tourism can become a real factor stimulating socio-economic development. It appears that rural tourism can be perceived as a chance for improving the local economy for the areas located in the northern part of the borderland, whereas for communities situated in the southern part, it is not a significant issue.

Key words: rural tourism, border areas, Lubelskie Voivodeship, Poland

JEL Classification: R110, R120

Introduction

The Lubelskie Voivodeship is a typical agricultural area characterized by a relatively low level of industrialization and urbanization. The eastern part of Lubelskie is a border region of Poland and also for the entire European Union. From the point of view of development opportunities this specific position is more a restrictive factor than an advantage. The territorial areas situated along the external border of the EU are less developed and poorly equipped with infrastructure. Their unfavorable location reduces the chances of improving their economic performance and living standards. Therefore peripheral, rural areas need a new approach in their development policy. In the process of transforming rural spaces, tourism can play an important role. Tourism is considered to be an effective catalyst for rural development (Sharpley and Vass, 2006), an important economic factor and an opportunity for creating non-agricultural businesses and jobs. It is widely acknowledged that tourism is not only one of the forms of human activity but also an important social and economic phenomenon in the contemporary world. Its development is related to the wide impact of tourism on many spheres of the national economy. As a significant economic phenomenon it is perceived by local and regional authorities as an opportunity for their development. However, the scale of economic benefits associated with the development of tourism is determined by a set of factors, i.e. natural and cultural values and attractiveness, good accessibility of transportation, and the development level of tourist infrastructure.

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The aim of the paper is to assess the level of tourism potential for the territorial areas located in the eastern border region of the Lubelskie Voivodeship. Another objective of the study is to identify communities with relatively well-developed tourism functions. This will show the areas for which rural tourism can become a real factor stimulating their development. The structure of the article is as follows: The first section outlines a literature review concerning the notions of rural border areas and rural tourism. The next part provides the research framework of the paper. The following section focuses on the results obtained from the conducted analysis. Finally, the last section contains the conclusions.

The Literature Review

The development of rural border areas is determined by many different factors. Border areas, due to their geographical position, are often marginalized. Numerous studies have confirmed that rural areas remote form urban centres are characterized by lower levels of development and competitiveness (Rosner, 1999; Brodziński, 2011) and they usually suffer from economic disparities, high unemployment, depopulation and unfavorable demographic structure.

The development of rural border areas is influenced by a set of factors like the structure of the economy, the regional labour market or local government policy. In the process of modifying rural communities in their environmental, economic, social and cultural structures and development an important role is played by tourism (Theodoropoulou, Kaldis, 2008; Andereck et al., 2005, Briedenhann and Wickens, 2004). Rural tourism is a multi-faceted concept and has no commonly used definition in literature. This notion can be used as a geographical term as well as a term describing cultural activities of rural communities (Lane 1994). Most authors emphasize certain features of this phenomena, i.e. the rural character of the recreation, contact to nature, experience of heritage and participation in rural traditions (Lane, 1994; WTO 2004; Drzewiecki, 2002; Dębniewska, Tkaczuk, 2007). In broader terms rural tourism is understood as all tourism-related activities that take place outside of urban areas and involve the natural and cultural patrimony of rural territories in promoting processes of local development. It includes low intensity activities that do not interfere significantly with the environment (Majewski, 1998; Tolstad, 2014). There are three main types of rural tourism, i.e. rural tourism covering all forms of recreation in the non-urbanized area, agricultural tourism – providing an opportunity to learn the practical aspects of a farmer's work – and rural tourism offering both theoretical and practical knowledge of the local community culture (Spychalski, 1998). They all are sub-components of tourism in rural space. Rural tourism can be one of the key factors contributing to the activation of a multifunctional development of a given area. The development of tourist functions can lead to the creation of new jobs and the diversification of income sources, as well as to the restoration of other sectors of the economy, i.e. trade or transport. Although rural tourism is generally addressed to individual travelers, families or small groups, it is regarded as an important element of diversification of the economic activity and at the same time as an alternative source of development (Majewski, Lane, 2003; Holland, Burian, Dixey, 2003).

The European Union (2002) has highlighted 10 factors that have a significant impact on the development of tourism in non-traditional tourist destinations, including rural areas, such as: natural and cultural values, distinctive features of the surrounding area, tourist

attractions, branding, networking, transport accessibility, partnership, development strategy and protection of monuments. These are the most important factors that enable the transition of tourism potential into tourism function.

Data and Methodology

The area of interest for research is located in the eastern part of the Lubelskie Voivodeship, covering rural communities of Polish-Belarusian and Polish-Ukrainian border areas. Delimitation of the study area was carried out in two stages. In the first stage, the rural areas of the Lubelskie Voivodeship were isolated on the basis of the classification of the European Commission called DEGURBA (Eurostat, 2017). In the second stage, rural communities located in the border area were separated on the basis of the delimitation criteria applied in the Lublin Spatial Development Plan (UMWL, 2015). Finally, the survey covered 58 border municipalities of Lubelskie Voivodeship from 213 communities in total and 190 rural communities in the voivodship according to DEGURBA classification.

Empirical analyses were based primarily on statistical data provided by the Central Statistical Office of Poland for 2015. In addition, data from the Marshal Office of the Lubelskie Voivodship, the National Institute of Heritage, Center for Geodetic and Cartographic Documentation as well as the National Sanitary Inspection were used.

The presented analysis was based on a Three-factor model of a comprehensive assessment of the tourist potential of the Lublin Voivodeship (Bronisz et al., 2017). The model (Figure 1) includes three interrelated components of the tourism potential: tourist attractiveness (conditions), tourist function (outlay) and tourist traffic (effects). The natural and cultural attractiveness of the area are the basis for the development of the tourist function of the individual communities. Outlays for the development of the broadly understood tourist economy, being a potential source of income for a given local community, are expressed in the municipal tourist policy (budgetary income and expenditure of communities) and the existing tourist supply (tourist base and economic activity). Finally, the effects presented by the tourist demand (the size and structure of the tourism movement) show which of the analysed communities constitute the target area for tourist flows. The development of the tourism potential of the area and the economic benefits of the tourist economy are conditioned by the combined occurrence of the above-mentioned factors.

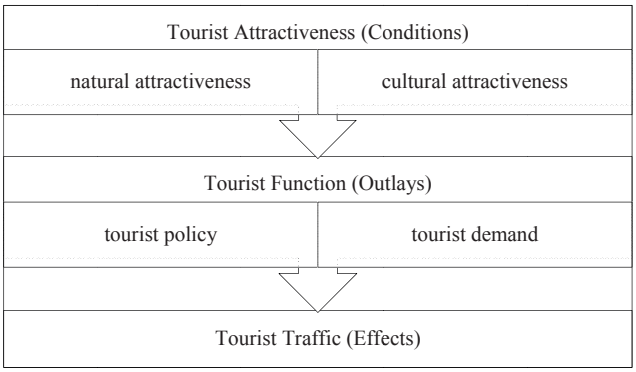

Fig. 1. The Three-factor model of a comprehensive assessment of tourist potential
Source: Authors' own elaboration.

According to the presented model, the following synthetic indicators were calculated for all communities of the Lubelskie Voivodeship:

- Tourist Attractiveness Index (TAI);
- Tourist Function Index (TFI);
- Tourist Traffic Index (TTI).

Each of the aforementioned indexes was based on a set of key indicators (Table 1). Due to the varied importance of the selected indicators, for each of them weight has been assigned. For this purpose, an expert method was applied. For the calculation of synthetic indicators, the method of relative distance from the pattern was used (multidimensional comparative analysis), which takes into account the nature of the indicator (stimulant or destimulant). For stimulants, formula (1) was used, and for destimulants – formula (2).

$$H_{ij} = \frac{100\,(x_{ij} - x_{i\,min})}{x_{i\,max} - x_{i\,min}} \tag{1}$$

$$H_{ij} = \frac{100\,(x_{i\,max} - x_{ij})}{x_{i\,max} - x_{i\,min}} \tag{2}$$

where: x_{ij} – empirical value of *i*-th measure in *j*-th municipality; x_{imin} – lowest value of *i*-th meter among voivodeship communities; x_{imax} – highest value of *i*-th meter among voivodeship communities.

Lubelskie Voivodeship was used (CODGiK, 2017). *The surface water index* was calculated as the share of land under surface waters flowing and standing in the area of the community. *The forest index* was calculated as the share of forests (area of forest land) in the total area of the community.

The other measures used to assess the attractiveness of the Lubelskie Voivodeship are the synthetic indicators. *The synthetic index of protected areas* was based on the weighted share of selected legal forms of nature conservation in the area of individual municipalities. According to G. Bezkowska (2003), the following weight factors were used in the study: national park – 4, nature reserve – 3, landscape park – 2, protected landscape area – 1. Thus *the synthetic index of protected areas* takes the following formula (3):

$$I = A_1 \cdot W_1 + A_2 \cdot W_2 + \ldots + A_n \cdot W_n \tag{3}$$

where: *A* – relative surface area of each form of the nature conservation; *W* – weight factor. The *synthetic natural attraction index* was based on the data concerning: nature monuments (per 1 sq.km), botanical and zoological gardens, watering places and health resorts. The individual elementary indices composing *the synthetic natural attraction index* were calculated according to the following formula (Łysoń, Szymkowiak, Wawrowski, 2016):

$$I = \frac{100 \cdot x_i}{x_{imax}} \tag{4}$$

where: x_i – empirical value for *j*-th community; x_{imax} – highest value of *i*-th meter among voivodeship communities. *A synthetic indicator of environmental status*, data on emissions of dust pollution per year in tonnes per 1 sq.km, gas emissions per year in tonnes per 1 sq.km, the share of the population using waste water treatment plants and the mixed waste

collected during the year were used. This indicator serves to assess the pollution of the natural environment as a factor limiting the tourist attractiveness of the analysed area.

Table 1. List of indicators used in the study

Index	Stimulant destimulant	Wage (%)
Tourist Attractiveness Index (TAI)		
Natural attractiveness:		
The terrain index	stimulant	7,5
The surface water index	stimulant	7,5
The forest index	stimulant	7,5
The synthetic index of protected areas	stimulant	15
Synthetic natural attraction index	stimulant	7,5
Synthetic indicator of environmental status	stimulant	5
Cultural attractiveness		
Synthetic index of historical monuments	stimulant	12,5
The synthetic indicator of museum, stage and exhibition activities	stimulant	12,5
Synthetic indicator of cultural events	stimulant	12,5
The index of religious tourism	stimulant	5
Tourist Function Index (TFI)		
Tourist policy		
Share of industrial land in built-up and urbanised land in 2014 (%)	destimulant	5
Expenditures of the municipality per capita on the protection of atmospheric air and climate	stimulant	5
Expenditure of the municipality per capita on tourism	stimulant	12,5
Expenditure of the municipality per capita on the culture and protection of the national heritage	stimulant	12,5
The income of the municipality from the culture and the protection of the national heritage per 1,000 population (Section 921)	stimulant	5
The value of European projects (2004-2013) concerning tourism per 1,000 inhabitants	stimulant	10
Tourist demand		
Bed places per 1000 inhabitants	stimulant	10
Tourist Accommodation Establishments per 1,000 inhabitants	stimulant	10
Agritourist Accommodation Establishments per 1,000 inhabitants	stimulant	10
Companies per 1000 inhabitants – Section H, Division 49	stimulant	2,5
Companies per 1000 inhabitants – Section I	stimulant	5
Companies per 1000 inhabitants – Section N, Division 79	stimulant	5
Companies per 1000 inhabitants – Section R	stimulant	2,5
Share of recreation areas in built-up and urbanised areas in 2014 (%)	stimulant	5
Tourist Traffic Index (TTI)		
Tourists per 1,000 inhabitants	stimulant	25
Overnight stays per 1,000 inhabitants	stimulant	25
Overnight stays (foreign tourists) per 1,000 inhabitants	stimulant	20
Occupancy rate (%)	stimulant	10
Museum visitors per 1,000 inhabitants	stimulant	10
Participants of events per 1,000 inhabitants	stimulant	10

Source: Authors' own elaboration.

The terrain index was calculated as the difference between the maximum and minimum height n.p.m. municipalities. In the study, the dataset of a numerical model of terrain for the

Data on the number of immovable monuments and archaeological sites by category per 1 sq.km of the area were used for the construction of *the synthetic index of historical monuments*. The following weight factors were used in this study: sets of monuments and castles – 2, urban layouts, sacred objects, residential buildings, public buildings – 1, other objects (defence buildings, dwellings, outbuildings and industrial objects, small architecture and archaeological monuments) – 0.5. Assuming the above weights, *the synthetic indicator of historical monuments* for individual municipalities takes the form expressed by the formula (5):

$$I = A_1 \cdot W_1 + A_2 \cdot W_2 + \ldots + A_n \cdot W_n \tag{5}$$

where: A – number of monuments by the category; W – weight factor.

The synthetic indicator of museum, stage and exhibition activities was built on four variables: exhibition venues, galleries and art galleries; museums; theatres and musical institutions. Data on the number of cultural events and mass events per 1,000 population were used to build *the synthetic indicator of cultural events*. Finally, *the index of religious tourism* was based on the number of sanctuaries. The three above-mentioned indicators were calculated according to formula (4).

In the next stage of the research rural communities of the Lubelskie Voivodship were classified into 4 categories within each of the analysed components according to all developed synthetic indicators (TAI, TFI, TTI). The division into two subsets was made on the basis of the mean, then the division of the two subsets into two parts (four in total) was made on the basis of the mean for the objects in both subsets. Depending on the value of the synthetic indicator, the rural communities located in the eastern part of the Lubelskie Voivodeship were assigned to group A – that consists of the communities with the highest indicator values, group B – characterised by a relatively high level of the indicator, group C – with moderate index level or group D – grouping the units with the lowest values of the indicator.

The last stage of the research concerned the identification of the potentially attractive municipalities for the development of tourist function. For this purpose analysed territorial units were divided into four categories according to the level of tourist attractiveness (high or low TAI-value) and the level of tourist function development (high or low TFI-value). For this purpose, both variables were standardised according to the following formula (6):

$$x = \frac{x_i - \bar{x}}{\sigma} \tag{6}$$

where: x_i – variable not standardised; $\bar{x}$ – arithmetic mean of the population; σ – standard deviation of the population.

Results

According to the results of the conducted analysis, there are 5 rural communities in the border area of Lubelskie Voivodeship, characterized by the highest TAI values, 19 – with

high, 17 - moderate and 17 - with low value of the indicator. In the top head of the TFI we can find 6 communes, almost all situated in the northern part of the borderland. These are the territorial units that have the most developed services for tourists. Among the examined group of the 58 communes, 13 achieved high scores, 22 – moderate results and 17 – poor performance. Spatial distribution of the obtained results was presented in Figure 2.

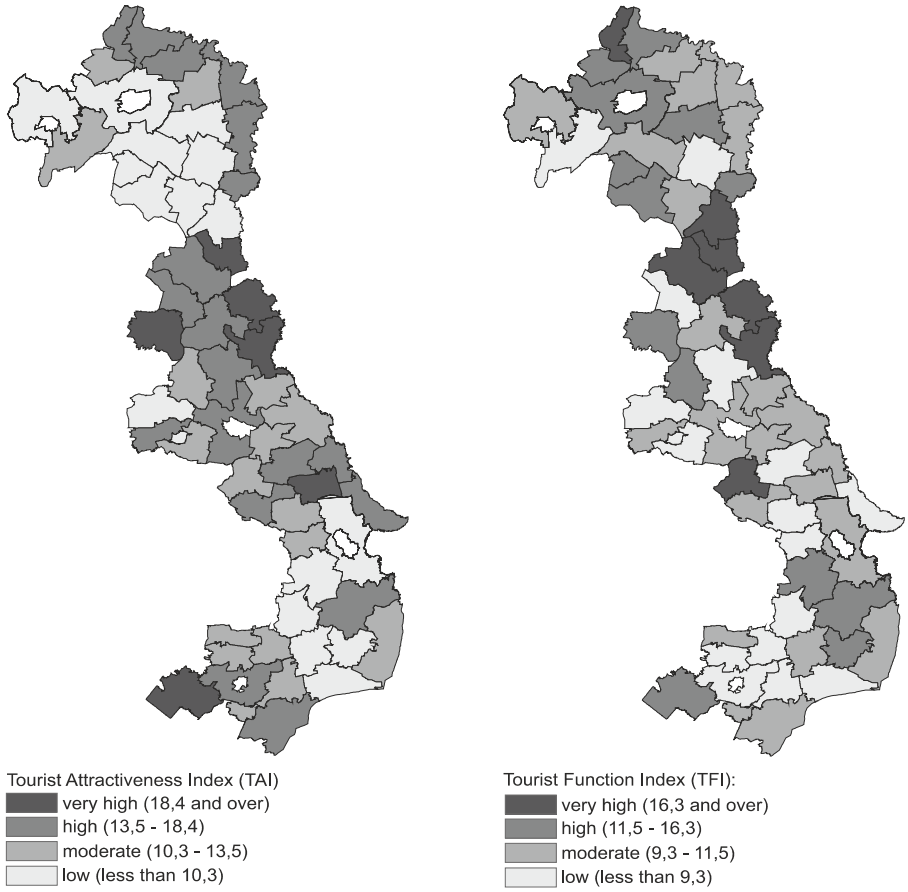

Fig. 2. Spatial distribution of the Tourist Attractiveness Index (TAI) and Tourist Function Index (TFI).
Source: Authors' own elaboration.

Both of the indicators discussed above were used to evaluate rural communities located in the border areas of the Lubelskie Voivodeship in terms of the tourist attractiveness utilisation for the purposes of tourist function development. As a result of the classification, four categories of municipalities were distinguished (Fig. 3):

- Category 1 (High-High) – encompassing 9 communities with high level of tourist attractiveness and high level of tourist function development, i.e. communities where the high level of tourist attractiveness (TAI) is reflected in the level of development of the tourist function (TFI);

- Category 2 (High-Low) – encompassing 15 communities with a high level of the tourist attractiveness (TAI) and a relatively low level of the tourist function development (TFI), i.e. municipalities whose tourist attractiveness has not yet become a prerequisite for proper development of tourist function;
- Category 3 (Low-High) – encompassing 10 communities with relatively low tourist attractiveness (TAI) and a developed tourist function (TFI), i.e. areas for which the tourist function is developed on the basis of factors other than natural or cultural attractiveness (especially those characterised by favorable location close to important urban centers or major transport routes);
- Category 4 (Low-Low) – encompassing 24 communities with a low level of tourist attractiveness and a low level of tourist function development.

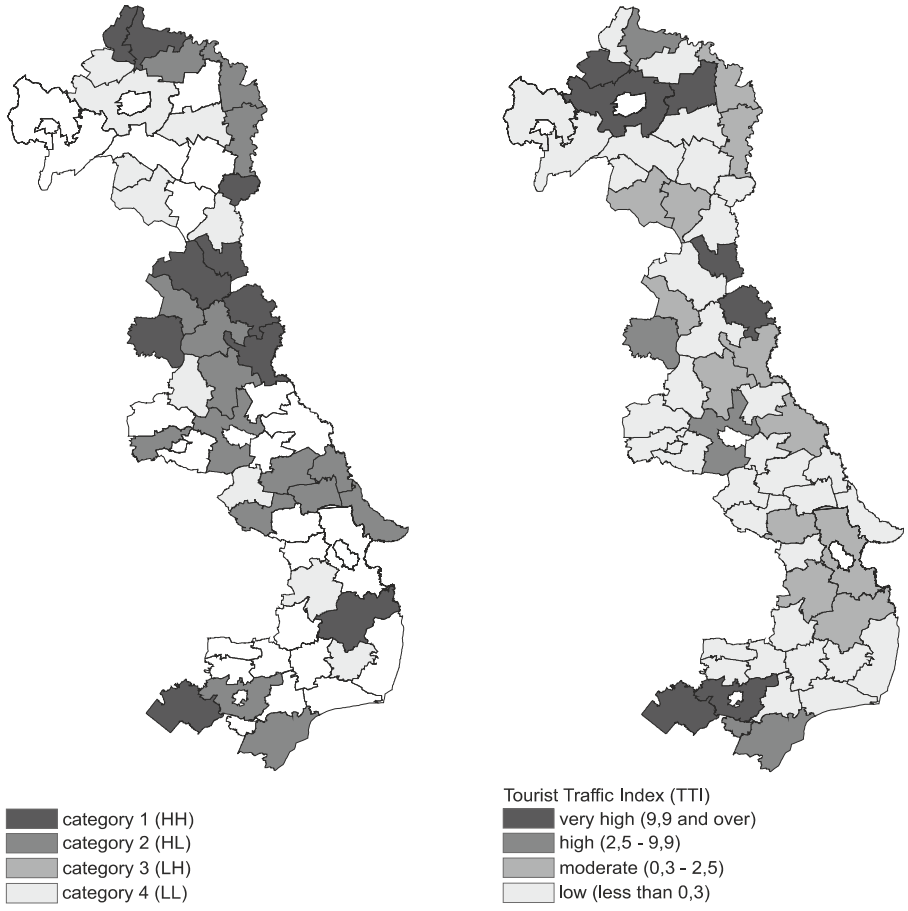

Fig. 3. Classification of communities according to terms of the utilisation of tourist attractiveness for the purposes of tourist function development and the spatial distribution of the Tourist Traffic Index (TTI).

Source: Authors' own elaboration.

Areas qualified for Category 2 can be considered as the communities where the untapped potential for development of the tourist base exists, which is an essential condition to attract potential tourists. It is also worth emphasizing, that only 6 rural communities located on the border areas of the Lubelskie Voivodeship are characterised by very large tourist traffic (TTI) and only in two cases is this due to their very high tourist attractiveness (Fig. 3).

Conclusions

The problem of tourism potential in the Lubelskie voiodeship has been the subject of interest for much research (Brzezińska-Wójcik, Skowronek, 2009; Brzezińska-Wójcik, Świeca, Tucki, 2009; Krukowska, Świeca, 2009; Świeca, Brzezińska, Wójcik, 2009; Tucki 2008, 2009; Wesołowska, 2014). However, in their considerations they focused mainly on tourism performance, attractiveness, role and functional typology as well as prospects for tourism development in different spatial dimensions. They didn't pay any special attention to the border location and the rural character of the communities. The development of tourism stimulates many socio-economic changes. It is a chance for professional activation of the population, income generation or infrastructure development. Therefore, developing tourist functions of a given area is important for proper programming and the use of planning tools that allow for a coherent strategy that takes into account the activity of all tourism market operators, both in the private and public sectors. That is why rural tourism should be recognized by policy makers as an important economic strategy.

Considering the research results, it seems that the basic factor influencing the attractiveness of the border communities and at the same time creating conditions for the development of rural tourism is their natural values. Another finding is the observation that rural tourism is seen as an alternative, important factor of socio-economic development and as a supplementary economic sector in the northern part of the borderland, whereas in the southern part it is not perceived as a development priority mainly because of the favourable conditions for agricultural production.

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The New Silk Road: Seeking Opportunities for Polish Exports in the Chinese Market

Abstract. The paper presents preliminary studies related to the problems of the New Silk Road and its influence on the Polish economy. The aim of the report is to define tendencies in the trade exchange between Poland and China and to evaluate the capacity of Polish exports to the Chinese market. The paper tries to answer the question whether the contemporary structure of Polish exports to the Chinese market allows for the full use of the potential of the Middle Kingdom market. In the study, the indicative trade potential was used.

Key words: China, Poland, economic relations, New Silk Road

JEL Classification: F14, F17

Introduction

When the Chinese President announced during his visits to Kazakhstan and Indonesia in October 2013 that he was going to reactivate the Silk Road, the initiative was not expected to unite so many countries. The New Silk Road, also known as One Belt One Road (OBOR) has become China's flagship international project for the coming years and the strategy largely affecting economic relations worldwide[2]. Poland has also become an element of this strategy, among others, due to its strategic geographical position. Analysing the current international situation and a growing role of China in the world economy[3], Poland should not only avoid becoming closed to cooperation with this country, it should also strengthen cooperation in many dimensions.

Consequently, analysis of the current trade relations between Poland and China seems to be an important issue in terms of further cooperation and development of Poland's position in the OBOR. In the assessment of potential directions for cooperation, sectors of the Chinese economy which remain particularly attractive for Polish exporters are indicated.

The paper presents preliminary studies related to the issues of the New Silk Road. The aim of the report is to define tendencies in the trade exchange between Poland and China and to evaluate the capacity of Polish exports to the Chinese market. In this way, the paper tries to answer the question whether the current structure of Polish exports to the Chinese

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The article is the result of the research project "Chinese New Silk Road strategy: implications for production linkages between China and Central and Eastern Europe" financed by the National Science Centre, Poland (UMO-2016/23/D/HS4/02748).
[2] In recent months, interesting reports on a possible role of the New Silk Road in the world in various areas, such as in the economic, security and political arenas, were published, inter alia, by Ghiasy and Zhou (2017), Saalman and Dethlefsen (2017), Blanchard and Flint (2017), Abdenur (2016), Putten et al. (2016), or Kaczmarski (2016).
[3] More on the role of China in the world economy, in the report by (Cieślik, 2012, 2015 and 2016).

market allows for the full use of the potential of the Middle Kingdom market. Estimation of the potential exports was performed with the use of the indicative trade potential (ITP).

The paper is divided into five parts, including the introduction and the summary. The second section comprises a short presentation of the OBOR and Poland's role in the strategy. The third part of the paper presents the most important facts related to the Polish-Chinese trade exchange. The fourth part is an attempt to evaluate the capacity for the development of Polish exports to the Chinese market.

The subject of the study carried out in the paper comprises two countries: Poland and China. In the paper, 2016 was adopted as a research period (last available data in the scope of Polish trade with China). However, in justified cases (information on the Polish-Chinese trade exchange), the scope of the study was extended by adding earlier years. In order to standardise the results of the study, statistical data derived from the United Nations Conference on Trade and Development (UNCTAD) databases (mostly from the section: International trade in goods and services on UNCTAD Stat) were relied on.

New Silk Road: Role of Poland in the Strategy

The New Silk Road is the third stage of China's opening to the world (preceded by the creation of special economic zones in the 1980s and accession to the WTO in 2001). The initiative comprises 65 countries, including Poland, i.e. the total of almost 4.4 billion people (63% of the world population). GDP of countries included in the OBOR is estimated at a level of approximately 30% of the global GDP. Until May 2017, over 40 countries and international organisations signed agreements concerning the OBOR creation with China. By the end of 2016, 8158 contracts between Chinese enterprises and foreign entities were signed within the framework of the OBOR. Under the strategy, six cooperation corridors shall be established: China-Pakistan, so-called New Eurasia Land Bridge, China-Mongolia-Russia, China-Central Asia-Western Asia, China-Indochina Peninsula, Bangladesh-China-India-Myanmar. In 2016, the trade exchange between China and countries covered under the OBOR strategy amounted to USD 953 million, i.e. 25.7% of China's total trade volume (UNCTAD 2017).

In accordance with the OBOR assumptions, Poland is an important element of the project. In one of the options, the country appeared at the entry of land transport routes to Europe[4]. By mid-2017, a number of events associated with the OBOR strategy in which Poland participated took place. In 2015, the President of the Republic of Poland paid a visit to China, during which strengthening of the economic cooperation between both countries was discussed. On the other hand, Xi Jinping, the President of the People's Republic of China paid a visit to Poland on 19-21 June 2016, which was the first visit to Poland at such a high level in 12 years. Subsequently, the Prime Minister of Poland participated in the One Belt One Road Forum in Beijing in May 2017[5]. Poland is a member of the Asian Infrastructure Investment Bank. Minor events focusing around the OBOR also took place.

[4] The first option of the OBOR comprises the transport route running across Poland to Germany and further on, to other countries of Western Europe. The second option assumes entering Europe via Slovakia towards Vienna. The third option is the OBOR entering Europe via Bulgaria towards the North (Kaczmarski, 2015).

[5] Representatives of over 130 countries and 70 international organisations participated in the event (among others, the UN Secretary-General).

On 20 May 2016, the 5th Europe-China Economic Cooperation Forum was held during the European Economic Congress in Katowice. At the end of April 2017, the first Research Centre of the New Silk Road of this type in Poland was established at the Poznań University of Technology, financed to a large extent by the Chinese party. Earlier, in October 2016, the Poznań University of Economics and Business initiated a research consortium between China and selected universities of Central and Eastern Europe, the "16+1 High Level Academic Platform". Up to date, many conferences and forums were also held, focusing on the New Silk Road as the leading subject, such as the launch of a railway connection between Chengdu and Łódź in 2013.

Polish-Chinese Trade Exchange in 2016: General Information

For Poland, China is the biggest trade partner in Asia. However, imports significantly exceed exports. In 2016, goods and services worth EUR 19.7 billion were imported to Poland whereas goods and services for EUR 1.5 billion were exported. This gave China 12.08% share in Polish imports and only 0.92% - in exports. Compared to the exchange carried out a decade ago, both Polish exports to China and imports from China have almost doubled. For years, Poland has been generating a high negative trade balance with China, which amounted to EUR 18.2 billion in 2016. The negative current account balance is the lowest for the exchange with China (UNCTAD 2017).

The average annual performance of exports in 2007-2016 reached a level over 8%. However, this performance showed many fluctuations - there were years of very high growth, e.g. 2013 with a 21% growth in Polish exports to China and years of declines in exports rate, e.g. 2015 with a decline exceeding 10%. In the case of imports, the average annual growth rate in 2007-2016 amounted to 13% and demonstrated less volatility than the performance of exports. In the last decade, years of very high growths of imports from China occurred (e.g. 2007 and 2008 with a growth amounting to 52% and 43%, respectively) as well as years of sudden declines in the value of goods imported to Poland from China (e.g. 2009 showed a decline of as much as 17%) (UNCTAD 2017).

Copper with the share of 19.8%, furniture & parts (7.4%) and parts & accessories of vehicles (4.1%) remained the most important product groups exported from Poland to China in 2016. Compared to the preceding decade, the structure of exports became more advanced, although also at that time copper prevailed (29.8%), followed by organo-inorganic, heterocyclic compounds (12.5%). In 2016, Poland imported mainly telecommunication equipment (17.4%), automatic data processing machines (8.3%) and parts & accessories for automatic data processing machines and office equipment (4.4%) from China. The structure of Polish imports from China has remained almost unchanged for a decade. Throughout all this period, telecommunication equipment and automatic data processing machines prevailed, although with various share in total imports (UNCTAD 2017).

Data, Methods and Results of the Study

The evaluation of the Polish export potential in the trade in goods with China was performed based on indicative trade potential which was calculated according to the formula:

$$ITP = \min (XPi, MAi) – XPAi,$$

where:
XP – total Polish exports,
MA – total Chinese imports,
XPA – exports of Poland to China's market,
i – products/group of products

According to Mukherji (2007), "By matching the import demand with the export supply of a given commodity, an estimate can be made of the possibility of trade expansion under the most favourable competitive conditions, after subtracting existing trade". The trade potential index first was used by Mukherji (2003 and 2005) under the name "bilateral potential trade" to estimate the benefits of the negative list approach in the economic integration of the Asia-Pacific region. The index was also proposed by Helmers and Pasteels (2006) to estimate the trade potential at the commodity level. They argued that the ITP can avoid problems such as lack of data when using the gravity model. Further, because this index is based on a strong assumption of complementarity between two trade partners, it is an indicator of potential trade. Pant and Panta (2009) also used this method to estimate the trade potential between Nepal and the US. They identified the main trade potential of Nepal with the United States as being in wool carpet, fine animal hair, and cotton; whereupon they suggested that the Nepal government should diversify its exports. The trade potential measure has also been used by Paswan (2003) to identify trade potential in India's agriculture sector.

Data derived from UNCTAD databases were used in the analysis. Within the study, an attempt was undertaken aimed at verifying a hypothesis that Poland develops the structure of its exports to the Chinese market using the potential of the target market as well as its own exports capacity.

In accordance with the results obtained (Table 1), the potential exports to China are estimated at a level of over USD 194.5 billion, which already allows for the assumption that the structure of Polish exports to the Chinese market most probably does not follow Polish export capacity and the absorption capacity of the Middle Kingdom market. The current export activity of Poland to China is insignificant. In fact, in 2016, Poland used only 1% of its export capacity to China. This confirms, on the one hand, huge development opportunities for Polish goods exports to the Chinese market, but it simultaneously shows very neglected exports to China.

In absolute terms, the highest development potential of exports from Poland to China, calculated with the use of the ITP measure may be observed in the case of group parts & accessories of vehicles [784], where the export capacity exceeded USD 11.2 billion, motor vehicles for the transport of persons [781]: USD 7.6 billion and articles of plastics [893]: USD 2.1 billion (Table 1). Among the listed product groups, group parts & accessories of vehicles [784] (4.1%) had the highest share in the structure of Polish exports to the Middle

Kingdom. On the other hand, the remaining listed product groups demonstrated minor shares in Polish exports, amounting to 0.1% for motor vehicles for the transport of persons [781] and 1.6% for articles of plastics [893] (UNCTAD 2017).

Among product groups included in Table 1, we use the capacity of the following product groups to the largest extent: copper [682] – 19.2%, furniture & parts [821] with the share of 5.2% occupies the second position and engines & motors, non-electric; parts [714] with the share of 3.1% occupies the third place. The foregoing figures indicate that those product groups should be ranked at the top of the structure of Polish exports to the Middle Kingdom. That is really the case as in 2016, group copper [682] had a 19.8% share in the total Polish exports to China and it was the biggest product group reaching that market; on the other hand, furniture & parts [821] constituted 7.4% (vice-leader in the structure of Polish exports to China), whereas the share of engines & motors, non-electric; parts [714] amounted to 3.3%, which gave the group fifth place in the structure of exports to China. Taking into account all product groups in the SITC Rev3 classification, the highest share of actual exports in the potential exports was observed in 2016 in the case of the following product groups: copper ores and concentrates; copper mattes, cement [283] and it amounted to 39.7%, group waste, parings and scrap, of plastics [579] and it amounted to 28.9% as well as group radio-actives and associated materials [525] and it amounted to 24.7%. However, none of the product groups had a significant share in the structure of Polish exports to China (0.17%-1.32%).

The analysis explicitly shows that Polish exports to the Chinese market are far from using the full potential. Product groups demonstrating the highest ITP values are ranked in further positions in the structure of Polish exports. Their share in the overall structure of Polish exports to China is often marginal, e.g. a group of vehicles for personal transport or plastic articles. Moreover, major product groups constituting Poland's exports to China still have the opportunity to increase their share in the absorptive market of the Middle Kingdom. The majority of top ten potential exports destinations of Table 1 indicated in the study, demonstrate a higher level of sophistication (stage of processing and technological intensity) than the current structure of exports. It is an important guidance in terms of the development and reconstruction of Polish exports to the Chinese market.

Table 1. Indicative trade potential and actual trade of Poland with China in 2016 (millions of dollars and per cent)

No.	Group of goods	XP_i	MA_i	XPA_i	Min (XP_i, MA_i)	ITP	XPAi/ITPi.	Actual exports' share
	Total	**196455.3**	**1589420.4**	**1911.1**	**196455.3**	**194544.1**	**1.0%**	**-**
1	[784] Parts & accessories of vehicles	11314.7	27056.5	79.0	11314.7	11235.7	0.7%	4.1%
2	[781] Motor vehicles for the transport of persons	7599.5	52971.7	2.1	7599.5	7597.4	0.0%	0.1%
3	[893] Articles of plastics	4378.7	4483.8	30.8	4378.7	4347.9	0.7%	1.6%
4	[713] Internal combustion piston engines, parts	4179.8	9929.4	8.3	4179.8	4171.6	0.2%	0.4%
5	[752] Automatic data processing machines	3910.7	16949.5	31.5	3910.7	3879.2	0.8%	1.6%
6	[699] Manufactures of base metal	3854.6	5167.3	25.7	3854.6	3828.9	0.7%	1.3%
7	[764] Telecommunication equipment & parts	3369.6	32886.8	50.4	3369.6	3319.2	1.5%	2.6%
8	[778] Electrical machinery & apparatus	3314.8	21177.0	65.4	3314.8	3249.5	2.0%	3.4%
9	[012] Other meat and edible meat offal	2897.7	4833.6	33.0	2897.7	2864.8	1.2%	1.7%
10	[553] Perfumery, cosmetics or toilet prepar. (excluding soaps)	2899.0	2749.5	6.1	2749.5	2743.4	0.2%	0.3%
11	[821] Furniture & parts	10500.5	2801.0	141.8	2801.0	2659.2	5.3%	7.4%
12	[773] Equipment for distributing electricity	2670.5	5444.1	44.9	2670.5	2625.5	1.7%	2.4%
13	[772] Apparatus for electrical circuits; board, panels	2539.4	32624.7	63.0	2539.4	2476.5	2.5%	3.3%
14	[542] Medicaments (incl. veterinary medicaments)	2472.0	15095.8	19.7	2472.0	2452.3	0.8%	1.0%
15	[641] Paper and paperboard	2242.7	3369.5	9.6	2242.7	2233.1	0.4%	0.5%
16	[334] Petroleum oils or bituminous minerals > 70 % oil	2209.3	14558.8	9.3	2209.3	2200.0	0.4%	0.5%
17	[714] Engines & motors, non-electric; parts	2127.0	5166.7	63.0	2127.0	2064.1	3.1%	3.3%
18	[682] Copper	2353.3	28066.7	379.2	2353.3	1974.1	19.2%	19.8%
19	[598] Miscellaneous chemical products	1871.9	12541.5	14.7	1871.9	1857.2	0.8%	0.8%
20	[743] Pumps (excluding liquid), gas compressors & fans; centr.	1814.9	10771.01	13.8	1814.9	1801.1	0.8%	0.7%

Top 20 groups of goods with the highest ITP. The number of merchandise classification group in SITC Rev3 Product is in brackets.

Source: (UNCTAD 2017), Author's own calculations.

The potential exports of Poland to China are also worth analysing according to the level of processing and technological intensity of products. Data contained in Table 2 illustrate a low technological advancement of Polish exports. In all categories, the actual exports cover a minor part of the potential exports.

Table 2. Indicative trade potential and actual trade of Poland with China in terms of technological intensity, 2016 (millions of dollars and per cent)

Group of goods	XP_i	MA_i	XPA_i	Min (XP_i, MA_i)	ITP	XPAi/ITPi.	Actual exports' share
Primary products	17507.3	306347.1	462.6	17507.3	17044.8	2.71%	24.2%
Resource-based manufactures: agro-based	24921.1	80891.4	170.3	24921.1	24750.7	0.69%	8.9%
Resource-based manufactures: other	9750.4	230234.1	146.3	9750.4	9604.1	1.52%	7.7%
Low technology manufactures: textile, garment and footwear	9139.4	32896.5	25.8	9139.4	9113.6	0.28%	1.4%
Low technology manufactures: other products	34151.5	48801.6	263.0	34151.5	33888.5	0.78%	13.8%
Medium technology manufactures: automotive	22844.1	82012.2	84.6	22844.1	22759.6	0.37%	4.4%
Medium technology manufactures: process	16173.3	124182.7	73.6	16173.3	16099.7	0.46%	3.9%
Medium technology manufactures: engineering	35263.4	199795.0	385.1	35263.4	34878.3	1.10%	20.2%
High technology manufactures: electronic and electrical	18649.8	346665.5	220.5	18649.8	18429.3	1.20%	11.5%
High technology manufactures: other	5477.8	134333.7	73.9	5477.8	5403.9	1.37%	3.9%
Unclassified products	2577.1	3260.5	5.4	2577.1	2571.7	0.21%	0.3%

Products classification groups on the basic of Lall (2000).

Source: (UNCTAD 2017), Authors' own calculations.

The highest share is observed in the case of primary products (2.71%). At the same time, primary products have the highest share in actual Polish exports to China (24.2%). It

turns out that the highest value of potential exports sent to China is observed in the case of products classified in the "medium technology manufactures: engineering" class (almost 34.8 billion). In 2016, this group of goods accounted for 20.2% of Polish exports to China. A slightly lower exports potential is observed in the goods category "low technology manufactures: other products" (USD 33.9 billion). Resource-based manufactures: agro-based occupy the third position (almost USD 24.8 billion). For those three product types, the largest market niche for Polish exports appears. However, for the purpose of highlighting the Polish presence in the Chinese market, the increase in the exports of more technologically advanced goods would be more important. The actual value of exports of this product category in 2016 amounted to 15.4% of the total exports to the Middle Kingdom. Polish exports of high technology goods cover slightly over 2.5% of potential exports that could be directed to the Chinese market. Overall, the ITP for all types of high technology products in 2016 amounted to over USD 23.8 billion, including: USD 18.4 billion for the "high technology manufactures: electronic and electrical" subcategory and USD 5.4 billion for "high technology manufactures: other". Both subcategories of goods covered 1.2% and 1.37%, respectively, of the potential exports to the Middle Kingdom. In general, the share of exports categorised as the highest technology for Poland is still too low for a highly developed country[6].

Summary

Polish exports to the Chinese market demonstrate a low level of sophistication and they are insignificant as compared to the size of imports. The New Silk Road offers the opportunity to Poland in the scope of catching-up exports arrears. The analysis presented in the paper has confirmed that Poland almost fails to use its export opportunities to the Chinese market[7]. Only in the case of less advanced products, Polish exports covered potential exports to a larger extent. The current commodity structure of Polish exports to the Middle Kingdom places our country among insignificant suppliers and the high value of goods imported from China to Poland shows a considerable asymmetry in mutual trade relations. In addition, the negative trade balance with China continuing for years and a limited restructuring of the structure of goods exported to this market, indicate very neglected exports and treating the Chinese market as an occasional purchaser of our goods rather than a permanent partner towards which a long-term export strategy should be developed.

Obviously, one should be aware of the limitations of the method applied in the study.

First of all, the analysis conducted is of an *ex post* nature, i.e. it does not take into account future changes in the conditions of development of trade exchange between Poland and China. A certain probability exists that as a result of the implemented OBOR strategy and efforts of the authorities (especially the Polish party), exports to the Chinese market will intensify in the coming years.

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[6] In 2016, the share of such exports reached only 12.3%, whereas the share of high technology directed to China in exports amounted to 15.4% in 2016. Primary products have the highest share in Polish exports to the Middle Kingdom (approximately one-fourth of exports) (UNCTAD 2017).

[7] The aversion of the Polish exporter to the Chinese market partly arises from numerous trade barriers faced by it in China.

Secondly, the construction of the indicative trade potential applied is based on the assumption that Poland's exports in the scope of specific goods may be assigned for covering the Chinese demand for imported goods and the presented values of Poland's potential exports to the Middle Kingdom are only indicative. Therefore, the results obtained may be treated as specific guidelines concerning the future directions of Polish exports to the Chinese market.

Thirdly, alternative methods of calculating the potential trade value exist. Methods adopted in the studies of Kabir and Salim (2011), Pastore et al. (2009), or Salim et al. (2011) may serve as an example of a different approach. The afore-mentioned alternative methods may be used in the future to supplement the analysis conducted.

Notwithstanding the limitations of the method applied, the analysis has demonstrated that the structure of Polish exports to the Chinese market in 2016 did not allow for the full use of the capacity. Polish exporters practically neglected the most prospective groups of goods for which demand exists in the Chinese market. Moreover, Polish exports concentrate on product groups which are less prospective, i.e. those with a lower value of potential exports.

Using the opportunities resulting from the accession to the OBOR by Poland depends, to a large extent on the construction of a coherent strategy and vision related to Poland's role in the project. Summit meetings or minor initiatives associated with the OBOR must be supported by specific measures aimed at strengthening the cooperation. Any such events should be concluded by signing contracts or negotiating more favourable conditions for Polish businesses operating in China.

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Paradigm of Financial Provision of the Agricultural Land Restoration in Ukraine

Abstract. The purpose of the research was to determine the system of measures aimed at financial provision of restoration and improvement of the fertility of the agricultural lands, which are an important part of the state strategy for the development of the Ukrainian economy agrarian sector. Characteristics of land use in European countries and Ukraine were presented. The sources of financial provision of agricultural land restoration were analyzed. The measures aimed at successful restoration of fixed assets of agrarian enterprises, in particular land resources are proposed.

Key words: financial provision of agricultural land restoration, state strategy, agrarian sector, agrarian enterprises, restoration of land resources, financing programs, preferential loans

JEL Classification: Q15

Introduction

The main problem of the development and reform of land relations in Ukraine is the continued deterioration of living conditions in rural areas. Life in the village is becoming less attractive; the number of peasants interested in agricultural activities is decreasing; there is a change in the age structure of the village due to the population aging; the processes of migration of the rural population, including economically active, in search of better living conditions, etc. is expanded. All this leads to the rapid degradation of the villages and their disappearance from the map of Ukraine (Hvesyk et al., 2013).

After all, according to the State Statistics Service of Ukraine, during 2013-2016 800 Ukrainian villages disappeared from the map of our country; 9,232 villages have no business entities; in 4,097 villages there were no registered newborns during this period, and in more than 3,500 villages there are no children under the age of 5.

In addition, the current ecological situation in Ukraine can be characterized as a crisis. Every year, according to the State Statistics Service of Ukraine, the air, water and land resources are contaminated with about 11 million tons of dangerous pollutants, of which 57% are harmful emissions into atmosphere, 40% - in surface water bodies, 3% - hazardous waste, polluting land resources.

In particular, during 2016, 3.1 million tons of pollutants and 150 million tons of carbon dioxide were released into the atmosphere. In the total number of harmful substances, emissions of sulfur dioxide and nitrogen oxide (which belongs to greenhouse

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gases) are respectively 1,076.4 thousand tons and 240.2 thousand tons. The size of environmental damage from production activities (losses of land, water and forest resources, pollution of the environment, etc.) in Ukraine, according to experts, exceeds UAH 50 billion each year.

The issue of financial provision, its availability and adequacy are one of the key tasks that can successfully solve the issues of conservation, improvement of agricultural lands, and thus the revival of Ukrainian villages.

Thus, the purpose of the research is to determine the system of measures aimed at financial provision for the restoration of land resources, which is an important part of the state strategy for the development of the Ukrainian economy agrarian sector.

The land in agriculture is spatially limited and is not artificially restored. Therefore, the prerequisite for expanded restoration in agriculture is the rational use of land and the implementation of measures for its restoration by preserving its fertility and environmental suitability.

In recent years one can observe how the rhetoric of specialists dealing with land valuation changes. If several years ago, on the pages of the leading editions, it was possible to read about unique Ukrainian black earths, that they were the best, and that a quarter of the world's black earths fell to Ukraine, then today there are growing questions about the thoughtless cultivation of Ukrainian lands. So, as of 2017, more than 70% of Ukraine's land is occupied by agricultural lands. In the context of modern challenges, the primary task is to restore them.

Restoration of lands implies preserving and improving their fertility and environmental suitability. In order to maintain and improve the earth's fertility, the necessary financial provision is required.

The mechanism of financial provision for land restoration is rather complicated and insufficiently investigated. In the first place it is advisable to determine the methods and possible sources of financial support for the land restoration.

Depending on the strategy of financial policy and the state of the economy, financial regulation tools can exercise their influence in the form of constraints or incentives. It is worthwhile to distinguish the main forms (incentives, restrictions) and instruments (taxes, lending, price regulation, budget financing and investment) of financial regulation of the state economic development. It should also be noted that the choice of financial instruments and the degree of their influence should be laid incentive. In this case the financial regulation can play a significant role in ensuring economic development (Zelensky, 2016).

Thus, T.V. Mayorova distinguishes the following methods of financing: self-financing, corporatization, lending, budget financing, financing through free and charitable contributions, mixed funding (Mayorova, 2009).

I. Blank distinguishes the following methods of financial provision: self-financing; corporatization; loan financing; leasing; mixed funding (Blank, 2012).

But nowadays the direction of investment in the agro-industrial complex of Ukraine is accompanied by a number of obstacles. The main factors that negatively affect the investment climate and predetermine the high risk of investing in agribusiness are the overly prolonged and inconsistent character of market reforming of the economy, legal, economic and political instability, imperfect financial and credit and tax system, low level of market infrastructure development, lack of land market, etc. (Zelensky, 2016).

To date, it can be argued that the existing mechanisms for financing the agrarian sector of the Ukrainian economy, in particular mechanisms aimed at the restoration of land resources,

need to be improved. In addition, there is an urgent need to develop a new system of measures adapted to the economic, social and political conditions in which the agrarian sector of the Ukrainian economy operates. It is this system of measures that should be the basis for a strategy aimed at financially supporting the restoration of agricultural lands.

Stages of the research and methods

The research involves the implementation of three stages.

The first stage involves an analysis of the current situation in Ukraine regarding mechanisms for financing the agrarian sector of the Ukrainian economy, in particular mechanisms aimed at the restoration of land resources.

Under the first stage of the study, method of analysis was used to study methodological approaches, concepts and proposals concerning financing mechanisms for the agrarian sector of the Ukrainian economy. The analytic and the systemic approaches were used for the analysis of legislative acts and other normative documents regulating relations in the area of land relations and state financial support of the agroindustrial complex in Ukraine.

The second stage involves: an analysis of the financial support under the state (budget) programs aimed at the development of the agroindustrial sector in Ukraine during the past 4 years; identification of the factors that restrain the restoration of land resources; as well as an assessment of the agrarian enterprises' ability to self-finance the restoration of fixed assets.

Under the research second stage, the following methods of scientific study have been applied: historical, analytical and logical methods - in the analysis process of agrarian enterprises' financial results; effectiveness evaluation of the state financial support to the agroindustrial sector; as well as analysis of the land resources' structure and information related to exploitation of land resources.

The third stage of the study involves using the abstract and logical methods to prepare the complex of measures for increase efficiency of the financial support strategy for restoration of land resources.

The research results

The results of the conducted research determined that the possible sources of funding for all methods of financial support for the restoration of agricultural lands are as follows: a) profit; b) depreciation deductions; c) funds from the sale of used fixed assets; d) funds from the issue of shares; e) bank loan; f) forfeiting; g) mortgage loan; h) public credit; i) foreign credit; j) bond loans; k) agricultural receipts; l) operating and financial leasing; m) investment tax credit; n) subsidies, grants, subventions.

The use of funds from these sources will attract and effectively use funds for financial provision for the land restoration, taking into account the state of material and technical fixed assets, considering sources and conditions for obtaining funds, organizational forms of activities of enterprises, forms of ownership of sources.

Most of the possible sources of financial provision for the restoration of fixed assets in practice are virtually not used in Ukraine, especially in agrarian enterprises.

The basis for self-financing the restoration of fixed assets of business entities is net income and depreciation deductions. We will analyze and try to evaluate the possibility of agrarian enterprises to self-finance the restoration of fixed assets (Table 1).

Table 1. Own Financial Resources of Agrarian Enterprises In Ukraine, 2010-2016 years

Ratios/Years	2010	2011	2012	2013	2014	2015	2016
Net profit, billion UAH	17.3	25.3	26.7	15.1	21.7	103.1	90.7
Amortization deductions, billion UAH	4.0	4.9	6.5	7.0	8.3	10.2	11.0
Total net profit and depreciation deductions, billion UAH	21.3	30.2	33.2	22.1	30.1	113.3	101.7

Source: prepared on the basis of statistical data (Statistical Yearbook of Ukraine "Agriculture in Ukraine for 2016", 2017).

Data analysis in Table 1 allows us to conclude as follows. Positive is the growth of the amount of depreciation deductions from UAH 4 billion in 2010 up to UAH 11 billion in 2016, i.e. in 2.75 times. The increase in the amount of depreciation deductions increases the ability of agrarian enterprises to provide independent financial provision for the restoration of agricultural lands.

Positive is the growth of the absolute amount of net profit of agrarian enterprises from UAH 17.3 billion in 2010 to UAH 90.7 billion in 2016. However, there is a fluctuation in the amount of net profit of agrarian enterprises in certain years. There is no doubt that fluctuations in the net profit of agrarian enterprises are due to the specifics of agrarian production, its dependence on natural conditions, their changes in some years, fluctuations of world prices for agricultural products and increased costs of its production. Fluctuations in the volume of net profit depends on the organizational forms of activity, the size of the enterprise. In 2010-2012, the growth of net profit of agrarian enterprises of Ukraine grew by 55%. But in 2013 there is a significant decrease in net profit – in 1.8 times. In 2016, compared to 2010, net profit increased by 524.28%. However, the profit of agrarian enterprises cannot be considered as a fairly stable source of financial support for the restoration of agricultural lands. Indeed, under such an economic situation, which is characterized by extremely high inflation (over 230% from 2010 to 2016), a significant part of the profits of agrarian enterprises is 'eaten'.

Own financial resources in agrarian enterprises are not enough to allocate them to the restoration of agricultural land; therefore, external sources of financial provision are important.

The rural development support programs and namely, expenditures for the development of agricultural servicing cooperatives, farms, agricultural advisory services provide insignificant and volatile funding (Ostaszko et al., 2010).

However, if we analyze the use of land by types of economic entities in 2016, then a significant proportion falls on agricultural households – 36.76% (Table 2).

Attention is also drawn to the destructives of the budgetary financial support of the state. First of all, it concerns the financing of agricultural lands, because in the EU, financial support for agricultural development is not directly related to the efficiency of cultivating products (Shchuryk, 2016). Thus, in the EU, farmers receive direct per-hectare payments that are not related to production efficiency (this support ranges from USD 500-600 in the EU countries to USD 200-300 in the USA and Canada), and only a few countries apply the practice of payments related to the productivity of agricultural activity (Ostaszko et al., 2010).

State support can be direct and indirect. In Ukraine, direct state support for agriculture remains low compared to EU countries. According to Annex 2 to the Agreement on Agriculture of the WTO, 1994, all measures for state support to agriculture are conditionally divided into three groups, or distributed in colored boxes: "green", "blue" and "yellow".

Table 2. Use of Agricultural Lands by Types of Economic Entities (as of 2016)

Business entities	Number of thousand units	Agricultural lands		Ploughlands	
		thousand units	specific weight, %	thousand units	specific weight, %
Agricultural households	13.0*	15706.4	36.8	11655.8	35.8
Agricultural enterprises		20746.9	48.5	19476.1	59.9
- private	3.6	19809.9	46.4	18702.2	57.5
- state	0.2	937	2.1	773.9	2.4
Enterprises of other business patterns	33.2		14.7	1409.4	4.3
Total	45.4**	42726.4	100.0	32541.3	100.0

* number of rural population, million people
** the total amount of economic entities is indicated excluding households in rural areas

Source: prepared on the basis of statistical data (Statistical Yearbook of Ukraine "Agriculture in Ukraine for 2016", 2017).

The financial support of agricultural producers in Ukraine (mostly indirect - at the expense of special regime) barely reaches 40 euros per hectare. Currently, almost 80% of financial assistance from the state budget is accounted for big companies or agroholdings. At the same time, as evidenced by the experience of the EU countries, the USA and Canada, the medium and small agricultural enterprises represented by the absolute majority of farmers are prevailing in the agriculture. Characteristics of land use in European countries and Ukraine are presented in Table 3.

Nowadays the state strategy of enhancement of management in the field of use and protection of lands of agricultural in Ukraine is not effective. Such conclusion is confirmed by the analysis of the indicators mentioned in the Table 3.

Table 3. Comparative characteristics of land use in European countries and Ukraine

Characteristics	Ukraine	European countries	Countries of EU
Land area, mln hectares	60.4	1015.6	437.4
Chernozem area, mln hectares	28.0	84.0	18.0
Area of agricultural land, mln hectares	42.7	474.8	177.7
Area of arable land, mln hectares	32.5	277.8	115.7
The share of leased agricultural land, %	97.0	62.0	53.0
Area of organic agricultural land, mln hectares	0.3	11.6	5.3
Area of irrigated land, mln hectares	0.5	20.8	11.1
Investment, USD thousands /1 hectare	1.0	4.0	5.5
Grain exports, mln tons	34.8	130.0	38.5
Area of agricultural land, hectares / person	0.7	0.6	0.4
Price per one hectare of agricultural land, USD thousand		3.7	7.2

Source: Strategy to improvement of land management mechanism in Ukraine, June 7, 2017.

Thus, the results of the analysis of the European countries legislation show that each of them (countries) have various restrictions in the area of using and protection of agricultural lands. Restrictions related to the size of land plots are characteristic of countries with economies in transition and countries with limited land resources. As a rule, such restrictions are established at the municipal or regional level, in particular: Hungary - no more than 300 hectares (for individuals and legal entities); Romania - no more than 200 hectares (for individuals and legal entities); Denmark - no more than 30 hectares (for persons who have professional education and farmer experience) (Strategy to improvement of land management mechanism in Ukraine, June 7, 2017).

Inefficient use of land resources as well as depletion of soil fertility in Ukraine are explained by an extremely high proportion of land cultivation, absence of appropriate restrictions on land use, as well as the lack of clear requirements for land users.

The expenditures financing by the Ministry of Agrarian Policy and Food of Ukraine at the expense of the State Budget Special Fund is presented in Table 4. As we see, the total amount of financing of the agroindustrial complex at the expense of the State Budget Special Fund for the last two years has decreased by 294.6 million UAH. So, since 2015, implementation of the budget program of financial support of the livestock sector has been suspended.

Lending is very significant in financial support for the restoration of agricultural lands, due to lack of own funds. At the same time, obtaining loans to agricultural enterprises of Ukraine remains problematic. The lending to agrarian enterprises is negatively impacted by: growth of interest rates on loans (increased from 14.9% in 2010 to 16.1% as of July 2017, with a decrease in the profitability of fixed assets of agrarian enterprises from 18.4% in 2010 to 10.8% in 2017); lack of a specialized agricultural bank (only 8 banks offer individual loan repayment schedules, taking into account the peculiarities of agrarian enterprises); reduction of state financial support of agrarian enterprises through the loans cheapening mechanism (from UAH 50 billion in 2000 to planned UAH 300 million in 2017); high requirements of banks in lending agrarian enterprises to mortgage property and its insufficiency.

Land resources are the main productive force in agrarian enterprises, the restoration of which largely depends on their financial support. Insufficient amounts of financial resources restrict the use of such a form of restoration of land, as reclamation. Land reclamation is a complex of works aimed at restoring productivity and economic value of disturbed lands, improving environmental conditions (Danylyshyn, Hvesyk, Holian, 2009). Land reclamation requires significant financial resources available for agribusinesses (agricultural holdings) and not available for small and medium-sized agribusinesses. However, even if there is sufficient financial resources, agricultural holdings do not provide full land restoration. The main reason, in our opinion, is irresponsible attitude to the land, because owners consider the land only as a commodity. The irresponsible activity of a modern human generates degradation phenomena in many spheres of social life, and agriculture isn't an exception.

Therefore, at the state level, it is necessary to oblige all economic entities, regardless of the organizational and legal form, to financially ensure the restoration of the land cultivated by them.

At the end of 2016 there were 47,697 agricultural enterprises in Ukraine, which owned and used 19.8 million hectares of agricultural lands; 18.9 million hectares of ploughland (Statistical Yearbook of Ukraine "Agriculture in Ukraine for 2016", 2017).

Table 4. Expenditure financing by the Ministry of Agrarian Policy and Food of Ukraine at the expense of the State Budget Special Fund

Expenditures	2014	2015	2016	2017	(+;-) 2017/2014
Apparatus of the Ministry of Agrarian Policy and Food of Ukraine	1941.5	200.9	180.8	1646.9	-294.6
Research, applied scientific and technical developments, works on state target programs and government orders in the field of development of agroindustrial complex, research and experimental development in the field of agroindustrial complex	33.5	35.3	37.2	48.5	15.0
Qualification improvement of agroindustrial complex specialists	6.7	6.6	6.6	8.5	1.8
Training of personnel for agroindustrial complex by higher educational institutions of the I-IV levels of accreditation	808.4	-	-	-	-808.4
Financial support of events in the agroindustrial complex	5.0	5.0	5.0	-	-5.0
The expenditures of the Agrarian Fund related to the complex of measures for storage, transportation, processing and export of objects of state price regulation of the state intervention fund	100.0	100.01	100.0	51.4	-48.6
Increase of the authorized capital of NJSC Ukragroleasing for the purchase of technical means for agroindustrial complex with their subsequent transfer under financial leasing conditions	-	54.0	-	-	x
Organization and regulation of activity of institutions in the system of agroindustrial complex and provision of activities of the Agrarian Fund	-	-	32.0	33.5	33.5
State support for the development of hop-growing, the laying of young gardens, vineyards and berries	100.0	-	-	-	-100.0
State support to the livestock sector	888.0	-	-	-	-888.0
Financial support of agricultural producers	-	-	-	1500.0	1500.0

Source: prepared on the basis of Law of Ukraine "On the State Budget of Ukraine for 2017".

On the other hand, in Ukraine there continues to be an extremely high proportion of land cultivation (Fig. 1). In Ukraine, more than 92% of the territory is involved for economic use. Extremely high is the level of cultivation of the territory and is more than 54% (in the developed countries of Europe it does not exceed 35%). The actual forest area of Ukraine is only 16%, which is not enough to ensure environmental equilibrium (the average indicator of European countries – 25-30%) (Strategy to improvement of land management mechanism in Ukraine, June 7, 2017).

Such a high level of land cultivation leads to a disturbance of the ecologically balanced ratio of land resources, namely agricultural lands, forests and reservoirs. In turn, this negatively affects the stability of agro-landscapes and causes a significant technological burden on the environmental sphere.

Much of the low-yielding land is part of the arable land: almost every 5th hectare of arable land falls on low-yielding land. With the use of land, there is a tendency to maximize the area of agricultural lands, especially arable, which leads to the intensity of degradation

processes. At the same time, land seizures for non-agricultural use often occur at the expense of suitable ones. A significant drawback is the unsystematic monitoring of quality soil parameters and anthropogenic loading carried out by economic activity, which makes it practically impossible to analyze the state of assimilation potential of the territory. Its systematic conduct will allow timely identifying any deviations from the established norms and assessing the possibility of using the territories under ecologically safe production. This confirms the necessity of urgent development and introduction of measures for optimization of land use, prevention of degradation processes, increase of agriculture productivity (Lisova, 2015).

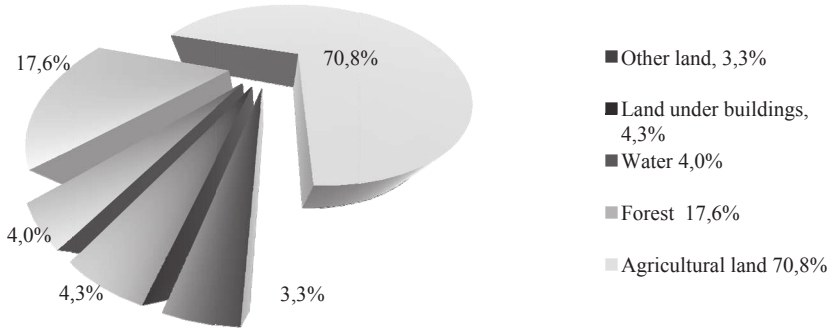

Fig. 1. Land area of Ukraine at 1 January 2016

Source: prepared on the basis of Strategy to improvement of land management mechanism in Ukraine, June 7, 2017.

Agrarian enterprises of Ukraine do not fully utilize the competitive advantage of natural potential of land in the cultivation of agricultural products. More than 90% of land resources, used by agrarian enterprises in Ukraine, are used on lease terms. Therefore, agrarian enterprises are aimed at increasing the volumes of crops and maximizing profits, violating the optimal structure of the acreage of agricultural crops, oversaturating land with herbicides, mineral fertilizers and other chemicals, which causes accelerated depletion of the soil and deterioration of its qualitative properties. That is, there is no real landowner who would be interested in preserving and restoring its natural potential. As of 01.01.2015, 4.8 million lease agreements for land shares with a total area of more than 17 million hectares or 64.4% of the total area of shared if agricultural lands were concluded. Therefore, agrarian enterprises conduct their economic activity mainly on leased land, which accounts for over 93% of their total land use (Lisova, 2015). The situation over the past two years has not changed.

The inefficiency state policy in the field of land use (high proportion of land cultivation, lack of effective organizational and financial mechanisms to prevent soil fertility decline) has a negative impact on the agrarian sector development, in particular on agricultural production and productivity (Fig. 2).

The mentioned above proves that nowadays restoration and improvement of the fertility of the agricultural lands are an extremely significant problem for Ukraine. There are the following conclusions made on the basis of the research results:

1. One of the features of land is its ability to natural self-restoration. At the same time, centuries-old practice knows two variants of natural preservation of the earth:

- scientifically grounded application of crop rotation;
- full rest of the land from crops (use of complete fallows).

Restoration of land in a natural way does not require additional, substantial costs, and hence financial resources. But the implementation of this direction of (natural) land restoration requires a clear (effective) administrative control system which should be combined with the simultaneous use of economic and financial levers.

2. The use of land as a means of production in agriculture requires taking into account the biological laws of the natural development, conservation and restoration of natural resources. The imperfection of technological processes of modern production exacerbates environmental problems in agrarian enterprises. Therefore, in the process of expanded restoration implies the increase of costs for restoring and preserving natural resources, in particular, restorating soil fertility.

3. Reduced land quality occurs in agriculture due to excessive saturation of land with mineral fertilizers, pesticides, herbicides. Their intensive use by agrarian enterprises is due to: failure to crop rotation; violation of the optimal structure of sown areas of agricultural crops; orientation on the production of certain crops that have a high level of profitability; specialization of large agrarian enterprises on growing of export-oriented agricultural crops of the grain group. The saturation of land with various chemicals is accompanied by a decrease in the quality of agricultural products, the receipt of products harmful to the health of people and animals consuming such products.

4. It is advisable to exempt economic entities who give full rest to the land (exempt it from crops) from the taxation of these land (upon payment of a single tax).

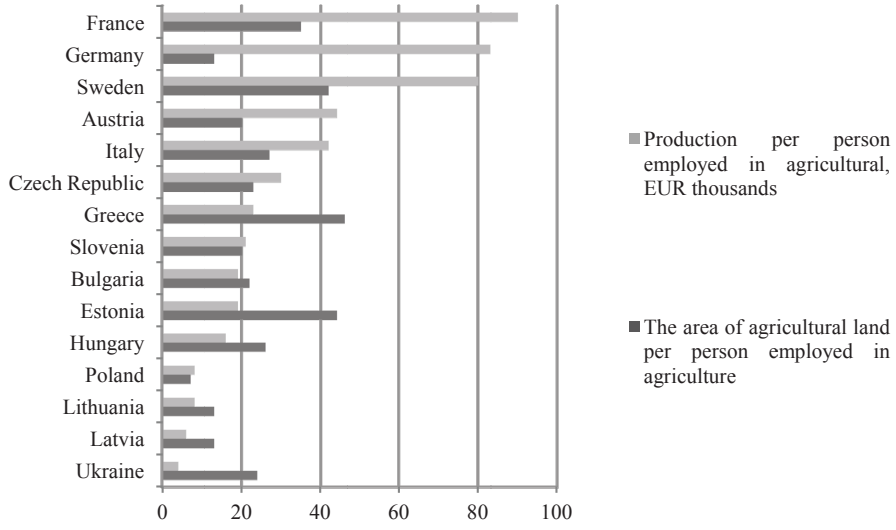

Fig. 2. Production and area of agricultural land per person employed in agriculture

Source: Strategy to improvement of land management mechanism in Ukraine, June 7, 2017.

The land share used for complete fallows from the total area of land used by the business entity must be scientifically justified for individual regions, natural zones, depending on the specialization in the cultivation of individual crops. Some economic sanctions (penalties) can be applied to the economic entities that do not adhere to the norms for using the land under complete fallow.

In the case of business entities, which adhere to or do not adhere to the recommended crop rotation, it is possible to establish certain privileges or apply penalties.

Conclusions

The agrarian sector is a strategically important sector of the Ukrainian economy. The strategy of financial support for restoration of land at the macro level should be consistent with the overall national strategy for agricultural development. Despite the significant problems associated with land degradation due to non-compliance with crop rotation, the uncontrolled use of chemical fertilizers and the lack of organic fertilizers, Ukraine still has potential for successful land restoration. For this, at the state level, it is necessary to carry out the following measures:

- to develop a strategy of financial provision for restoration of land at the macro level;
- to contribute to ensuring a stable economic situation in the country in order to attract investments in the agricultural sector, and, in particular, for land restoration;
- introduction of permanent monitoring of the use of funds received from the state for land restoration (for this purpose, it is expedient to improve the financial reporting on the use of state financial support funds);
- exempt from taxation the part of the land to which the natural restoration applies (complete fallows);
- to create the legal and economic preconditions for restoration of the fertility of the agricultural lands by improvement of legislation basis for related to land management. For example, the State Budget of Ukraine provides for the allocation of funds for the implementation of environmental protection measures at the expense of funds received under the article "environmental tax", where 53% of the total amount received from paying this tax should come to the special fund of the State Budget of Ukraine. At the same time, in the budget, in particular in this part, there is no specification of environmental measures for which these funds are allocated.

Moreover, during the past 4 years, capital investments and current expenditures on environmental protection measures have risen from 20.4 billion UAH in 2013 to 32.5 billion UAH in 2016. But just only 325 million UAH in 2013 and 420 million UAH in 2016 were aimed at protecting and rehabilitating the soil. It should be noted that such financing is inadequate and ineffective. Based on the results of conducted statistical surveys, the main source of financing for a complex of measures aimed at protecting the environment (capital investment) is the own funds of enterprises, and only about 2.8% of the total funding is financed from the State Budget of Ukraine. It is the same situation related to the current expenditure on environmental protection.

However, now it is difficult to say how many financial costs are required to implement an effective integrated program for agricultural land restoration. First of all, it is necessary to create such program as well as clearly define the system of measures within the framework of such program. Just in this case there will be possible to calculate the required financing.

Summarizing the results of the conducted research it was established that at the state level, the strategy aimed at financial support for the restoration of agricultural lands should be realized through: creation of the legal preconditions, implementation of special financing programs, granting of preferential loans, attracting foreign investments, preferential taxation conditions.

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Relational Premises in the Cooperation Between Farms with Conservative Breeds and Industry Organisations[2]

Abstract. The main aim of the study was to indicate relational premises in the cooperation between industry organisations and farms with conservative breeds (cattle, pigs, and sheep). It has been assumed that the processes of integration of domestic animal breeders depend on the state of the relationships established (in terms of quality, sustainability, dependence and uniqueness) with industry organisations. The research was carried out on the basis of an interview questionnaire (in 2017) with farmers from south-eastern Poland, representatives of organisations, and a review of secondary sources describing the activities of industry organisations since the beginning of their existence. The specificity of the entities under analysis stems from their role and responsibilities. Breeders contribute to the growth of biodiversity, while industry organisations are an important partner in their relationships as they support farms (they mediate in the contracting process, organise trainings, represent the interests of producers in Poland and abroad). Preliminary results of the research indicate that the best conditions for cooperation are in the networks of breeders of conservative breeds of pigs as well as in interorganisational relationships with the 'POLSUS' industry organisation.

Key words: network relationships, producers and breeders of conservative breeds, industry organisations

JEL Classification: Q13, P48, O43

Introduction

The study of human relationships as well as economic relationships is based on the network theory. We treat our interactions as a source of satisfying our needs and creating added value.[3] The benefits of developing interorganisational relationships include an increase in knowledge and innovativeness (Cygler, 2002, 2007, p. 17; Czakon, 2007, p. 248; Krzyżanowski, 1999, p. 165; Latusek-Jurczak, 2011, p. 19 and others). Creating inter-organisational relationships and bonds grants access to resources, resulting in faster development and higher levels of efficiency (Lorenzoni, Lippari, 1999, p. 317-338).

As relationships provide numerous desirable benefits, they can be perceived as valuable assets, and, therefore, should be monitored. This is because there is a real possibility of multiplying or losing the benefits of the relationships.

Modern agriculture has many models of production, from traditional (ecological) to sustainable, to industrial or high-tech. Due to the changing levels of biodiversity and consumer preferences (an increase in awareness and wealth), animal production is carried

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[3] This generally concerns economic benefits from the relationships in which the examined entities take part.

out in new conditions of integration (and globalization). A closer look reveals that producers (breeders) and industry organisations fulfil new functions. The history of industry organisations repeatedly confirms that the process of adaptation to the changing socio-political conditions is ongoing. The new context for perceiving the role of industry organisations as associations implementing the biodiversity Programme raises the question as to what extent they are ready to fulfil the new role and support farms? Do relationships developed between them give hope of development of farms through a network of relationship of cooperation?

The main objective of the study was to indicate relational premises in the cooperation between industry organisations and farms with conservative breeds (cattle, pigs, and sheep). The specific objectives included:

1. Description of the involvement of industry organisations in actions supporting member producers and breeders.
2. Assessment of the relations between farmers and industry organisations in terms of quality, sustainability, dependence and uniqueness.
3. Opinions on "good relations" of cooperating farmers and organisations (what is a good relation?).

The following research questions were posed: Do farmers and industry organisations rate the relations similarly? In which cases are the relations (between farmer and institution) the most harmonious? Which relation quality characteristics can be considered satisfactory and which require improvement (due to a low rating)?

The subject of the study was the farms with animals of conservative breeds and the best organised industry organisations of the supra-local nature, with which they established formal relationships. The specificity of the farms results from their role and responsibilities. By maintaining the breeds of protected animals, breeders commit themselves to complying with certain procedures and, thus, increasing biodiversity. Breeders establish formal relationships with various institutions, including, apart from the aforementioned industry organisations, the National Research Institute of Animal Production in Balice (the coordinator and implementer of the protection of farm animals[4]), the Agency for Restructuring and Modernization of Agriculture (ARMA)[5] (which transfers subsidies to livestock units covered by the biodiversity protection Programme), the Agricultural Advisory Centre, Veterinary Inspection, banks, municipal offices, universities, feed suppliers, and customers.

Industry organisations participate in activities which support farmers and processes of transformation in agriculture by influencing the state agricultural policy, amending the legislation, representing their interests in the European institutions (in Brussels) and global organisations (IHAR), and providing services (issuing certificates for breeding animals) (Grzybek, 2003, p. 32; Halamska, 2006, p. 35; Kawa, Grzybek ,2009, p. 128;

[4] The National Research Institute of Animal Production in Balice determines the criteria, thresholds and the number of animals which indicate that breeds are endangered; it establishes the program for the protection of endangered breeds; it supervises the implementation of and coordinates programs for the conservation of genetic resources. Downloaded: 7 October 2017, from: http://www.arimr.gov.pl/fileadmin/pliki/PB_2015/WPRE/03_03_2017/PRSK_2017_Pakiet_7.pdf.

[5] The Agency for Restructuring and Modernization of Agriculture (ARMA) plays its role at the beginning of the process of applying for co-financing of farms. The applications for the first and subsequent agri-environmental payments are submitted with the head of the Agency's Poviat Office, competent for the farmer's place of residence or registered office, within the deadline set for submitting applications under the direct support schemes.

Kołodziejczyk, Milczarek-Andrzejewska, Śpiewak, 2015, p. 67; Miś, 2008, p. 60; Wasilewski, 2005, p. 9; Wójtowicz-Dawid, 2011, p. 335). It should be mentioned that in the present economic conditions, industry organisations are becoming involved in the process of improving the institutional system. The improvement of the institutional environment in which farms with animals of conservative breeds operate, is achieved by various means, such as: replacing ineffective institutions with more effective ones, experimenting in the area of institution building and allowing institutions to compete on the regional, national and transnational level (Wilkin, 2003, p. 50). Industry organisations enter the path of building an institutional order aimed at EU socio-economic cohesion and the harmonization of legal standards (Woźniak, 2009, p. 9).

The interest in the relationships established between farms with conservative breeds and industry organisations stems from the needs of both practice and theory. This is, among others, the continuation of the author's research on the relationships among groups of agricultural producers (GAP). The attempt made to determine the conditions for creating high-quality cooperation[6] filled **the cognitive gap in the area of relational variables** responsible for biodiversity development with the participation of breeders of conservative breeds, and industry organisations.

Theoretical justification for the analysis of relationships in network-based structures

The study of network relationships can be explained by different theories. One of the most significant is the theory of transaction costs (TC). R.H.Coase (1988), the author of the transaction costs put forward a hypothesis that the networks appear in response to the constraints of the mechanisms for the coordination of business activity (of the market and enterprise). Subsequently, W.W. Powell (1990) modified the assumptions of the TC theory by pointing to the network as a separate form of coordination. From the point of view of the analysis of the functioning of organisational networks, contractual theories are of great importance, as they analyse the contents of the 'black box', including: property rights, information asymmetry, resource specifics, limited rationality, contract incompleteness, power, opportunism or the risk of abuse. Referring to information asymmetry, S. Balakrishnan and M. Koza (1993, p. 99-117) emphasise that the organisation that has the information has more bargaining power, which makes the relationship asymmetrical.

Contract orientation modified the perception of the enterprise (the nexus of contracts became the subject of analysis), but it also allowed for the formulation of any problem in terms of the contract, and, consequently, made its analysis possible through the prism of transaction costs (Williamsom, 1998). The theory of property rights, which is focused on specific contractual relationships with asymmetric position of the parties participating in the contracts, also carries a cognitive value. Identifying and analysing this asymmetry also extends the cognitive value of the research on relationships, transferring them to the realms of the agency dilemma (Arrow, 1985).

[6] Selected results of the research are presented, among others, in the publication of M. Domagalska-Grędys (2016).

The data and methods

The analysis of the relationships between farms and organisations was carried out with due regard of the historical background of industry organisations (the review of the literature) and own research, embedding the information obtained in the new economic reality (the implementation of agri-environmental Programmes). The opinions of farmers and employees of industry organisations in the context of the official declarations made by the organisations (based on their statute or descriptions on their websites) were of great importance. The aim was to objectively present the greatest amount of information which confirms the involvement of the institutions in resolving problems of farmers, or breeders of conservative breeds.

The testing instrument was a questionnaire of an interview**,** carried out by employees of the Agricultural Advisory Centre and the author with farms and representatives of organisations. The research was carried out in deliberately selected entities (farms[7] having the appropriate number of animals of conservative breeds) and the professional organisations of which the farms were members. The literature review and secondary data from the websites were used to analyse the industry organisations and their roles. The area of the research on farms included the provinces of south-eastern Poland (Małopolskie, Podkarpackie and Lubelskie). The research was conducted from June to September 2017.

The research task was to determine the state of the relationships (based on the characteristics[8]) that can affect agricultural producers (breeders) integration processes. It was assumed that integration processes depend on the state of the relationship (quality, sustainability, dependence) between participants. The focus was not on dependence (power) as such, but on the conditions of creating such dependencies, which were examined based on literature on network relations and selected results of own research[9].

The network approach, applied in the paper, resulted from highlighting the contacts between farms and industry organisations. The scope of the network environment was considered from the perspective of an individual farm, which, by joining the industry organisation, extends its network of connections with the environment. **The identification** of network relationships in the conventionally accepted network was based on three distinctive features, proposed by Milena Ratajczak-Mrozek (2009, p. 89), namely: continuity of interactions, interdependence and infinity.

[7] Approx. 100 farms and 30 cooperating institutions in the entire research trial. For the purposes of this publication, we used representatives of the farms with most influential conservative breeds: cattle, pigs and sheep of three industry organizations of which they were members. These are the preliminary results of the study.

[8] The selection of characteristics for relation assessment modelled on studies of the authors quoted in the paper, concerning the relations in networks of companies carrying out business activity in Poland and abroad.

[9] The selection of characteristics for the assessment of relationships was based on the research of relationships in the networks of enterprises conducting business activity in Poland and abroad, carried out by the authors, cited in this study.

The findings of the research

1. The scope of protection of biodiversity in livestock production (the outline of the history of protection and selected legal aspects)

In 1996, Poland officially joined the implementation of FAO's Global Strategy for the Conservation of Animal Genetic Resources. The Minister of Agriculture established the National Coordinating Centre for the Conservation of Animal Genetic Resources, which initially operated within the Central Animal Breeding Station, and in 2002, it became part of the National Research Institute of Animal Production. In 1999, the work on the National Programme for the Protection of Animal Genetic Resources was undertaken. On this basis, in 1999, the Minister of Agriculture and Rural Development approved 32 Programmes for the protection of genetic resources, which included 75 breeds, varieties and families of farm animals, including fish (Krupiński, 2008, p. 3).

In June 2001, the Minister of Agriculture and Rural Development declared Poland's participation in the FAO-initiated process of preparation of the World Livestock Genetic Resources Report, joined by 169 countries.

In line with the FAO guidelines, the report included an assessment of the status of agricultural biodiversity in the livestock sector along with a review of production systems and assessment of the state of use of the genetic resources[10].

The protection of animals of conservative breeds was announced, among others, by the ordinance of the Ministry of Agriculture and Rural Development of 13 March 2013, item 361 on detailed conditions and procedures for granting financial aid within the 'Agri-environmental Programme', covered by the Rural Development Programme for the years 2007–2013. Package 7 of the ordinance includes the statement on conservation of endangered genetic resources of animals in agriculture. In turn, the ordinance of 18 March 2015 stipulates the detailed conditions and procedures for granting financial aid within the 'Agri-environmental and Climatic Measure' of the Rural Development Programme for the following years (2014–2020)[11].

The agri-environmental payment is granted for cows, mares, sows or sheep mothers, with a minimum number of 4 cows, 5 sheep mothers of the Olkuska breed, 15 sheep mothers of the cakiel podhalański breed and 10 sows of the Puławska breed.

Package 7 entitled "The Conservation of Endangered Genetic Resources of Animals in Agriculture" specifically defined races, subject to protection. For cattle, they include the following breeds: Polish red, white-backed, Polish red-and-white and black-and-white; for sheep, they include the following breeds: Wrzosowka sheep, Swiniarka sheep, Olkuska sheep, colored Polish mountain sheep, colored merino sheep, Uhruska sheep, Wielkopolska sheep, żelaznienska sheep, Koridеil sheep, Kamieniecka sheep, Pomorska sheep, cakiel podhalański sheep, old-type Polish merino sheep; for pigs: Puławska, Złotnicka white pig and złotnicka spotted pig.

[10] The remaining elements of the FAO document as well as the elaboration on ten priority areas of activities can be found in the cited publication by J. Krupiński (2008).

[11] http://www.arimr.gov.pl/fileadmin/pliki/PB_2015/WPRE/16_03_2017/D20150415.pdf; Downloaded: 7 October 2017.

The aforementioned ordinances (of 2013 and 2015) brought consequences for producers, including: fees and penalties for non-compliance, but also the need to contact various institutions. It leads to the establishment of numerous formal relationships (with The Agency for Restructuring and Modernization of Agriculture (ARMA), National Research Institute of Animal Production in Balice, Veterinary Inspection, Commune Offices) and informal connections (with other farmers).

2. The role of industry organisations in establishing relationships (legal basis)

Agricultural industry organisations operate on the basis of the Law of 8 October 1982 on socio-professional organisations of farmers[12]. As stated by A. Sikorska-Lewandowska (2016, p. 164), the law has been amended several times. According to Article 23 of the Law, agricultural industry organisations constitute voluntary, independent and self-governing socio-professional organisations, representing and defending the rights and interests of individual farmers specializing in a particular branch of plant or animal production. The cited law provides the rights of industry associations which determine the adaptation of the organisation to the new political conditions, formed as a result of the economic changes which occurred after 1989 and, subsequently, as a result of Poland's accession to the European Union. The basic rights and obligations of industry organisations are the following: submission of expert opinions to relevant bodies, filing motions, postulates and demands, initiation of legal regulations and participation in negotiations relating to consultations on legal acts. The consultation takes place through sending draft legal documents, project assumptions, plans and invitations to participate in developing documents, holding joint meetings, consultations and negotiations. The competent authorities are obliged to comment on the opinions, motions and postulates submitted by the agricultural industry organisations within one month. An industry organisation can represent its members as a proxy when negotiating contractual terms and conditions, contracts for the supply of the means of production, plant protection products, and it can act as the supervisor of the implementation of the contracts.

Industry organisations are established at different levels of territorial division of the country, which means that they have a different spatial range of activity: area, district, region, province, and the entire country. One of the best organised groups are pig farmers (apart from beekeepers and sugar beet producers), producers of cattle and milk, and producers of sheep and goats (Halamska, 2008, p.118).

3. The examples of industry organisations bringing together breeders and animal producers in Poland

The achievements of agricultural organisations in Poland are connected with the existence of the law which was introduced more than 30 years ago, and historically, they go

[12] The Act of 8 October 1982 on socio-professional farmers' organizations, Dziennik Ustaw 1982, No. 32, item 217.

back to the period of the Partitions of Poland[13]. Socio-professional farmers' organisations play an important role, along with agriculture chambers, agricultural industry organisations and producer organisations, in representing the interests of farmers before the State and local government administration (Sikorska-Lewandowska, 2016, p. 175). Due to the aim of the research as well as a very large target group of all industry organisations, the focus was made on three of them (PFHBiPM, POLSUS and PZOw), representing breeders of conservative breeds of cattle, pigs and sheep in south-eastern Poland.

POLSUS

The origins of POLSUS date back to 1958, when the first National Assembly of Delegates of province unions of producers of breeds of pigs, suitable for the manufacture of bacon and ham, was held in Warsaw. The activities of the association were focused on a number of issues, including training and instruction activities, the protection of the interests of producers, and cooperation with individuals and organisations working for the benefit of agriculture.

The history of POLSUS includes four periods, namely: 1. The preintegration period (1958-1973), in which the Union, having a legal personality, was involved in intensive activities with full autonomy; 2. The integration period (1974-1980), when the Union was incorporated into the Central Union of Agricultural Circles, and, thus, deprived of a legal personality; consequently, its work was made dependent on administrative decisions; 3. The renewal period (1981-2003), in which the Union regained its legal personality and once again became a self-governing and independent organisation. In 1981, a new statute was adopted at the 7th National General Congress of Delegates of the province associations. The statute changed the previous name of the Association of Producers of Pigs to the Polish Association of Breeders and Producers of Pigs, and the abbreviation 'POLSUS' was selected through the competition process (in 1989). 4. Since 1 April 2003, ... the Polish Union of Breeders and Producers of Pigs 'POLSUS' took over from the National Centre for Animal Breeding, the tasks of pig breeding in Poland on the basis of a permit issued by the Ministry of Agriculture and Rural Development.

The 45-year period of the Association/Union's activity was marred by diverse socio-political conditions of the country, which had a clear impact on its work.

The main objective of the Association's activity was to 'defend the interests of pig producers', and, after 1 April 2004, also to defend the interests of breeders. While in the initial period of the union's work, the protection of interests was expressed mainly in the supervision of standardization in meat processing plants, the control at purchase points and in the sphere of the supply of feed and veterinary medicines, since 1982, the Union has been involved in shaping agricultural and social policy. Changes of the transformation period, the privatization of meat processing plants, have changed the perspective of the activities carried out by POLSUS. The union assumed, among others, matters related to breeding. On 10 December 2003, the Main Board of the Polish Union of Breeders and Producers of Pigs 'POLSUS' admitted to the ranks of the Union, organisations of breeders affiliated to the Polish Federation of Breeders of Breeding Pigs with its seat in Poznań. The 'POLSUS' organisation undertook new tasks which included, among others, assuming

[13] The first farmers' circles were established in the Polish lands in the 19th century.

breeding activities throughout Poland from the National Centre for Animal Breeding/ Regional Centre for Animal Breeding in April 2003, establishing cooperation with breeders who had previously belonged to various organisations. Earlier, i.e. until May 2003, breeders had practically no influence on the shape of breeding in Poland. Currently, 'POLSUS' operates in four districts[14]: 1. Northern District with its registered office in Bydgoszcz (with branches in Bydgoszcz, Gdańsk, Olsztyn and Koszalin); 2. Central District with its registered office in Warsaw (with branches in Warsaw, Białystok and Łódź); 3. Western District with its registered office in Poznań (with branches in Poznań, Opole, Wrocław and Zielona Góra); 4. Eastern District with its registered office in Lublin (with branches in Lublin, Kielce, Rzeszów and Krakow).

The cooperation between POLSUS and other entities consists in:

1. Implementation of the objectives of the National Breeding Programme with research institutes.
2. Measures aimed at stabilizing the market of pigs with the Online Slaughter Pigs Exchange Platform called e-WGT, under the auspices of the Minister of Agriculture and Rural Development. The establishment of e-WGT is the result of an agreement concluded between 'POLSUS', the National Council of Agricultural Chambers and the e-WGT Company.
3. Cooperation with the Modern Farmer Portal called 'farmer.pl'.

'POLSUS' undertakes initiatives to stabilize and protect the market of pigs. It carries out promotional and information activities supporting the pig breeding and raising sector. It cooperates with numerous industry organisations and R&D units.

Within these activities, PQS (Pork Quality System) was created with the participation of 'POLSUS' as the co-author and co-owner. In 2009, the Minister of Agriculture and Rural Development recognized PQS as the national food quality system.

'POLSUS' is a partner in the cooperation programme with the AUCHAN retail chain in the field of the production of pork from pigs of the Puławska breed and cooperates with the National Rural Development Network (NRDN) of the Lubelskie Province.

As part of the individual cooperation or as a member of the consortium, it also participates in national and international research projects (e.g. Q-PorkChains, EconWelfare, or POIG).

Due to the funds from the Meat Pork Promotion Fund, it implements a number of valuable and attractive projects. Every year, it organises breeding animals exhibitions, promoting breeding stock. The financial means of the Meat Pork Promotion Fund served to establish the 'Strategy for Reconstruction and Development of Pork Production in Poland through 2030', which contains a set of guidelines for the sector; the implementation of the guidelines would improve the situation in the pig sector. Also, the data on the dietary value of pork was updated, and dissemination of the results allows the reputation of pork as fat and unhealthy meat to be changed. With the participation of a law firm, training was organised for farmers in the scope of obtaining permits for the construction or extension of pig farms.

The cooperation with the Foundation of Assistance Programmes for Agriculture (FAPA) made the organisation of training courses for farmers in the field of high quality meat production possible.

[14] http://www.polsus.pl/kontakt/filie

PFHBiPM – The Polish Federation of Cattle Breeders and Dairy Producers

The Polish Federation of Cattle Breeders and Dairy Producers in Warsaw is the only legitimate representative of cattle and dairy producers in Poland. It was established in 1995. It is an independent, voluntary and self-governing organisation bringing together more than 11,000 members gathered in eleven regional and breeding organisations[15]. These are individual farmers, state-owned farms, state-owned and private companies, co-operative and leased farms. Since 1 July 2006, the Polish Federation has had its representation in all the provinces in the country. It is a member of the International Committee for Animal Recording (ICAR), the World Holstein Friesian Federation (WHFF) and the European Holstein and Red Holstein Confederation (EHRC). On 1 July 2004, the Polish Federation of Cattle Breeders and Dairy Producers in Warsaw became the only entity authorized by the Minister of Agriculture and Rural Development in Poland to keep flock books for dairy cattle breeds. On 1 July 2006, the Polish Federation of Cattle Breeders and Dairy Producers in Warsaw assumed the task of evaluating cattle performance. The Ordinance of the Ministry of Agriculture and Rural Development of 30 November 2010, describes in detail the responsibilities of the PFHBiPM. Article 7, section 1, points 1-6 and 10 of the Law on the Organisation of Livestock Breeding and Reproduction establishes the principles for carrying out the evaluation of performance. On 1 July 2007, the Polish Federation of Cattle Breeders and Dairy Producers in Warsaw assumed the tasks of evaluating the type and structure of first-calf heifers and dairy cows.

The purpose of PFHBiPM is to represent interests and defend the rights of its members, in particular, through:

- taking strategic actions connected with cattle breeding and dairy production;
- supporting cattle breeding and dairy production;
- undertaking supra-regional or nationwide tasks in cattle breeding and dairy production;
- adopting breeding Programmes and coordinate their implementation;
- helping members of the organisation with their statutory activities;
- representing PFHBiPM on the international arena;
- interacting with international organisations dealing with issues related to the evaluation of cattle performance, insemination and breeding.
- cooperating closely with national organisations and institutions dealing with the insemination of cattle;
- promoting the good reputation of Polish cattle breeders through:
  - carrying out evaluations of the performance of breeding value of cattle of dairy breeds as well as meat and dairy breeds,
  - keeping cattle flock books and breeding documentation in accordance with the existing regulations,
  - running milk evaluation laboratories,

[15] Regional branches of PFHBiPM are represented by: 1. Białystok with the registered office in Jeżew Stary, 2. Bydgoszcz with the registered office in Minikowo, 3. Gdańsk, 4. Gostyń, 5. Koszalin, 6. Lublin; 7. Łódź with the registered office in Rzgów, 8. Olsztyn with the registered office in Dorotowo, 9. Poznań, 10. Wrocław, 11. Zabierzów near Kraków.

- publishing results of the evaluation of the performance or breeding value of cattle,
- maintaining an IT system for the needs of evaluation of the performance and breeding value of cattle,
- conducting specialized vocational trainings for persons conducting the evaluation of performance, and issuing appropriate certificates in this field,
- organising activities ensuring the implementation of modern methods in the field of cattle breeding and dairy production,
- developing and implementing regional and national breeding Programmes,
- organising exhibitions, shows and seminars,
- carrying out the selection in the herd subjected to evaluation, giving recommendations regarding herd replacement, selective breeding and cattle classification at the request of breeders,
- utilizing grants for biological progress in the Programmes approved by the Ministry of Agriculture and Rural Development,
- conducting trade and service activities in the field of milk quality assessment,
- conducting an evaluation of milk for breeding purposes,
- providing advisory and training services.

PZOw – The Polish Sheep Breeders' Association and its regional branches

The Polish Sheep Breeders' Association (PZOw) is a voluntary, independent and self-governing, socio-professional organisation representing and defending the rights and interests of the Regional Sheep and Goat Breeder Associations and other organisations promoting the breeding and raising of sheep and goats. The Polish Sheep Breeders' Association acts on the basis of the provisions of the Act of 8 October 1982 on social and professional organisations of farmers (Polish Journal of Laws "Dziennik Ustaw", No. 32, item 217) and the Ordinance of the Minister of Agriculture and Rural Development concerning the entrustment of the matters of breeding sheep and goats to the Polish Sheep Breeders' Association.

The Polish Sheep Breeders' Association gathers 11 regional associations, covering the entire territory of the country. Regional Associations work directly with sheep and goat breeders. They carry out the evaluation of sheep and goats in flocks as well as make entries on the animals of these species in the flock books.

The Polish Sheep Breeders' Association was established on 20 January 1958 at the 1st General Assembly. Shortly after, the statutes of the Province Associations of Sheep Breeders were developed and approved. The key moment for the Polish Sheep Breeders Association and the whole of the sheep industry was the National Council of Sheep Industry Workers, held between 11-13 December 1958 in Zakopane. It was attended by representatives of science, the system of sheep assembly centres, textile industry, and sheep breeders. It was pointed out that the existence of sheep breeders' associations, whose main tasks were the improvement of domestic sheep breeding and organising sheep production, is useful. The main directions of activity, in which sheep industry was perceived as an integrated whole, have been determined.

The period between 1958-1969 marked an intensive development of sheep production. In the subsequent years, the Association organised the Teams of Shearers and the National Training Centre for Shearers. In 1973, in Poznań, the National Shearing Contest was organised with the participation of foreign shearers. This was the first international shearing contest in Europe. The period of 1974-1980 brought further integration around the Central Association of Agricultural Circles and the loss of independence of the unions. This resulted in the departure of a large part of experienced zootechnical staff working in the sheep industry. The years 1981-1983 resulted in the regaining of full self-management by sheep breeders' associations. Organisational and self-government structures were rebuilt. In 1982, the association has begun to activate the production of livestock for export purposes.

Table 1. Information on selected industry organisations

Specification	POLSUS	PFHBiPM	PZOw
Year of establishment	1958	1995	1958
Geographical reach	4 districts 13 regional unions of producers and breeders	All provinces in Poland	11 regional branches
Number of members	No data available	11,000	No data available
Membership in organisations, (cooperation), advertising	Yes Partner of the AUCHAN retail chain[16], Member of the Foundation for the Promotion of Pork Meat (FPMWp[17]); Cooperation with: the National Rural Development Network, Online Slaughter Pigs Exchange Platform e-WGT, the Modern Farmer Portal 'farmer.pl' and Wieprzopedia; it organises exhibitions of farm animals	Yes Member of the International Committee for Animal Recor ding (ICAR), the World Holstein Friesian Federation (WHFF) and the European Holstein and Red Holstein Confederation (EHRC)[18]; it organises exhibitions of animals and runs an online portal	Yes It runs its own online portal The Polish Sheep Breeders' Association was a co-author of the 'Programme for Improving The Sheep Population by 2010'
Service activity (e.g. keeping flock books)	Yes	Yes[19]	Yes[20]

Source: own elaboration.

The 1990s saw a large decline in the number of sheep caused mainly by low wool prices and the established quotas for export of slaughter lambs to the European Union. The Polish Sheep Breeders' Association was the initiator and participant of the teams working on rebuilding and development Programmes for the sheep industry. 'The Programme for

[16] In the cooperation program with AUCHAN in the field of the production of pork from pigs of the Puławska breed (conservative breed).
[17] The 'Strategy for Reconstruction and Development of Pork Production in Poland through 2030' was developed due to the funds of FPMWp.
[18] http://www.www.pfhb.pl/pages/uczestniczylismy
[19] PFHBiPM is responsible for keeping flock books for nine breeds of dairy cattle in Poland.
[20] Since 1995, the Polish Sheep Breeders Association has carried out the evaluation of performance and has kept flock books for sheep and goats.

Improving The Sheep Population by 2010' was approved by the Minister of Agriculture and Rural Development in 1996. The breeding objectives were changed, from the improvement of the wool characteristics to the improvement of the meat characteristics and reproductive performance of the entire sheep population. Since 1995, the Polish Sheep Breeders' Association has been evaluating the performance of sheep and goat and has kept flock-books for these animals.

In the description of the three tested organisations (Table 1), POLSUS clearly stands out. It has a long tradition of activity (more than sixty years) and is involved in activities for the benefit of producers and breeders of pigs (including the conservative breed 'Puławiak') through cooperation and promotion. The Federation of Cattle Breeders and Dairy Producers is also active, although its activity has been much shorter (since 1989). Against the backdrop of the two distinguished organisations, the Polish Sheep Breeders Association is an organisation with a long tradition, fulfilling its statutory purpose, more focused, with less diverse activities.

The results of own research

Knowing how to cooperate with external entities is a source of advantage on the market and a form of coordination (Latusek-Jurczak, 2011, p. 27). Thus, learning the context of the farm↔environment system allows for the role of industry organisation in the network of connections to be assessed. Relationships with industry organisations allow farms to develop (through access to knowledge, facilitating the establishment of contact with recipients or the acquisition of public aid for investments and innovations).

The variables (characterising the studied relationships) adopted in the paper define their current state. The first characteristic (variable), **quality**, is a subjective measure expressing the respondent's opinion on their existing experience regarding the cooperation of farms with industry organisations. The high quality rate proves that the relationship is very good, regardless of the reasons behind it. Relationship quality can be due to sustainability, dependence, or uniqueness, which provided the context for further assessment.

The second variable is relationship **sustainability**, depending mostly on the duration of cooperation. The longer the relationship, the more sustainable it is. The **power of dependence** in a relationship between a breeder and an industrial organisation depends mostly on the competence of the organisation (or association). The more services (such as registering animals, signing sale contracts) the organisation can provide to the farmers, the greater the dependence. High dependence rating indicates a strong connection, not necessarily good relationships. According to B. de Wit and R. Meyer (2007, p. 224), the impact of the distribution of power on inter-organisational relationships may lead to **four relationship types**: mutual independence, unequal independence, interdependence, and unequal dependence. Dependence relationships in a network allow the participants to obtain a quasi-pension from the relation through cost reduction (Dyer, 1997, p.535-556). On the other hand, independence relationships are more beneficial when network partners do not need to maintain many relationships. For example, when products are standardised or cooperation is formalised, independence relationships stimulate organisational innovation.

Uniqueness is a very subjective relationship characteristic resulting for example from statutory conditions of membership of an industry organisation (assessment of rights,

responsibilities, fees, possibilities of applying for aid from the organisation in emergency situations, etc.).

The results of the research carried out among representatives of industry organisations and farmers who are members of industry organisations, show the differences in the evaluation of quality, sustainability, interdependence and uniqueness of the relationships. This confirms the existence of a quality gap and the need to implement corrective actions (trainings, meetings, trips). As for the opinions of farmers, breeders of pigs and sheep rated the relationship the highest (Table 2), while cattle owners – the lowest.

A thorough analysis of the status of the relationships allows us to conclude that the best quality and sustainability was developed by pig breeders, with 'weak' uniqueness of these relationships (1 point), as the relationship with the union in terms of 'uniqueness' was not classified (0 points). The situation with the industry association POLSUS was quite different, as all the categories of relationships with farmers were rated very high (5 points). The remaining industry associations of cattle breeders (PFHBiPM) and sheep breeders (PZOw) also evaluated the quality and sustainability of relationships highly, but the uniqueness of the relationships with breeders was rated lower than in the case of POLSUS.

According to the author's interview, the working climate in the POLSUS association was family-friendly (clan-type relationships). The association's employees were satisfied with their cooperation with farmers and with one another in the office. In the author's opinion, the presence of the leader (an outstanding expert in the Puławska breed), supporting the cooperation of the association, evoked enthusiasm in the relationships. In the Polish Sheep Breeders' Association, the rating of the association was lower (more prudent) and the lowest score was given to the association (PFHBiPM), representing producers and cattle breeders.

Table 2. Evaluation of relationships between industry organisations and farms (farmers) with conservative breeds [1-5; with 5-max]

Specification	Cattle		Pigs		Sheep	
	PFHBiPM	Farmer	POLSUS	Farmer	PZOw	Farmer
Quality	5	3	5	5	4,5	3
Sustainability	5	3	5	5	5	4,5
The power of interdependence	3	4	5	1	5	5
Evaluation of uniqueness of relationships	1	1	5	0	1	3
What do good relationships mean?	Trust	Trust; maintained relationships give the opportunity to exchange new information	Continuous collaboration	Mutual benefits	Good collaboration, 'for the sake of good economy', mutual understanding	They make available the exchange of information, timeliness

Source: own research.

In terms of dependence power, breeders networks and sheep associations were given the highest rating. In the remaining relations (cattle and pigs), the rates were uneven. The

relation between POLSUS and the breeders was the weakest (rating: organisation -5, breeder 0 = no opinion). The weight of relationship ratings in the context of their durability (time from the establishment of industry organisations). The highest weights of ratings of relationships between industry organisations and breeders due to durability regard POLSUS and PZOw (since 1956). Thus, low ratings of the relationship with the PFHBiPM cattle breeders federation may be due to its shorter lifetime (since 1995) and less experience in cooperation with breeders.

As for the understanding of 'good relationships' by breeders and industry associations, PFHBiPM had the closest understanding, as it indicated 'trust' as the basis for good relationships. In the statements of POLSUS and PSBA, there was a greater divergence in understanding 'good relationships'. It is interesting that the aspect of economic benefits from the relationships with industry associations appeared solely in the opinions of employees of PSBA, and not the breeders. Sheep and cattle breeders agreed that 'proper exchange of information' is a common denominator of good relationships. One may conclude that in such relations, knowledge and information flow gain importance, so all sources of knowledge asymmetry should be eliminated.

Conclusions

Researching the relational premises in the cooperation between industry organisations and breeders provides many conclusions. The existence of cooperation and engagement fostering the studied relationships can surely be confirmed. The opinions of breeders of different animal species vary both in terms of relationship assessment (regarding quality, sustainability, uniqueness and dependence) and the meaning of "good relations".

The paper poses research questions as to whether industry organisations feel comfortable in the new role and support farms with conservative breeds of animals in order to put them on the path to development, and the answer to this question is in the affirmative. The history of activity of industry organisations confirms that they constantly take efforts to fulfil the needs of breeders/producers. Regardless of the political conditions, the organisations have tried to activate the farmer's environment to meet challenges, such as adjusting the production to EU requirements, entering foreign markets, and promotion. The current status of industry organisations is a result of effective actions with regard to the needs and challenges of the environment represented (e.g. maintaining biodiversity).

This is largely achieved through the soft skills of co-operating members of the network, the creation of platforms with the aim of exchanging views, consistent demonstration of the needs of members (farmers).

Analyses of industry organisations have confirmed their participation in activities which are important for affiliated farms, such as: cooperation with international organisations, evaluation of the value of animals, keeping flock books, representation, promotion, training. Preliminary studies show that the best **conditions for cooperation** for producers and breeders of conservative breeds of animals were created in the pig industry association (POLSUS). Good relationships in the network created by the POLSUS organisation and farms with conservative breeds are the result of continuous cooperation and mutual benefits. A thorough analysis suggests that lower relationship ratings could have been due to a shorter time of market operations of the cattle breeders association and better ratings were a result of longer cooperation.

Within the assessment of relationship characteristics, a particularly unequal "dependence" between pig breeders and the association was discovered. The unionists rated it highly, contrary to farmers. This discrepancy may indicate that breeders do not take the association seriously. In contrast, the sheep breeders association rated the "dependence" in inter-organisational relationships highly. These rates do not affects the relationships negatively, but they indicate differences in the organisational cultures of the associations.

From the practical point of view, the power of "dependence" is created by the provisions of the industry organisations' statutes and the range of services provided to the farmers (keeping herd-books, guaranteeing sale contracts). In the case of the cattle association, relatively low dependence proves the independence of the association, which has limited abilities to "bind" breeders. Special attention should be paid to the development of the uniqueness of relationships between breeders and organisations. Changes in the practices regarding the atmosphere of cooperation and the development of actions supporting individual farms could shift the state of the relationships from slightly unique to unique. The problem of relationship uniqueness should be considered in future studies, specifying what unique relations (not only good relations) are.

It is also possible to conclude that industry organisations of supra-local nature play more important role in shaping contractual (formal) relationships and trade habits (contracting) than small organisations. Hence, nationwide (major) industry organisations mainly create conditions for integration of domestic producers and breeders. Recognizing the trend in the EU legislation (reinforcement of the position of agricultural producer organisations), efforts should be taken to empower industry organisations in order to increase their capacity to fulfil their role in the context of globalization and commercialization of agriculture[21] through engagement in solving problems not only pertaining to the entire industry, but also to individual cases[22].

In the perspective of the research on economic relations of farmers representing the interests of biodiversity policy, it is useful to keep an eye on the opportunities and threats of the relationships and to seek ways to strengthen those relationships. The respondents' opinions on the meaning of "good relations" indicate that information and knowledge exchange is the key to success in this field. The flow of information in networks of breeders and industry organisations (in particular sheep and cattle) requires further research. Farmers expect assistance, while industry organisations - good cooperation. The development of tested relationship management techniques, as well as the development of a methodology for analysing transaction costs of such activities should be at the centre of both parties' interest.

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[21] Attempts are being made to oblige the private sector to cooperate with agricultural organizations. Currently, the private sector is exempted from the obligation.

[22] Currently, representation of the interests of individual farmers is legally restricted; the issue was raised by A.Sikorska-Lewandowska (2016, p. 175); hence, it is advisable, according to the author, to 'strengthen the position of agricultural producer organizations', as suggested by L.Russo (2014, p. 151).

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Implementation of Selected Sustainable Development Objectives in European Union Countries

Abstract. The aim of the paper is to assess the implementation of selected sustainable development objectives in European Union countries with particular focus on Poland. Several different indicators were taken into account: greenhouse gas emission, share of renewable energy, GDP energy intensity and protection of environment and biodiversity, which cover goals set in The Europe 2020 Strategy, among others: reduction of carbon dioxide emission, increase share of renewable energy usage, increase the effectiveness of energy usage, preservation of biodiversity. It was found, that European Union countries generally strive towards achieving those goals, though the effectiveness differs among them. Poland positively pursues all discussed issues. However, is not the leader in any of them. It is important to underline, that analysed data seem to allow to say, that it is possible to achieve objectives set in Europa 2020 Strategy.

Key words: sustainable development, European Union, sustainable development objectives, greenhouse gas emission, energy efficiency, renewable energy

JEL Classification: Q01, Q15, Q42, Q54

Introduction

Sustainable development is one of the mail concerns in European Union. Many actions are being taken to ensure that European Union is leading in the direction of sustainability. It is important, because of many risk of associated with more conventional development, such as dependence on fossil fuels, growing demand for natural resources that increase the pressure on the environment, climate changes. Furthermore, with the leading role in sustainable development European Union can possibly increase its competitiveness. By taking this development path is stands out among not only developing countries, but also highly developed countries.

The Europe 2020 Strategy describes general goal for European Union in regards to its development till 2020. The Strategy is based on three priorities (Komunikat Komisji…, 2010):

- smart development - development of economy based on knowledge and innovation;
- sustainable development – supporting economy that is more resource efficient, more environmental-friendly and more competitive;
- inclusive growth – supporting economy characterized by high employment level and ensuring economic, social and territorial cohesion.

In accordance to climate and energy there are several goals set for European Union countries in The Europe 2020 Strategy, among others: reduction of carbon dioxide emission

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by 20% (in comparison to 1990), increase share of renewable energy usage up to 20% and increase the effectiveness of energy usage by 20%. It is also important to underline the place of biodiversity preservation in that Strategy.

The aim of the paper is to assess the implementation of selected sustainable development objectives in European Union countries with particular focus on Poland.

Methodology

The paper uses the Eurostat and Central Statistical Office data about the European Union countries, with particular focus on Poland, for different years up to 2015. Different timeframes in accordance to different factors analysed are due to the availability of data in the Eurostat database. Data concern topics such as: greenhouse gas emission, share of renewable energy, energy intensity of GDP, protected terrestrial area and protected breeds of livestock. Those factors were chosen to cover sustainable development objectives considered in the paper. Simple statistical methods of data processing were applied and the obtained data were presented as figures and tables.

Results

Several different indicators were analysed in order to assess the way European Union countries realise sustainable development objectives in relation to environment and agriculture. The first one is greenhouse gas emission.

Greenhouse gas emission in the European Union was decreasing over the analysed period of time – from 5,2 to 4,3 billion tonnes of carbon dioxide equivalent – drop by 16,3%. Relevant data for 10 countries with the greatest volumes of emissions are shown on figure 1. The largest emitters – Germany, United Kingdom, France and Italy – emitted more than 400 million tonnes of carbon dioxide equivalent each in 2015. However, it is worth underlining, that each country also achieved a decrease in emission – respectively by 7,2%, 25,1%, 14,0% and 22,9% in 2015 in comparison to 2007. Furthermore, not only the largest emitters fulfil their goals in greenhouse gas emission reduction. What is really significant from the point of view of meeting the goals of sustainable development, is the fact that all European Union countries were reducing their emissions in the analysed period of time. The rate differs from -6,3% (Netherlands) to -30,3% (Denmark). It shows, that the goals set have real chances to be achieved.

Figure 2 presents data on greenhouse gas emissions in agriculture in the European Union countries in 2007-2015 for the 10 biggest emitters. Agriculture across the European Union emitted in 2015 more than 436 million tonnes of carbon dioxide equivalent – 0,5% less than in 2007. The share of agricultural greenhouse gas emission in total emission was 10.1% in 2015. It increased in the analysed period by 1.5 percentage points. When comparing data on figure 1 and figure 2 the certain pattern can be seen – most countries with highest emission in total, are also the countries with highest emission from agriculture.

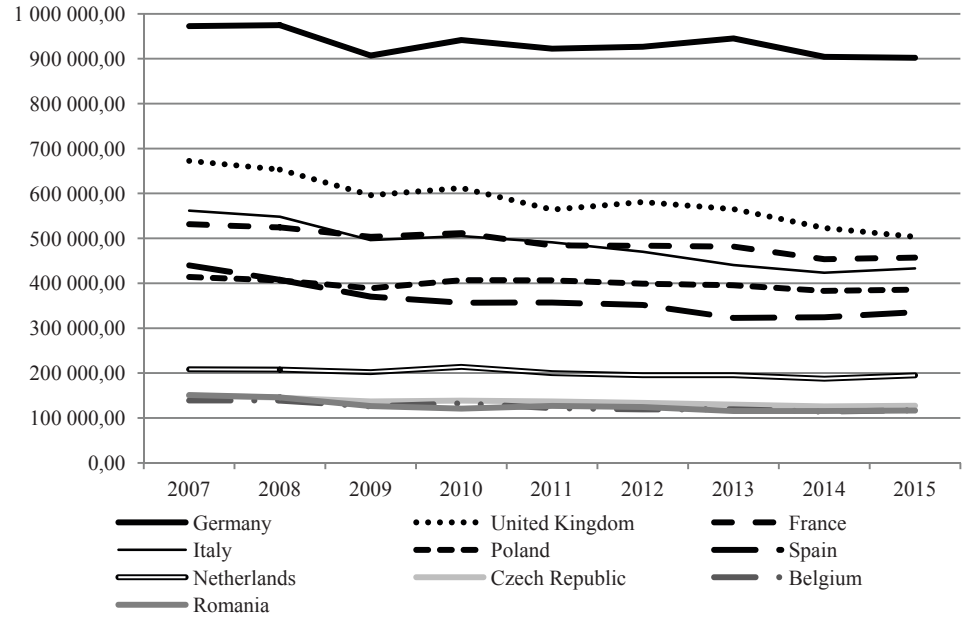


Fig. 1. Greenhouse gases emission in selected European Union countries (thousand tonnes of carbon dioxide equivalent) in 2007-2015

Source: Eurostat.

As mention above, the nominal decrease in agricultural emissions can be seen across the European Union, although significant disproportions between the countries can be observed. Greenhouse gas emissions generated by agriculture increased in the analysed period in half of the European Union countries. This is an utmost unfortunate phenomenon considering sustainable development in agriculture and climate changes. In three countries: Bulgaria, Latvia and Estonia, this increase was very high, as the emission volumes there went up by a dozen or more percent. As regards countries in which agricultural greenhouse gas emissions decreased in the analysed period, the greatest drops were recorded in Cyprus (-13.1%), Malta (-12.3%) and Romania (-9.7%). In Poland the decrease was by 3,9%. Sustainable development objectives were set for countries, not particular economy sector. Nonetheless, for countries to achieve those goal its sectors have to reduce emissions. From that point of view it is very unfortunate, that in half European Union countries agriculture increased its emissions.

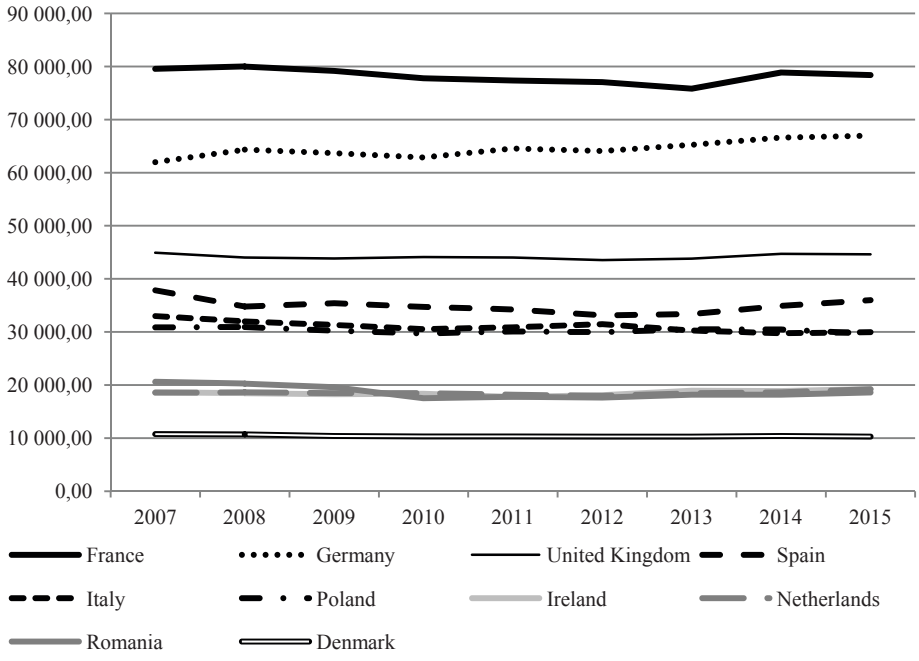


Fig. 2. Greenhouse gases emission in agriculture in selected European Union countries (thousand tonnes of carbon dioxide equivalent) in 2007-2015

Source: Eurostat.

The author in cooperation with Konrad Prandecki carried out separated studies about selected greenhouse gas emissions in agriculture in Poland (Prandecki, Gajos, 2017). Results from the study are shown in table 1.

Taking into consideration, that presented data are not fully compatible with data from figures 1 and 2 because of differences in their scope (both timetable and substances analysed), it is interesting to analyse changes in agricultural emissions in details – broken down by substances. Analysing four selected substances: carbon dioxide, nitrous oxide, methane and nitrogen oxides, it can be observed that the highest drop was observed in case of nitrogen oxides (by more than 18.5%) and carbon dioxide (almost 14%), while emissions of nitrous oxide and methane remained stable. However, it is worth noting that the emission of nitrogen oxides is low compared to the other three gases discussed in the study – in carbon dioxide equivalent, it is less than 0.3% of total emissions. As a consequence, the overall reduction of analysed emissions from agriculture in the discussed period is mainly due to limiting carbon dioxide emissions. Significant reductions in emissions of nitrogen oxides did not produce such an effect due to their small share of total emissions.

The second analysed indicator is renewable energy. Data about shares of renewable energy in gross final energy consumption in European Union countries in 2006-2015 is shown in table 2. About 16,7% of energy in European Union in 2015 was obtained from renewable sources. There was an increased in that ratio by 7,2%. To achieve 20% share of renewable energy another increase by 3,3% is needed.

Table 1. Greenhouse gases emission in Polish agriculture in 2008-2014

Specification	2008	2009	2010	2011	2012	2013	2014
	Emission volume (thousand tonnes)						
Carbon dioxide	16904,4	16029,0	17034,0	16370,6	15998,9	14568,6	14568,6
Nitrous oxide	56,0	54,9	53,1	54,5	54,3	55,5	54,8
Methane	582,0	571,1	572,8	569,7	567,9	570,0	576,2
Nitrogen oxides	191,4	177,2	185,7	185,2	185,3	165,2	155,6
	Emission volume (thousand tonnes of carbon dioxide equivalent)						
Carbon dioxide	16904,4	16029	17034,4	16370,6	15998,9	14568,6	14568,6
Nitrous oxide	14851,1	14517,4	14080,6	14445,6	14391,9	14720,1	14515,5
Methane	16295	15990,5	16037,8	15951,4	15902	15959,8	16134,3
Nitrogen oxides	134	124	130	129,7	129,7	115,6	109
Sum	48184,4	46661	47282,7	46897,2	46422,5	45364,2	45327,3

Source: Eurostat; Prandecki, Gajos 2017.

There are big differences between European Union countries in that ratio. Countries with the highest shares (more than 30%) of renewable energy were: Sweden, Finland, Latvia, Austria and Denmark. In Sweden more than 50% of energy used was the renewable one. Another few countries were characterized by higher than 20% share of renewable energy: Croatia, Estonia, Lithuania, Portugal, Romania and Slovenia. In total, eleven European Union countries already achieved 20% use of renewable energy and therefore the goal set. The lowest shares (less than 10%) were in Luxembourg, Malta, Netherlands, Belgium, United Kingdom, Ireland and Cyprus. Those countries are far from achieving 20% renewable energy share and it is unlikely, that it will be achieved in foreseen time. In Poland the ratio equals to 11,8%.

All countries are meeting the sustainable development goal related to increasing the share of renewable energy, however, the scale differs significantly. In case of Netherlands, Luxemburg, Malta and Poland it increased by less than 5 percentage points. In case of Sweden, Estonia and Denmark it was more than 10 percentage points.

Figure 3 presents data about final energy intensity of GDP with climate correction in Poland and European Union in 2000-2013. It is one of the ways to assess the effectiveness of energy usage.

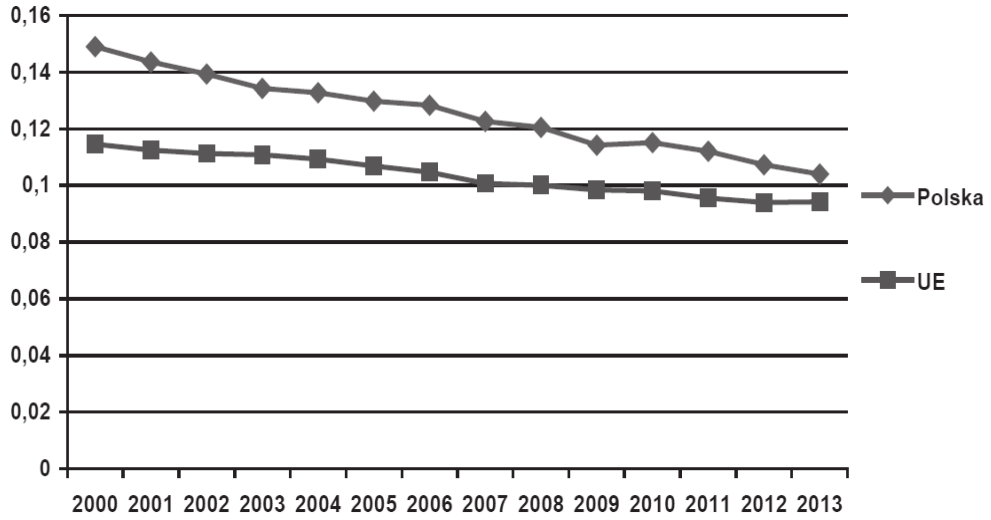
The final energy intensity of Poland's GDP with climate change correction equaled to 0.104 in 2013 and was 11% higher than the European Union average of 0.094. Effectiveness of energy usage in Poland was significantly lower than in European Union. However, the rate of energy intensity improvement in Poland was almost twice higher in the years 2000-2013 than in the European Union (2.7% vs. 1.5%). That means, that Poland is improving its effectiveness and it foreseen future there is a real chance to achieve the same level of GDP energy intensity as average for European Union countries.

Drawing conclusions from this indicator it can be said, that European Union in general, and Poland in particular, are achieving the goal set for energy efficiency usage. Poland’s rate of improvement is much higher though.

Table 2. Shares of renewable energy in gross final energy consumption in European Union countries in 2006-2015,%

Specification	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
European Union	9,5	10,4	11,0	12,4	12,9	13,2	14,4	15,2	16,1	16,7
Austria	25,4	27,2	28,1	29,9	30,4	30,6	31,4	32,3	32,8	33,0
Belgium	2,6	3,1	3,6	4,7	5,7	6,3	7,2	7,5	8,0	7,9
Bulgaria	9,6	9,2	10,5	12,1	14,1	14,3	16,0	19,0	18,0	18,2
Croatia	22,7	22,2	22,0	23,6	25,1	25,4	26,8	28,0	27,9	29,0
Cyprus	3,3	4,0	5,1	5,6	6,0	6,0	6,8	8,1	8,9	9,4
Czech Republic	7,4	8,0	8,6	9,9	10,5	11,0	12,8	13,8	15,1	15,1
Denmark	16,3	17,8	18,6	20,0	22,1	23,5	25,7	27,4	29,3	30,8
Estonia	16,1	17,1	18,9	23,0	24,6	25,5	25,8	25,6	26,3	28,6
Finland	30,0	29,6	31,3	31,3	32,4	32,8	34,4	36,7	38,7	39,3
France	9,3	10,1	11,1	12,1	12,5	11,1	13,4	14,1	14,7	15,2
Germany	7,7	9,1	8,6	9,9	10,5	11,4	12,1	12,4	13,8	14,6
Greece	7,2	8,2	8,0	8,5	9,8	10,9	13,5	15,0	15,3	15,4
Hungary	5,1	5,9	6,5	8,0	12,8	14,0	15,5	16,2	14,6	14,5
Ireland	3,1	3,6	4,1	5,1	5,6	6,6	7,2	7,7	8,7	9,2
Italy	8,3	9,8	11,5	12,8	13,0	12,9	15,4	16,7	17,1	17,5
Latvia	31,1	29,6	29,8	34,3	30,4	33,5	35,7	37,1	38,7	37,6
Lithuania	16,9	16,5	17,8	19,8	19,6	19,9	21,4	22,7	23,6	25,8
Luxembourg	1,5	2,7	2,8	2,9	2,9	2,9	3,1	3,5	4,5	5,0
Malta	0,2	0,2	0,2	0,2	1,0	1,9	2,8	3,7	4,7	5,0
Netherland	2,8	3,3	3,6	4,3	3,9	4,5	4,7	4,8	5,5	5,8
Poland	6,9	6,9	7,7	8,7	9,3	10,3	10,9	11,4	11,5	11,8
Portugal	20,8	21,9	23,0	24,4	24,2	24,6	24,6	25,7	27,0	28,0
Romania	17,1	18,3	20,5	22,7	23,4	21,4	22,8	23,9	24,8	24,8
Slovakia	6,6	7,8	7,7	9,4	9,1	10,3	10,4	10,1	11,7	12,9
Slovenia	15,6	15,6	15,0	20,1	20,4	20,3	20,8	22,4	21,5	22,0
Spain	9,2	9,7	10,8	13,0	13,8	13,2	14,3	15,3	16,1	16,2
Sweden	42,7	44,2	45,3	48,2	47,2	48,7	51,1	52,0	52,5	53,9
United Kingdom	1,5	1,8	2,7	3,3	3,7	4,2	4,6	5,7	7,1	8,2

Source: Eurostat.



*) kgoe – kilogram of equivalent oil, euro2005 – market value of euro in 2005 with the purchasing power of the currency.

Fig. 3. Final energy intensity of GDP with climate correction in Poland and European Union in 2000-2013 [kgoe/euro2005*]

Source: GUS 2016.

The last analysed indicator in accordance to sustainable development objectives relates to protection of environment and biodiversity.

Data about protected terrestrial area in European Union countries in 2004-2015 are presented in table 3. In European Union the average of 18% of terrestrial area was protected at different level in 2015. Earlier it was 13%. Enlargement of the European Union to new member countries caused increased in that ratio – the share of protected terrestrial area in new member countries were significantly high, for example Croatia – 37% and Bulgaria 34%.

In general the share of protected terrestrial differs between countries from less than 10% (Denmark and United Kingdom) to more than 25% (Bulgaria, Croatia, Cyprus, Greece, Luxembourg, Slovakia, Slovenia and Spain). In Poland that ratio equalled to 20% in 2015. In general, some increase in the ratio level was observed in many countries.

The last discussed issue concerns protection of farm and wild animals. It is an important element in protection of biodiversity and environment in general. Livestock Genetic Resources Conservation Program is a program, which focuses on protection of rare farm animals in Poland. Generally, it concerns breeds, that came originally from the territory of Poland and which rearing was limited in last decades for many reasons. In Poland a total of 79 breeds are currently protected under that program (Bioróżnorodność…, 2017):

- Cattle - 4,
- Pigs - 3,
- Horses - 7,
- Sheeps - 15,
- Poultry - 35,
- Fur animals - 6,

- Fish - 7,
- Bees - 1,
- Goats - 1.

Table 3. Protected terrestrial area in European Union countries in 2004-2015, %

Specification	2004	2007*	2010*	2013	2015
European Union	-	13	13	18	18
Austria	11	11	11	15	15
Belgium	10	10	10	13	13
Bulgaria	-	-	30	34	34
Croatia	-	-	-	37	37
Cyprus	-	7	13	28	29
Czech Republic	-	9	10	14	14
Denmark	7	7	7	8	8
Estonia	-	17	17	18	18
Finland	13	13	13	14	14
France	7	8	9	13	13
Germany	7	10	10	15	15
Greece	16	16	16	27	27
Hungary	-	15	15	21	21
Ireland	10	10	11	13	13
Italy	14	14	14	19	19
Latvia	-	11	11	12	12
Lithuania	-	10	14	12	12
Luxembourg	15	15	15	18	27
Malta	-	13	13	13	13
Netherlands	10	8	8	13	13
Poland	-	7	11	20	20
Portugal	17	17	17	21	21
Romania	-	-	13	23	23
Slovakia	-	12	12	30	30
Slovenia	-	31	31	38	38
Spain	23	23	24	27	27
Sweden	14	14	14	14	13
United Kingdom	7	7	7	9	9

*) 25 countries

Source: Eurostat.

In case of wild animals, the list consists of 591 species (Rozporządzenie…, 2016) including:

- Mammals – 51,
- Birds – 427,
- Reptiles – 5,
- Amphibians – 10,
- Fish – 5,
- Others – 93.

It can be seen, that protection of both farm and wild animals covers a long list of breeds and species. It is both a good and bad indicator. The fact, that there is a need to create protection programs indicates, that something is not right for there to be any endangered species. On the other hand, it is good that effort is being put to protect those already endangered animals.

Discussion

It is worth mentioning, that while available literature quite broadly describe and analyse the problem of sustainable development from theoretical and socio-economic points of view, the environmental point of view is not so well described.

For example Czech (2013) compared the competitive position of the economy with sustainable indicators, but only the socio-economic ones concerning employment, expenditures on research and development or education. Her analysis proves the lack of contradiction between the achievement of goals set in Europa 2020 Strategy and the competitive position of European Union economies. Busłowska (2014) attempted to evaluate the implementation of development goals in eastern Polish regions contained in the "Strategy for the social and economic growth of Eastern Poland by 2020" in the context of sustainable development. Again, she focused on aspects connected with economy development, employment, infrastructure. It was found, that the realisation of the Strategy has to be assessed positively. Changes in indicators level were significant, however, it was not determined whether they are permanent or not.

In author's studies it was shown, that all European Union countries, including high-developed countries with strong economies, are realising sustainable development objectives concerning climate change and biodiversity. It is a different aspect of Europa 2020 Strategy or Strategy concerning Eastern Poland and different goal, however all goals set in Europa 2020 Strategy are connected with sustainable development. Therefore dependencies described by Czech (2013) and Busłowska (2014) are in correspondence with author's studies.

Data analysed in the paper allow to formulate the conclusion, that Poland is on the way to sustainable development, is not however the leader among European Union countries. The same conclusion was drawn by Katoła (2013). She studied the level of sustainable development in Poland and other European Union countries and focused on indicators related to the quality of life. She found, that Poland is in the middle of the ranking set based on Sustainable Society Index and Happy Planet Index. Similar studies were carried by Imiołczyk (2016). She, however, focused not only on socio-economic aspects of sustainable development, but also include in considerations ecologic ones, for example renewable energy usage. Her findings were similar to the ones of Katoła (2013) and author's own ones. It was concluded, that Poland positively realise sustainable development objectives.

Conclusions

Sustainability is at the heart of the European Union's development strategy. The objectives of sustainable development are being achieved by each European Union country, but with varying effectiveness. Poland positively pursues all discussed issues:

- Reducing greenhouse gas emissions - low emissions' reduction rate compared to other European Union countries;
- Increasing share of renewable energy - average share of renewable energy among European Union countries, but low rate of increasing the this ratio level;
- Increasing energy efficiency – energy efficiency of GDP higher than average in the European Union, but much higher rate of decreasing its level;
- Biodiversity conservation - relatively high percentage of protected terrestrial areas.

In accordance to other European Union countries it can be said, that there are positive changes in consideration to analysed sustainable development objectives. However, countries differ in case of the scale of those changes and closeness to the final goal. All European Union countries reduce greenhouse gas emission. In the years 2007-2015 it fall from -6,3% (Netherlands) to -30,3% (Denmark). In case of shares of renewable energy in gross final energy consumption eleven European Union countries already achieved 20% use of renewable energy and therefore the goal set. All countries are increasing that share. In European Union about 16,7% in average of energy usage in 2015 was obtained from renewable sources and the ration is increasing. Also the energy efficiency measured by final energy intensity of GDP with climate change correction is improving.

It is important to underline, that analysed data seem to allow to say, that it is possible to achieve objectives set in Europa 2020 Strategy by European Union in general and by member countries.

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Review of Inclusive Growth and other Alternatives to Confront Authoritarian Populism

Abstract. Our world has gone through myriad forms of administrative and economic ideological eras, some of which helped positively and others contributed regressively. Recently, the rise of authoritarian populism as an alternative path to mainstream democracy stems from the failure of inclusiveness in the political and economic institutions especially in the rural world. Due to extractive capitalism, nowadays, rural areas are characterized by persistent poverty, deep inequalities, marginalization and exclusion, fractured identities and loss of self-esteem, which in turn engenders a regressive politics dubbed 'authoritarian populism'. It endangers our future unless we confront it and it has gained momentum by winning national elections in some countries. Alternatively, inclusive growth that would successfully share benefits to the rural people via inclusive political and economic institutions could be able to transform the rural poor. Endorsing and supporting this option with emancipatory rural politics, therefore, saves globalization from a looming collapse and ultimately culminates the world to a new level of civilization.

Key words: authoritarian populism; emancipatory politics; inclusive growth

JEL Classification: A10, P16, D72

Introduction

The world has gone through myriad forms of political and economic ideological eras, some of which helped positively and others contributed negatively. Recently, the rise of authoritarian populism as an alternative path to mainstream democracy stems from the failure of inclusiveness in the political and economic institutions, especially in the rural world (Fraser, 2017). Due to extractive capitalism, nowadays, rural areas are characterized by persistent poverty, deep inequalities, marginalization and exclusion, fractured identities and loss of self-esteem, which in turn engenders a regressive politics dubbed 'authoritarian populism'.

The nexus between authoritarian populism and inclusive democracy is a matter of some confusion in contemporary political analysis. However, from a pragmatic point of view, authoritarian populism is essentially a strategy of political mobilization using a typical style of political rhetoric, which undermines the established institutions and constitutional democracy in favor of outrageous nationalism movement. Authoritarian populism further manifests itself by preferring nationalism over regional or global integration, by portraying misogynist, xenophobic and other discriminatory behaviors. It endangers our future unless we confront it and it has gained momentum by winning national elections in some countries.

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Alternatively, inclusive growth that would successfully shares the benefits to the rural people via inclusive political and economic institutions could be able to transform the rural poor. Adopting and supporting this option saves globalization from a looming collapse and ultimately culminates the world to a new level of civilization. Therefore, I would argue intuitively that the mainstream political and economic institutions are failing to include the rural world and to benefit from the fruit of capitalism and globalization. This argument answers the question why the rural world is adopting authoritarian populism and how this ideology is getting ground as an alternative political system. In this paper, I would explore the potential of strengthening inclusive institutions, both political and economic to subside the authoritarian populism. Moreover, the interaction between rural areas and regressive national politics will be discussed intrinsically, and other alternatives like emanicipatory rural politics will also be discussed. This paper seeks to use the term 'authoritarian populism' in a politically neutral way focusing on its features, its background and alternative pathways. The aim of this paper is to review the main reasons of the rise of authoritarian populism in the rural world and to forward some alternative paths needed; like inclusive growth. To achieve this, I applied qualitative analysis as a method and recently published papers in the area (most suitable to my aim) are included as data sources.

Overview of Authoritarian Populism

My concern in this part is not to provide an overarching historical background of authoritarian populism but rather to synthesize my own understanding of the process.

During the period between the two world wars, as articulated by Heinö (2016), authoritarian parties were highly successful in the fragile European democracies. Weimar-Germany was of course the evident frame of reference in this respect. In the last free election in November 1932, democratic parties won less than 50% of the votes: the Nazis got 33% and the communists took 17%. This pattern could be seen in large parts of Europe at the time, where both the right and the left split into democratic and anti-democratic factions. In terms of popular legitimacy, both social democrats and conservatives were challenged by anti-democratic alternatives. When the democracies on the continent gradually collapsed this was only in part against the will of the people.

The Second World War put an end to this. Since the end of the war democratic parties have won overwhelming majorities in practically all elections. Liberal democracy has become a super-ideology, uniting parties with roots in both socialism, conservatism, and liberalism, Christian democratic parties as well as green parties. The lowest point for the challengers of democracy was reached in 1987, when only 9.5% of European voters voted for a totalitarian or authoritarian leftwing or right-wing alternative. In the 1980s Britain, for instance, leftist thinkers in the UK and Europe fashionably considered Margaret Thatcher as an eminent authoritarian populist, and 'Thatcherism' as an authoritarian populist ideology (Sanders *et.al*. 2016). However, following her resignation in 1990, debates about authoritarian populism waned.

Today, faced with new kinds of authoritarian populism, rural–urban divides are increasingly framed in racial or ethnic terms. After the recent contributions of Ian Scoones et al. (2017), the idea of authoritarian populism and the rural world is getting the embodiment as an initiative. Reclaiming authoritarian populism, with the rural focus, is the main discussion point of these researchers. Although there are significant differences in

how this is constituted in different places, one manifestation of the new moment is the rise of distinct forms of authoritarian populism. What is being observed is the rise of politicians, movements and spaces where these political-economic dynamics are playing out, with connections between them; scholars name these dynamics and these features authoritarian populism.

Currently, populism is becoming the main agenda of political discussions in Europe and the US. More ironically, some populist leaders like Donald J. Trump are winning national elections, which in turn supposed to shift the power dynamics and looms the failure of constitutional democracy. These populist leaders are based on the resentments of different sections of the society and they are not mainly based up on rational political assumptions. One powerful man with rhetoric who claims restoring the country to its former greatness epitomizes populism leadership.

A reaction against immigration and cultural change is the main common theme of populist authoritarian parties on both sides of the Atlantic. Economic factors such as income and unemployment rates are surprisingly weak predictors of the populist vote. Thus, exit polls from the U.S. 2016 Presidential election show that those most concerned with economic problems disproportionately voted for Clinton, while those who considered immigration the most crucial problem voted for Trump. Authoritarian populist support is concentrated among the older generation, the less educated, men, the religious, and the ethnic majority – groups that hold traditional cultural values.

During the influx of immigrants from Syria and other war-torn regions to Europe, populist authoritarian parties got the encouragement to organize and lead xenophobic movements. Moreover, these parties motivated again to participate in national and regional electoral processes and ultimately some of them won the unprecedented amount of votes. One of the most successful nationalist party families in Western Europe is the populist radical right. Parties such as the French *Front National* (National Front), the Austrian *Freiheitliche Partei Österreichs* (Freedom Party of Austria), the Italian *Lega Nord* (Northern League), the Belgian *Vlaams Belang* (Flemish Interest), the Danish *Dansk Folkeparti* (Danish People's Party) and the Dutch *Partij voor de Vrijheid* (Freedom Party, PVV) have, in their most successful years, obtained between 12 and 27% of the votes (Rooduijn, 2014).

According to Inglehart and Norris (2017), support for populist authoritarian parties is motivated by a backlash against the cultural changes linked with the rise of Post-materialist and Self-expression values, far more than by economic factors. The proximate cause of the populist vote is anxiety that pervasive cultural changes and an influx of foreigners are eroding the cultural norms one knew since childhood.

The Reasons for the Rise of Authoritarian Populism in the Rural World

Different scholars in the field tried to define authoritarian populism but I adopted the definition of Hall (1985, 1980), which is probably the best. It refers to 'a movement towards a dominative and "authoritarian" form of democratic class politics – paradoxically, apparently rooted in the "transformism" of populist discontents'. Essentially, it refers to changes in the "political and economic dynamism". However, there is no a definitional consensus within the scholarly community as one can apparently check it by revisiting the existing literature.

Authoritarian populism, as defined by Ian Scoones et al. (2017), is a subset of populism, a capacious and at times problematic category (a political struggle between 'the people' and unfairly advantaged 'Others') that the political right and left perceive it differently. Moreover, these researchers asked what features of authoritarian populism are evident. At a time of increasing inequality between rich and poor, rural and urban, labor and capital, the following features seem particularly relevant: the rise of protectionist politics and the embrace of nationalism over regional or global integration, whether in trade blocs or international agreements for instance, the Trump rhetoric to withdraw from the NAFTA; highly contested national elections, resonant with broad-brush appeals to 'the people', in which candidates are rewarded for 'strong man' talk that pits insiders against outsiders of different colors, religions and origins; growing concern over the 'mobile poor', including refugees and migrants whose presence seems to threaten a shrinking resource base; appeals for security at the expense of civil liberties; a concerted push to increase extractive capitalism at all costs; and, finally, a radical undermining of the state's ability to support the full range of citizens, while utilizing state powers to increase surplus for a minority.

The above situations are not evident everywhere as explained by different researchers, nor are they necessarily evident in their entirety anywhere (Hall and Kepe, 2017; Badiou, 2016). At the same time, many are actively working to counter these elements and nowhere is any single political approach absolute.

According to Levitsky and Way (2010), different authoritarian populisms range from 'competitive' regimes that allow some political space for opponents to 'non-competitive' ones that in extreme cases border on absolute dictatorships. Therefore, contemporary populist politics are far from uniform and are often contradictory, often exacerbated by religious forces in the US, Europe and Africa (Hasan, 2016).

Authoritarian populism can further be classified as right wing and left wing populist authoritarians. Populist radical right parties in Europe, for example, share a core ideology of nativism, authoritarianism, and populism; all these three features have a strained relationship with liberal democracy (Mudde, 2007). The political right has often used the term 'populism' as a synonym for demagoguery. Left-wing authoritarian populism, on the other hand, is manifested in the political movement of Latin American countries. In this respect, they have used the term to attack even progressive or anti-imperialist governments with a multi-class base that claimed to defend 'popular' or national, rather than solely working-class, interests (Svampa, 2015). Authoritarian populism, whether of the left or the right, is thought to be a threat to democracy.

To reiterate and emphasize the idea of authoritarian populism and its rural roots, one shouldn't overlook the contribution of Ian Scoones et al. (2017). Nowadays, rural areas everywhere are characterized by deep inequalities, persistent poverty, marginalization and exclusion, fractured identities and loss, giving rise to a regressive politics. These aspects of the contemporary moment are shaped by prior transformations in rural society and economy and they portend even more dramatic and usually negative changes for rural areas. Other former contributions should also be emphasized (e.g., Rancière, 2016; Mudde, 2007; Edelman, 2003; Hall, 1985).

According to Li (2010), massive exclusions and dispossessions in the process of resource extraction hit rural areas. Austerity measures taken due to the recent capitalism's upheaval and the associated worst impacts of the withdrawal of public services have been felt in rural areas.

Deindustrialization, a product of both automation and robotics in the US, for example and of companies moving abroad, famously hit rural areas hard, leading to the near disappearance of jobs that paid adequate wages. Moreover, small town Main Streets, historically populated with family-owned businesses that provided both off-farm income and employment for farm households and sites of human contact and thick social networks, withered as malls and big chain stores were located in nearby areas. These changes against the rural world forced the rural people to adopt some sort of authoritarian politics.

At the same time, a global economy based on a voracious, unsustainable use of natural resources has devastated many rural areas. Almost half of the world's population makes a living from the land, and yet this resource base is being depleted through various forms of extractivism (Conde and Le Billon, 2017; Veltmeyer and Petras, 2014). Because of this reason, industrial economies fail to provide employment opportunities they once did (Monnat, 2016). This prompted the rise of regressive politics in the rural world.

On the other side, patterns of migration – including both an exodus of young people from rural areas and an in-migration of both short-term agricultural workers or herders and formerly urban elites –are affecting rural politics, across generations and classes (Gusterson, 2017). Hence, this situation has played its own role for the rise of authoritarian populism. However, how patterns of migration worked out and the consequences of such rural transformations in diverse settings need to be explored.

Overview of Alternative Paths

To suggest possible alternatives, one should understand the roots of the discontent culpable for the rise of populism in the rural world. Nowadays, the situation of peoples dwelling in rural areas is worsening. Feeling of isolation from the mainstream economic and political institutions is growing, losing the trust that global capitalism is well functioning, growing inequalities, and ultimately persistent poverty. These features of the rural world gave rise and encouraged the movement of populism. More dramatically, the authoritarian populism, which opposes the establishment of constitutional democracy, originated because of extractive economic and political institutions. Economic history tells us nations fail and go regressively when inclusive institutions turn to their extractive counterparts. In exploring alternatives to authoritarian populism, we must know what experiments in rural solidarity economies are emerging that offer rural employment and new livelihoods, providing the base for a new politics.

To restore growth and stability, adopting and supporting inclusive economic and political institutions is indispensable. Some countries perform far better than others because of the way their institutions, both economic and political, shape the incentives of businesses, individuals, and politicians. Each society functions with a set of economic and political rules created and enforced by the state and the citizens collectively. Economic institutions shape economic incentives: the incentives to become educated, to save and invest, to innovate and adopt new technologies, and so on. It is the political process that determines what economic institutions people live under, and it is the political institutions that determine how this process works out (Robinson and Acemoglu, 2012).

However, inclusive growth is insufficient to address many challenges (De Haan, 2014), during an epoch of social revolution. Instead, a more radical transformation needs to be imagined, rooted in mutualist, embedded forms of organization of life and economy,

ones that are simultaneously local and transnational, yet attuned to class difference and identity. Therefore, any alternatives must reclaim the 'public sphere' (Fraser, 1990), reinventing citizenship, drawing on new forms of communalism and solidarity, and linking to a broad front of resistance.

Emergence of such politics that is not just bottom-up, but also horizontal, connecting across class, gender, racial, generational and ideological divides and transcending geographic boundaries called 'emancipatory politics' is more phenomenal (Ian Scoones *et al*, 2017). Following Bookchin (1998), the fostering of autonomous, local, decentralized, participatory democracies, based on inspirations from 'social ecology', are the best route to emancipation. Therefore, emancipatory rural politics is an alternative to confront authoritarian populism by bringing rural people together who also struggle in small, often isolated ways, able to understand a particular situation and engage in collective action.

Conclusion

In exploring rural politics, we therefore must understand, but not judge, the social base, and its class, gender, ethnic and cultural-religious dimensions, which gives rise to regressive and exclusionary, sometimes violent, political movements. Forms of dislocation, prolonged and widespread neglect, challenges to identity and the undermining of rural communities and livelihoods have been widely documented as the root causes for the rise of authoritarian populism.

In order to confront authoritarian populism, alternatives are needed. There are plenty of experiments with alternatives – around long-term challenges, sectoral interests and society-wide visions – but they will be more profound and long lasting if they are better understood and connected. An emancipatory politics, for example, requires an understanding of the current regressive trends – the things to be 'resisted' – and a vision of a better society and ways to move towards it. In confronting authoritarian populism, I recommend the adoption of inclusive growth via inclusive institutions to culminate the world for further prosperity. In this view, a new emancipatory politics must therefore address many challenges together, rather than in piecemeal fashion. But to know how the interaction of different emancipatory alternatives plays out, it needs further investigation.

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Statistical Analysis of Soft Commodities Returns in the Period 2007-2016

Abstract. Soft commodities, often referred to as tropics, constitute a significant element of international trade and are also important to the Polish economy. Moreover, Polish investors may invest in foreign markets of soft commodities through commodity-linked ETFs, offered by some brokerage houses. Obviously, each investment decision should be preceded by an analysis of asset performance. This paper provides results of statistical analysis of soft commodities returns over the period January 2007 to December 2016. They reveal the existence of weak positive correlation between the returns, non-normal distributions, negative trends, and serial autocorrelation.

Keywords: soft commodities, distributional characteristics, correlation, trend, autocorrelation

JEL Classification: C10, C12, G12

Introduction

Soft commodities (softs) constitute an important part of the world trade. Their role is reflected in construction of commodity indices, such as the Tomson Reuters/Core Commodity CRB Index that is a broad indicator of commodity price movement and the most widely followed index of commodities futures. The index, originally composed of 28 commodities, currently is made up of 19 commodities and soft commodities cover more than 20% of its portfolio.

Basic soft commodities are: coffee, cocoa, sugar, cotton, orange juice, and rubber[3]. With no doubt, the most important of them is coffee - the most valuable agriculture item on the world market. According to the FAIRTRADE Poland, the actual value of the world coffee market exceeds the amount of 81 billion USD (www.faitrade.org.pl). The coffee bean had its origin in Ethiopia, where it was roasted for the first time in the 14th century and then brewed into coffee (Eller and Sagerer, 2008). Today, this tropical crop is grown in many different varieties, but the basic classification establishes two main coffee types: the higher-quality African coffee Arabica and Latin American coffee Robusta. Geman (2007) notes that the USA almost exclusively import Robusta coffee, probably because the US consumers have gotten to its taste. The largest coffee producer is Brazil, followed by Colombia, Ecuador, Costa Rica, and Vietnam. Eller and Sagerer (2008) claim that since the trend in Asian regions has been to plant less tea crops and more coffee crops, demand for this agro-sector is only expected to increase in the future.

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[3] According to Fabozzi, Füss and Kaiser (2008), there are three other commodities that may fall into the group of softs. These are: silk, timber, and wool.

On the contrary, cocoa is mainly cropped at the Ivory Coast. It is characterized by a long production cycle as new trees take approximately seven years to mature and fruit (for new coffee bushes it takes 3 – 5 years). The typical cocoa flavor occurs after fermentation of the bean semen. More than 90% of the world harvest is used in the sweets industry, the rest in cosmetics and pharmaceuticals industries.

The agro-raw material sugar is manufactured from sugarcane and from sugar beets. Sugarcane is grown in tropical sub-regions such as Brazil, India, and Cuba, whereas sugar beets come from moderate climates such as in Europe, Australia or China. Sugar is used to improve flavor and preserve goods, but it has also been used increasingly as gasoline competitor in the form of ethanol fuel. Brazil is the largest sugar producer, but half of the Brazilian sugar harvest is currently processed into biofuel. The second largest producer is India followed by European Union[4], and China.

Cotton is another hot-weather crop that has been in use for more than 5 000 years in India. Also in China, Egypt and the United States it has been in use for 1 000 years. Today, cotton is grown in more than seventy countries worldwide, of which China and the United States are the most important producers (Eller and Sagerer, 2008). In the US it is grown from Georgia through Arizona and California. According to Geman (2007), Californian cotton is among the best quality cotton in the world. After the harvest, the cotton is dried, cleaned, and packed into the bales. Cotton fibers are used in the textile industry.

The most important producers of concentrated orange juice are: Brazil (the state of Sao Paulo) and the United States (the state of Florida), and then Italy and Mexico. Frozen concentrated orange juice (FCOJ) was first traded in an organized way around 1947. Innovations in packaging and transportation permitted the emergence of an international market. In 1966 the New York Board of Trade (NYBOT), launched FCOJ futures contracts, whereas options on futures appeared in 1985. Both instruments allow for hedging against the impact of the weather on commodity price as production in Florida is very sensitive to Frost while orange trees in Brazil languish in a dry climate (Geman, 2007).

The last one of the soft commodities under consideration is rubber. Natural rubber is mainly produced in South and Southern-West Asia (in Thailand, Indonesia, and Vietnam), but also in India, China, and Malesia. The world centers for rubber trade are Tokyo Commodity Exchange and Singapore Commodity Exchange. Natural rubber is used extensively in many applications and products, either alone or in combination with other materials. In most of its useful forms, it has a large stretch ratio and high resilience, and is also waterproof.

As all these soft commodities are underlying assets for derivatives, not only producers and consumers, but also institutional and individual investors are interested in recognizing some patterns, trends and anomalies in performance of their prices and returns. Thus, this paper is aimed at the statistical analysis of soft commodity returns in the period January 2007 through December 2016. Data under consideration covers daily spot prices of the commodities available at www.bloomberg.com.

[4] The sugar market in the EU is among most regulated food markets in the world. This regulation is based on production limits and foreign trade regulations (Hamulczuk and Szajner 2015).

Methods of analysis

Following Chevallier and Ielpo (2013) we consider commodities as any other financial asset and work with returns on commodities:

$$r_t = p_t - p_{t-1}, \tag{1}$$

where p_t is the logarithm of commodity price at time t and p_{t-1} is the logarithm of commodity price in the previous period.

Then, we calculate several descriptive characteristics.

1. Mean return is an indicator for the location of the return distribution. It is:

$$\bar{r} = \frac{r_1 + r_2 + \ldots + r_n}{n}. \tag{2}$$

2. Standard deviation:

$$\sigma = \left(\frac{1}{n-1} \sum_{i=1}^{n} (r_i - \bar{r})^2 \right)^{0,5}. \tag{3}$$

The standard deviation indicates the dispersion of the return distribution. It accounts for both the positive and negative deviations from the average value and is thus a measure for the total risk of an investment.

3. Skewness:

$$S = \frac{\frac{1}{n} \sum_{i=1}^{n} (r_i - \bar{r})^3}{\sigma^3}. \tag{4}$$

The skewness describes the asymmetry of a probability distribution. If the distribution has a longer tail on the right (left) side then the distribution is referred to as positively (negatively) skewed. The skewness of a symmetrical probability distribution is equal to zero.

4. Kurtosis:

$$K = \frac{\frac{1}{n} \sum_{i=1}^{n} (r_i - \bar{r})^4}{\sigma^4}. \tag{5}$$

Kurtosis describes whether a probability distribution is more acute or wider in comparison to normal distribution, which has kurtosis of three. If the probability is more acute (wider) and has more (less) returns at tails than a normal distribution, then the distribution is referred to as leptokurtic (platykurtic). Having thick distribution ends ("fat tails") is referred to as having positive excess kurtosis; having thinner tails when compared to the normal distribution indicates negative excess kurtosis.

In order to assess linear dependence between soft commodities returns, Pearson correlation measure is considered. The Pearson correlation coefficient k_{XY} of commodities X and Y is:

$$k_{XY} = \frac{\sum_{i=1}^{n}(r_{Xi} - \bar{r}_X)(r_{Yi} - \bar{r}_Y)}{(n-1)S_X S_Y}. \tag{6}$$

Its value ranges between <-1, 1>. The higher the value of its modulus, the stronger the linear dependence between the investigated time series.

For the purpose of analysis, there is also tested normality of distribution of time series under consideration. The normal distribution can be statistically verified using respective Jarque-Bera test.

The null hypothesis:
H_0: the returns follow a normal distribution
is tested against the alternative hypothesis
H_1: the returns do not follow a normal distribution.

The test statistic *JB* is:

$$JB = \frac{n}{6}\left[S^2 + \frac{1}{4}(K-3)^2\right]. \tag{7}$$

The statistic follows an asymptotic chi-squared distribution with two degrees of freedom.

Commodity returns often exhibit trends. A trend in the commodity returns can be represented in the following way:

$$p_t = \alpha_0 + \alpha_1 t + \varepsilon_t, \tag{8}$$

where ε_t captures the deviation from the trend. The sign of α_1 estimator (a_1) decides the nature of the trend. Moving back to returns, this equation turns out to be:

$$r_t = a_1 + e_t - e_{t-1}, \tag{9}$$

where e_t - residuals from equation (8).

When a_1 is positive (respectively negative), the commodity is driven by a positive (negative) trend.

Trends can be understood as a natural tendency for returns to have one particular sign, regardless of the period considered or of the frequency used to compute it. This is measured in equation (8) by the estimator of α_1. The question is whether the trends observed are persistent. A first simple and intuitive approach to gather the evidence that commodities exhibit persistent trends is to compute the autocorrelation of order *h*, that is:

$$\hat{\rho}_h = \frac{\sum_{i=h+1}^{n}(r_i - \bar{r})(r_{r-h} - \bar{r})}{\sum_{i=1}^{n}(r_i - \bar{r})^2}. \tag{10}$$

If $\hat{\rho}_h$ is positive and significant at 5% risk level, this provides evidence that a given commodity exhibits persistence. Conversely, when $\hat{\rho}_h$ is negative and significant, the commodity under consideration has a mean-reverting behavior, rapidly correcting its trajectory in case of a large positive or negative return (Chevallier and Ielpo, 2013).

If observed trends are persistent, then investors applying trend-following strategies can benefit from commodity markets (see Lukac, Brorsen and Irwin (1988), Irwin et al. (1997), Erb and Harvey (2006), Miffre and Rallis (2007), Fuertes, Miffre and Rallis (2008), Szakamary, Shen and Dharma (2010), Górska and Krawiec (2011), Zaremba (2015)).

Instead of testing the statistical significance of any individual autocorrelation coefficient, we can test the joint hypothesis that all the $\hat{\rho}_h$ up to certain lags are simultaneously equal to zero. This can be done by using the statistic developed by Box and Pierce (1970). In 1978 this statistic was modified by Ljung and Box. The Ljung-Box (LB) statistic is defined as:

$$LB = n(n+2)\sum_{h=1}^{m}\frac{\hat{\rho}(h)^2}{n-h}, \tag{11}$$

where: n – sample size, m – lag length.

In large samples LB statistic follows chi-square distribution with m degrees of freedom (Ljung and Box 1978). According to Gujarati (2003), the LB statistic has been found to have better (more powerful in the statistical sense) small-sample properties than the Box-Pierce statistic.

Empirical results

Following the methodology described in the previous section, in the first step of research there are calculated logarithmic returns of soft commodities (displayed in Figure 1) and their basic descriptive characteristics (given in Table 1): maximum and minimum, range (that is the difference between them), standard deviation, kurtosis, skewness, the JB statistics, trend slope a_1, and coefficient of autocorrelation of the first order ($\hat{\rho}_1$).

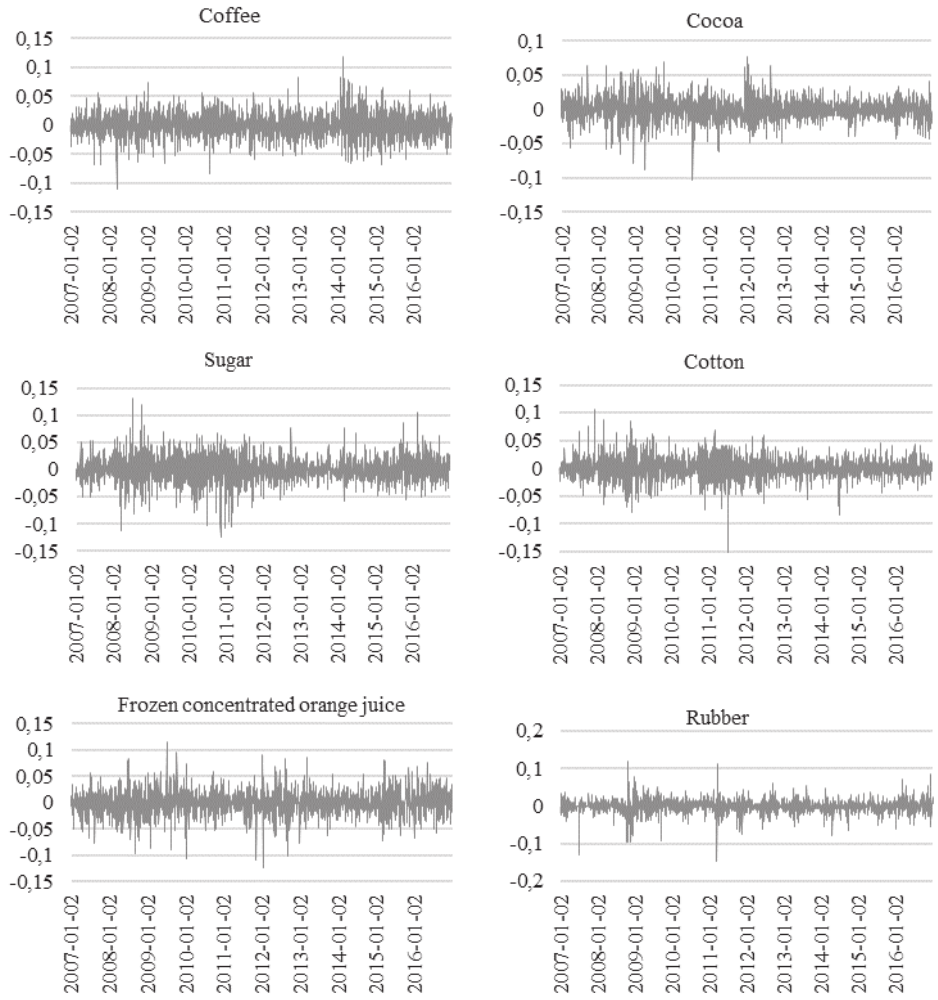

Fig.1. Soft commodities daily logarithmic returns in the period 2007-2016

Source: own elaboration.

On the base of results given in table 1 we can conclude that almost all soft commodities exhibit positive mean returns, the highest one - cocoa. The only exception is frozen concentrated orange juice with negative mean return. All commodities (except for coffee) are described by negative skewness. Moreover, kurtosis is higher than 3 for four out of six soft commodities (cocoa, sugar, cotton, rubber) whose distributions are leptokurtic. The Jarque-Bera (JB) statistic of normality confirms the rejection of null hypothesis for all return series at 5% level of significance. All commodities, with the exception of frozen concentrated orange juice, are driven by negative trends. We also find a statistically significant positive autocorrelation of order 1 for four soft commodities (cocoa, cotton, frozen concentrated orange juice, rubber), which is the evidence, although limited, of trend persistence.

Table 1. Basic characteristics for logarithmic returns of soft commodities

Characteristic	Commodity					
	Coffee	Cocoa	Sugar	Cotton	Frozen concentrated orange juice	Rubber
Maximum	0.11789	0.07810	0.13062	0.10527	0.11474	0.11879
Minimum	-0.11089	-0.10401	-0.12366	-0.15555	-0.12314	-0.14774
Range	0.22878	0.18211	0.25428	0.26082	0.23789	0.26653
Mean	0.00003	0.00026	0.00019	0.00009	-0.00001	0.00002
Standard deviation	0.01982	0.01550	0.02190	0.01888	0.02163	0.01711
Kurtosis	2.08055	3.48264	3.26530	4.47554	2.74104	8.78294
Skewness	0.09118	-0.14439	-0.07872	-0.31238	-0.13873	-0.67168
Trend slope	−2.2e-07	−5.7e-07	−1.7e-07	−2.8e-07	6.8e-07	−3.1e-07
Autocorrel. of order 1	-0.0336	**0.0464**	-0.0099	**0.1126**	**0.0874**	**0.1233**
JB	471.33*	1320.77*	1155.69*	2209.30*	820.62*	8544.24*

Note: bold type denotes statistical significance at 0.05 level; * denotes rejection of null hypothesis at 0.05 level

Source: own calculations.

In Table 2, there are presented values of Pearson correlation coefficient between soft commodities return series. Almost all of them are characterized by weak positive linear correlation. The strongest correlation is between coffee and sugar (0.283).

Table 2. Pearson correlation coefficients for logarithmic returns of soft commodities

Commodity	Coffee	Cocoa	Sugar	Cotton	Frozen concentrated orange juice	Rubber
Coffee	**1**					
Cocoa	**0.137**	**1**				
Sugar	**0.283**	**0.124**	**1**			
Cotton	**0.209**	**0.111**	**0.220**	**1**		
Frozen concentrated orange juice	**0.063**	**0.026**	**0.064**	**0.096**	**1**	
Rubber	**0.106**	**0.067**	**0.072**	**0.133**	0.048	**1**

Note: bold type denotes statistical significance at 0.05 level

Source: own calculations.

Additionally, to test whether soft commodities returns are independent, we plot the sample autocorrelation functions (ACFs) in Figure 2. Although some autocorrelations are statistically different from zero at the 5% level (e.g. at lag 3, 18, 20, 21, 23 and 24 for coffee; at lag 1, 25, 28, 31 and 34 for cocoa; etc.), there is no systematic pattern of autocorrelations. To investigate it further, we compute the Ljung-Box test statistic of the joint null hypothesis that all of the first 5, 10, 20, and 30 autocorrelations are zero. The results obtained are given in Table 3. They show that regardless the number of lags, we find statistically significant autocorrelation for cotton, frozen concentrated orange juice, and rubber returns. Only for cocoa returns, there is no evidence of significant autocorrelation. This finding is consistent with informationally efficient market, where price changes must be unpredictable if they are properly anticipated by market participants.

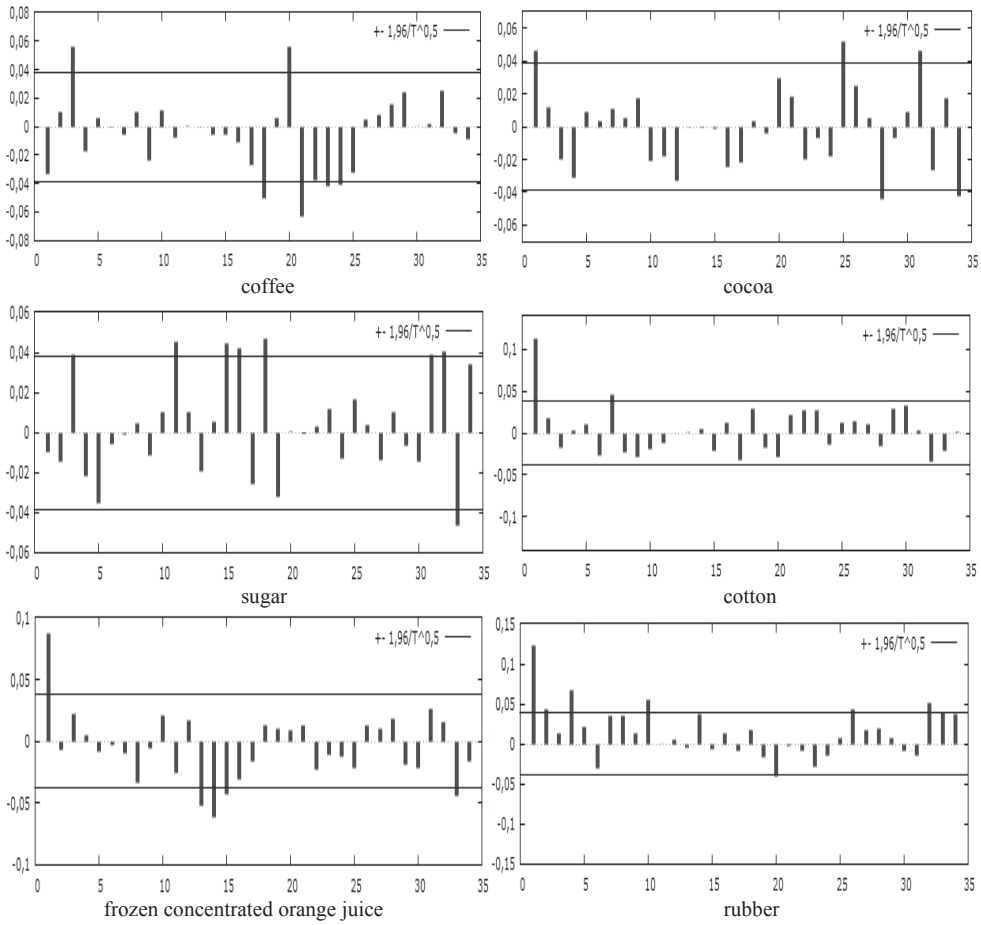

Fig.2. Sample autocorrelation functions (ACFs) for logarithmic returns of soft commodities

Source: own elaboration.

Table 3. Values of LB statistic for logarithmic returns of soft commodities

Commodity	Number of lags			
	5	10	20	30
Coffee	12.340*	14.564	32.304*	60.903*
Cocoa	9.794	12.088	21.215	38.321
Sugar	9.493	10.266	37.215*	40.347
Cotton	35.172*	46.966*	56.997*	69.494*
Frozen concentrated orange juice	21.612*	26.111*	55.013*	62.654*
Rubber	58.007*	75.274*	85.707*	96.172*

Note: * denotes rejection of null hypothesis at 0.05 level

Source: own calculations.

Concluding remarks

Soft commodities are often referred to as „tropics", because these commodities are grown primarily in tropical or subtropical regions. In most cases they are grown in developing countries. The most important of soft commodities are: coffee, cocoa, sugar, cotton, orange juice, and rubber. They constitute a significant element of international trade balance, and are also important to Polish economy. According to the data released by the Central Statistical Office of Poland: "*Foreign Trade Turnover By Main Commodities 2016*" (Foreign…, 2017), in 2016 import of coffee to Poland reached the value of 459 924 000 USD and quantity of 148 394 tons, whereas import of cocoa (cocoa beans) – the value of 38 832 000 USD and quantity of 10 443 tons, cane or beet sugar, chemically pure sucrose in solid form – value of 125 353 000 USD (246 351 tons); cotton, carded or combed – 12 347 000 USD (6 689 tons); cotton yarn – 81 723 000 USD (30 218 tons), and woven fabrics of cotton - 302 123 000 USD (38 335 tons). Moreover, Polish investors have an opportunity to invest in foreign markets of soft commodities through commodity-linked exchange traded funds (ETFs), as some brokerage houses, for example Pekao or mBank, offer these instruments to their clients.

Using commodities as a financial investment opens a whole new universe of potential assets. However, investors should consider carefully certain aspects of each asset such as returns distribution, the correlation to other assets or autocorrelation. This paper was aimed at statistical analysis of soft commodities returns in the period January 2007 through December 2016. The results show that in the period under consideration soft commodities returns exhibited weak positive correlation. What is more, the returns were not normally distributed. In most cases they exhibited negative skewness and excess kurtosis. It is worth to remember that negative skewness and positive excess kurtosis are distribution properties that investors do not appreciate, because they imply more overall large returns (positive and negative) compared to the normal distribution. The larger negative returns are generally not compensated for by larger positive returns. We also find the statistically significant autocorrelation in soft commodities returns (with the exception of cocoa), which could be the evidence for weak-form informational inefficiency of their markets.

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Eco-innovative Activity of Ukrainian SMEs

Abstract. The study attempts to investigate the eco-innovative activity of Ukrainian enterprises according to their size (small, medium, and large) with special focus on SMEs as the predominant group of enterprises, which ensure the innovative development of the whole national economy, and is central to the efforts to achieve environmental sustainability and green growth. The empirical analysis is based on a questionnaire survey of 254 Ukrainian enterprises of different sizes; the survey presents data on their current state and foreign trade activity, opportunities and barriers for the implementation of technological innovations and eco-innovations. The relationships between the export and eco-innovative activities is also explored. The analysis showed that SMEs are less eco-innovative in comparison with large enterprises, have fewer numbers of exporters than large firms, but exporters are more eco-innovative than non-exporters. Also, the size of the Eco-innovation Index for Ukraine was calculated. Based on the obtained results, Ukraine is an economy with a low level of eco-innovativeness, so, the study is extremely important.

Key words: eco-innovation, innovative development, small, medium and large enterprises, exporters, foreign trade activity, Ukraine

JEL Classification: O13, O3, Q5, F18

Introduction

Innovative development has become the main factor providing international competitiveness of national economies on world markets. Eco-innovation aims to create both economic and environmental values, it plays an increasingly important role in building competitive advantadge of individual enterprises, sectors and whole economies, but in spite of this, ecological innovation is currently a neglected area. According to Kemp (Kemp, 2011), eco-innovation is a prime candidate for "new mission" policies to deal with (interrelated) societal challenges of climate change, resource efficiency, and energy/resource scarcity. Thus, the main purpose of this paper is to analyse the eco-innovative activity of enterprises according to their size (small, medium, and large), and to determine the relationship of their export activity and eco-innovation. For the investigation we choose Ukraine as an economy with a low level of eco-innovativeness. The economic transformation since 1991 has brought significant changes in the innovative activity of Ukrainian enterprises. Nowadays, they implement new technologies much more actively, but environmental innovations still are not widely adopted.

The understanding of eco-innovation activity of enterprises has been an ongoing topic in practitioner and academic discussion since the 1980s. Different studies emphasized that those entrepreneurs who give importance to collaboration with research institutes, agencies and universities, and to the increase of market demand for green products are more active in all types of eco-innovations (Triguero et al., 2013). Eco-innovations are expected to help

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finding sustainable solutions for the "grand challenges" such as global warming, tightening supplies of energy, water and food, or public health (Aschhoff et al., 2013).

As it is noted by Rennings and Jaffe et al. (Rennings, 2000; Jaffe et al., 2005), the environmental innovation policy has the dual effect of increasing the innovation across all economic sectors and improving the state of the environment for the benefit of the citizens of the country as well as for the rest of the world.

Cuerva et al. found that technological capabilities such as R&D and human capital foster the conventional innovations but not the eco-innovations. Moreover, they recommend reducing the financial constraints for SMEs in order to incentivize eco-innovation (Cuerva et al., 2014).

According to recent studies (Enhancing…, 2017) SMEs play a key role in national economies around the world, generating employment and value-added and contributing to innovation. SMEs are central to the efforts to achieve environmental sustainability and green growth. However, these contributions vary widely across firms and across countries and sectors.

Objectives

The primary objective of the study is the investigation of the adoption of eco-innovations by Ukrainian enterprises with a focus on companies of small and medium sizes, mainly those which are involved in export activity, because of a huge lack of the investigations of both innovative and foreign trade activities of SMEs in Ukraine. Moreover, SMEs are regarded as less favored in the innovation diffusion. Most models regarding innovation are focused on the diffusion of new developments within business networks and clusters, such as percolation models. If large enterprises, especially multinationals, benefit from a large support network at an international level, SMEs are often isolated, thus reducing their capacity to have access to the newest research (Voicu-Dorobantu et al., 2011). In Ukraine the systemic monitoring of foreign economic activity of small and medium-sized enterprises generally is not conducted (Pokryshka, 2016). From time to time periodic surveys of this area are carried out either by the domestic research institutes, such as the Institute for Economic Research and Policy Consulting (Ryzhenkov, 2015; Pokryshka, 2016), or by international institutions, such as the World Bank Group (Ukraine..., 2013), and their innovation activities are monitored and analyzed by the State Statistics Service of Ukraine (Scientific…, 2016). However, the implementation of eco-innovative technologies by the exporters according to their size is not out of sight neither for independent scientists, nor for the whole institutes. That is why the presented analysis of eco-innovative activities of SMEs is one of the most important tasks for theoretical researchers, businessmen and policy-makers.

Other objectives of this paper are:

- to explore the purpose and barriers to implementation of eco-innovation of SMEs;
- to determine the problems and possibilities of the eco-innovative development of SMEs in Ukraine.

Data sources and research methods

In the study three comparative and descriptive methods were applied in the analysis of the research problem. Data used for the comparative analysis are taken from the databases of the State Statistics Service of Ukraine, the Eurostat and OECD official statistics. The information framework of the paper is based on Ukrainian and the EU member laws and regulations in eco-innovation policies, and scientific publications.

Empirical analysis of the literature revealed the most important problems to eco-innovation of SMEs, especially in the case of Ukraine.

Based on the Eco-Innovation Scoreboard as the first tool to assess and illustrate eco-innovation performance across the EU Members, we have calculated the size of the Eco-innovation Index for Ukraine. This index aims at capturing the different aspects of eco-innovation by applying 16 indicators grouped into five thematic areas: eco-innovation inputs, eco-innovation activities, eco-innovation outputs, resource efficiency and socio-economic outcomes. It has allowed us to show how well Ukraine performs in different dimensions of eco-innovation compared to the EU Members.

This paper is based on a structured interview as a method of data collection in quantitative research to reveal the main directions and drivers to eco-innovation of Ukrainian enterprises, and to determine the concept of innovative development through implementation of eco-innovations by SMEs.

Research results

The analyses of Ukrainian eco-innovative development based on the Eco-Innovation Scoreboard Index indicators has shown that Ukraine is a country with a low level of eco-innovative efficiency (Figure 1). Ukraine was in the penultimate position in comparison with other EU Members with the result of 34 points in 2015 (Environmental…, 2016). Bulgaria and Poland are rated a bit better with the results of 49 and 59 points.

Analyzing the results of the eco-innovation index in terms of individual groups of indicators, it can be noted that the relatively strongest area of Ukrainian eco-innovation is the area of the achieved results (it is placed before Bulgaria). In the other four areas – expenditures on eco-innovation, eco-innovation activity, social and economic effects resulting from the introduction of eco-innovation, and achieved environmental effects – Ukraine takes the last position.

Following the results of the Eco-Innovation Index it should be emphasized that Ukraine needs more effective state-supported programs of eco-innovation and sustainable development. The Ukrainian government also regards eco-innovation as part of the growth strategy of the national economy, but researchers noticed that in practice, however, these goals are not treated as priorities, and the institutions supporting the innovation consider environmental issues to be of secondary importance. But nowadays, Ukraine has a wide range of possibilities for both conducting research and introducing eco-innovation projects by enterprises of different sizes.

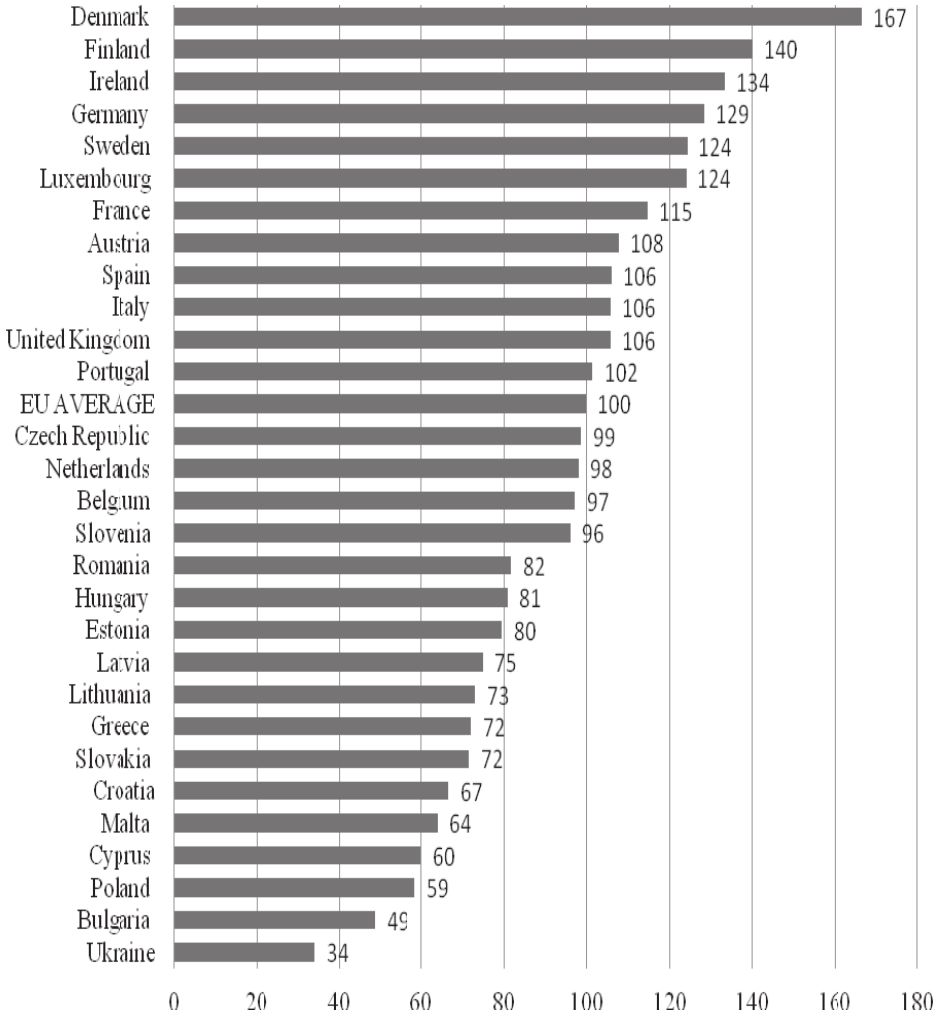

Fig. 1. Eco-innovation Index for EU-28 and Ukraine, 2015

Source: own compilation based on (Hrabynskyi et al., 2017 A) (in case of Ukraine) and on (The Eco-Innovation…, 2016) (in case of the EU).

It should be emphasized that in Ukraine SMEs are the predominant form of enterprises, accounting for approximately 99.7% of all firms. The indicators that show the weight of SMEs in national economy confirm their importance for economic growth. According to the State Statistics Service, in Ukraine SMEs provide about 72.6% of jobs and contribute 52.5% of value added (The official…). In addition, eco-innovative development of SMEs can contribute to economic diversification and resilience. This is especially relevant for resource-rich countries that are particularly vulnerable to commodity price fluctuations.

It should be noted that a standard international definition of small and medium-sized enterprise does not exist. SMEs are defined differently in the legislation across countries, in particular because the dimension "small" and "medium" of a firm are relative to the size of the domestic economy. The most common factor determining the size of enterprises is the number of people employed. According to this factor the World Bank divides enterprises into three groups: small – 1-19, medium – 20-99, and large – more than 100 employees (Ukraine..., 2013). The OECD refers to SMEs as the firms employing up to 249 persons, with the following breakdown: micro (1 to 9), small (10 to 49) and medium (50-249). Large enterprises have more than 250 employees. This provides for the best comparability given the varying data collection practices across countries, noting that some countries use different conventions (Enhancing…, 2017).

In the study, the classification of enterprises is based on the Ukrainian laws, which determined that small-sized enterprises employ less than 50 people, medium-sized - from 50 to 249 people, large-sized – 250 or more people (Economic...). The same classification method is used by the Ukrainian Institute for Economic Research and Policy Consulting (Ryzhenkov, 2015).

During the period from 10th of September 2016 through 22nd of December 2016 we collected data received from the telephone interviews with business owners and top-managers in 254 Ukrainian enterprises. For more probability of the analysis, the survey covered about the same number of different-sized enterprises - 88 large, 84 medium and 82 small enterprises. The survey was concerned the participation of enterprises in foreign trade activity, and the present situation, opportunities and barriers in the implementation of technological and environmental innovations. Geographical coverage of the study: all regions of Ukraine, except for the temporarily occupied territory of the Autonomous Republic of Crimea, Sevastopol and parts of the zone of anti-terrorist operation.

Table 1 shows the results of the survey of Ukrainian small, medium and large-sized enterprises regarding their innovation activity. Additionally, the implementation of eco-innovations was also evaluated.

Table 1: Innovation activity of Ukrainian enterprises according to their size

	Total number of surveyed enterprises	Innovation-active enterprises				Non-innovative enterprises	
		Number	% of total number of surveyed enterprises	Number of firms with eco-innovation activities, % of total number of innovation-active firms	% of total number of innovation-active enterprises	Number	% total number of surveyed enterprises
Total	254	57	22,4	19	33,3	197	77,6
including							
Small	82	8	9,8	2	24,9	74	90,2
Medium	84	18	21,4	5	27,8	66	78,6
Large	88	31	35,2	12	38,7	57	64,8

Source: Author's own elaboration.

In Ukraine the eco-innovative activities of firms of all sizes are growing but SMEs are less eco-innovative in comparison with large enterprises. The low eco-innovation of SMEs is due to poor results in research and development as well as investments in environmental technologies. In 2015 their eco-innovative activity was funded almost entirely from their own sources (85%), 0,7% - from state and local budgets, 0.8% - by loans, and 1.3% - by domestic and foreign investment [Scientific… 2016].

In the study the companies were divided into the groups with respect to their participation in export activities (Table 2).

Table 2. Groups of enterprises by size with respect to their participation in export activities

	Large				Medium				Small			
	Exporters	%	non-exporters	%	Exporters	%	non-exporters	%	Exporters	%	non-exporters	%
Total	66	100	22	100	20	100	64	100	12	100	70	100
Including:												
Innovative	16	24,2	3	13,6	5	25,0	8	12,5	2	16,7	4	5,7
Eco-innovative	8	12,1	4	18,2	3	15,0	2	3,1	1	8,3	1	1,4
Neither innovative, nor eco-innovative	42	63,6	15	68,2	12	60,0	54	84,4	9	75,0	65	92,9

Source: Author's own elaboration.

As Table 2 shows, large enterprises are the most innovative and active, and implement eco-innovations more often than SMEs. Also, SMEs have fewer exporters than large firms. This is largely due to the fact that, firstly, the large companies have better access to the internal capital, some of which they can allocate to innovations, including to eco-innovations, the more so, because their business is often environmentally polluting. Secondly, the large companies are better able to obtain loans. Thirdly, they have greater volume of products which they might bring to the external markets and remain competitive on the international level. According Galliano and Nadel (Galliano & Nadel, 2013), the structuring role of firms' internal characteristics, co-evolution with other forms of innovation, and the influence of firms' external environments on their eco-innovation adoption are the most important determinants of firms' eco-innovation and export behavior. As our previous analysis shows, in the case of SMEs the export activities positively influence the implementation of eco-innovations (Hrabynskyi et al., 2017 B).

In general, the eco-innovation projects of SMEs focuses on the reduction of materials or water consumption per unit of output, and the reduction of energy consumption or carbon footprint (Table 3). High costs of energy, water or materials cause the enterprises to look for the ways and instruments of the optimization and decreasing their use.

Table 3. Types of eco-innovations implemented in Ukrainian enterprises according to their size, % of total number of enterprises with eco-innovation

Size of Enterprise	Number of enterprises with implementation of eco-innovations	Including:										
			Including for purpose:						Including for purpose:			
		During the production of goods and services in the enterprisei	Reduction of materials or water consumption per unit of output, reduction of energy consumption or carbon footprint	Reduction of noise, soil, water or air pollution	Replacement of parts of materials with less toxic or hazardous ones	Replacement of part of fossil energy sources into renewable ones	Ensuring the recycling of waste, water, materials for own use or sale	In the process of using goods or services by the end consumer	Reduction of energy consumption or carbon footprint	Reduction of noise, soil, water or air pollution	Facilitate the disposal of products after use	Prolongation of the product's use by producing more durable products
Total	33,3	22,5	11,4	11,0	7,3	1,1	6,5	13,3	10,2	6,8	3,1	3,4
Including:												
Small	3,5	3,5	3,5	0,0	1,8	0,0	3,5	3,5	3,5	1,8	1,8	0,0
Medium	8,8	8,8	7,0	5,2	3,5	0,0	5,2	5,2	3,5	3,5	3,5	1,8
Large	21,1	19,3	17,5	10,5	14,0	3,5	11,3	17,5	14,0	12,3	7,0	5,2

Source: Author's own elaboration

In general, five groups of drivers of eco-innovation are defined in literature (Rennings et al., 2003): regulation, demand from users, capturing new markets, cost reduction and firm's reputation. We use this classification to estimate the importance of each of these group for Ukrainian business' eco-innovation activity. So, the most important drivers of eco-innovative activity of SMEs in Ukraine are as follows (Table 4): existing and expected environmental regulations and taxes, and the reduction in operating costs on energy, water and materials.

Table 4. Drivers of firms' eco-innovation activity in Ukraine, % of total number of enterprises with eco-innovation*

	Existing environmental regulations	Existing environmental taxes, charges or fees	Environmental regulations or taxes expected in the future	Government grants, subsidies or other financial incentives for eco-innovation	Current or expected market demand for eco- innovations	Improving enterprise's reputation	Voluntary actions or initiatives for environmental good practice within the sector	High cost of energy, water or materials	Meeting the requirements for public procurement
Total	12,4	9,5	5,5	1,7	2,4	3,4	4,5	9,7	7,8
Including:									
Small	3,5	3,5	1,8	0,0	0,0	0,0	0,0	3,5	1,8
Medium	8,8	8,8	3,5	0,0	1,7	1,7	1,7	8,8	1,7
Large	21,1	19,3	8,7	1,7	1,7	10,5	7,0	21,1	10,5

Source: Author's own elaboration.

In the case of SMEs, it should be noted that this group of firms are often characterized by the more flexible structures and ability to adapt to changes. They are not burdened with numerous managerial levels, large fixed assets, or strategic commitments to their employees, customers, suppliers. It is much easier for a small or medium firm to track their employees' activities and reward their efforts or successful innovations. Since resources for micro-enterprises are less available, small firms are motivated to choose their innovative projects more carefully, giving preference to those with the greater likelihood of success.

Conclusions

Nowadays eco-innovations are vital for the development of each country all over the world. They raise the competitiveness of the national economy on the international markets, provide export growth, lead to sustainable economic development, and foster the transition to a green economy. The analyses of Ukrainian eco-innovative development based on the Eco-Innovation Index indicators shown that in comparison with other EU Members Ukraine is the country with the lowest level of eco-innovativeness. Its expenditures on eco-innovation, eco-innovation activity, social and economic effects from the introduction of eco-innovation, and achieved environmental effects are on the insufficient scope. This negative situation is deepened with low state support of eco-innovation, low level of funding for implementation of eco-innovation projects, the lack of the long-term credits for eco-innovative activity of enterprises. In order to increase the effectiveness of state eco-innovation policy it is necessary to introduce the conception of formation of a priority instruments system of national eco-innovation policy that has to ensure the effective

environmental protection with the minimum of cost, and to reorient from the direct budget financing of eco-innovation projects to the indirect policy instruments.

As the systematic monitoring of eco-innovative and foreign trade activities of SMEs are not carried out in Ukraine, the study was focused on this group of enterprises. Evaluation of SMEs' eco-innovation activity showed that, in general, they are often isolated from the eco-innovative development, and regarded as less favored in the innovation diffusion despite of their important role in economic growth and their contribution to value added.

The empirical analysis confirmed the relationships between the export activity and implementation of eco-innovations in SMEs, and showed that SMEs are less eco-innovative in comparison with large enterprises, have fewer exporters than large firms, but exporters are more eco-innovative than non-exporters. The most important drivers of eco-innovative activity of SMEs in Ukraine were indicated as the follows: existing and expected environmental regulations and taxes, and the reduction in operating costs on energy, water and materials. The increasing of market demand for green products caused to higher activity in all types of eco-innovations, but the rising costs of energy, water or materials force the enterprises to look for ways and instruments to optimize and reduce their materials or water consumption per unit of output, and to reduce their energy consumption or carbon footprint.

SMEs in Ukraine have the potential to adopt eco-innovation throughout the structure of their economic activities, to develop new environmental technologies and knowledge as well as to create partnerships and mutual cooperation with research institutions.

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A Retrospective Evaluation of Rural Populations: Social and Economic Challenges, Expectations and Evaluation

Abstract. In 1996 and 2016, respectively, the Independent Creative Group (ICG) conducted a comprehensive sociological study "Economic reform - the eye of the village." The aim of the project was to explore the evaluation of economic reform of rural populations in 5 areas: a) economic reform; b) quality of life and expectations; c) businesses; d) agricultural transformation; e) development of farming. The research was conducted in the form of "sociological fixation" expectations, estimates and other reactions to social challenges. The object of the study was a typical village of the Lviv region.

The study confirmed the simultaneous increase of confidence in economic transformation and the growth of pessimism in the impact of reforms. The rural population understands the goals and objectives of reforms, and supports private property and the market economy. The standard of living has improved significantly, but it does not cover the real expectations of the population. Farmers understand the role and importance of entrepreneurship and accept new business entities. The study showed significant structural changes in the views and assessments of rural residents of the Lviv region. There is obvious public awareness of fundamental lifestyle changes in the countryside.

Key words: rural population, economic expectations, reform, agrarian transformation, sociology, Lviv, Ukraine

JEL Classification: O18, P25

Introduction

Economic decisions, including economic policy, should have an information basis (basis). Besides the standard data of official statistics, information about public attitudes and economic expectations is of great importance in making decisions. Such data, as a rule, are based on data from sociological surveys. The information on understanding and comprehension by the society (population) of real economic, social and political challenges, and the use of this understanding for an adequate and rational correction of evaluations and expectations also have a significant impact.

Monitoring of socio-economic sentiments, evaluations and expectations just in rural areas is especially important in countries with a significant share of agricultural production and rural population. Obviously, the studies with a retrospective nature will be of considerable interest, since they allow us to further evaluate changes and trends. After all,

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"the analysis of policy uses theory and empirical methods of social sciences to predict the consequences of possible policy options" (Vejmer, Wajning, 1998, p. 22).

Data and methods

An independent group of researchers conducted a retrospective sociological research "Economic reform through the eyes of the village: 20 years later" in 2016 (Ekonomichna…, 1997). In fact, it was a follow-up research, which was based on the methodology of a similar project conducted in 1996. The idea of both studies was to hold a comprehensive sociological survey of the villagers, that can be considered as a "typical" or representative with a significant approximation. Village (selo) Kryve, Radekhiv district, was chosen for the Lviv region. By the overwhelming group of characteristic features, it could be considered as a representative for the region.

The survey stipulated the following stages:

- Development of research methods;
- Choice of the inhabited locality;
- Advocacy work among the population;
- Selection of respondents;
- Development of questionnaires, tests, etc. Conducting a survey;
- Transfer of information to concerned parties and institutions, the media;

The survey provided for the following sections:

A. General evaluation of the economic reform by rural population;
B. Economic reform and living standards of the rural population;
C. Attitude to entrepreneurship and its manifestations;
D. Evaluation of the agrarian reform and its components;
E. Attitude towards farming.

The individual results of the survey on the first three sections (A, B, C) are the subject of the presentation in this publication.

In the studies carried out in 1996 and 2016 there were insignificant differences in the questionnaire form and the survey algorithm. The survey was carried out by specially trained local residents. The processing of the questionnaires was carried out by the researchers of the Department of Law and Entrepreneurship of the Lviv National Agrarian University. Analytical notes and final presentations were prepared by members of the temporary creative group.

Results

In 1996, the results were published in the brochure "Economic reform through the eyes of the village. Results and analysis of the sociological survey" (Ekonomichna…, 1997). In 2016, the results were published in the monograph "Economic reform – through the eyes of the village: 20 years later. Results and analysis of a follow-up poll" (Hubeni et al., 2017). Some results can be found on a special page on Facebook (https://www.facebook.com/ekrefpost/).

The preliminary results of the survey show that significant changes have taken place in the public consciousness of the rural population of Lviv region. These changes indicate a gradual but consistent implementation of new thinking, the formation of rational evaluations of expectations and an awareness of the challenges of development.

A. General evaluation of the economic reform by rural population

During the first survey about 75% of respondents assessed economic reform very negatively, and only 12% saw it as positive. According to recent studies, the share of negative assessments decreased to 57%, and positive – to 10%.

Table 1. General evaluation of economic reform, survey results, %

Question - answers	1996	2016	2016 +/- to 1996
How do you estimate the economic reform in general?			
- very positive;	2	6	+ 4
- very negative;	18	22	+ 4
- it ruined national economy;	18	8	– 10
- it leads to an improvement in the economy;	10	4	– 6
- economic reform goes in the wrong direction;	39	27	– 12
- it's hard to say;	22	27	+ 5
- I don't know.	3	6	+ 3

Source: Hubeni et al., 2017, p. 28.

For 20 years, the number of supporters of "socialism" has significantly decreased, and the share of supporters of its modernization is steadily decreasing.

Table 2. Transformation of socialism, survey results, %

Question - answers	1996	2016	2016 +/- to 1996
Was it necessary to change the economic model of "*socialism*" ?			
- yes;	38	58	+ 20
- no;	10	5	– 5
- just to improve a bit;	49	20	– 19
- I don't know.	7	18	+ 11

Source: Hubeni et al., 2017, p. 29.

The results of both studies indicate that rural population in matter of property have been and remain rational, more balanced and more responsible than many politicians and officials. The pluralism of forms of ownership and management today is supported by 62% of respondents (49% in 1996).

The majority of respondents in both studies believed that economic problems, crisis phenomena are primarily determined by inept reforms: 60% of respondents in 2016 and 64% in 1996.

B. Economic reform and living standards of the rural population

Questionnaire B was designed to study the standards of living of rural residents, their consumer expectations, as well as to determine the impact of economic transformations on them. The rural population of Lviv region expressed a clear dissatisfaction with the level of their life during the basic study. No respondent considered his family to be "very rich", "rich", "prosperous", and 40% of respondents considered their families to be "poor". In a second study, 1% of the "very rich" and "prosperous" households appeared, the share of the "poor" decreased to 26% (- 14%), the most common became "middle-class" families (63%). Objective statistical data also confirms that in 2016 the rural population lived twice as better materially than the previous generation.

The growth in the standard of living and the resulting change in the structure of consumption has been confirmed by this simple question:

Table 3. Consumer preferences - food, survey results, %

Question - answers	1996	2016	2016 +/- to 1996
What food stuff do you usually buy?			
- bread;	16	83	+ 67
- macaroni;	40	79	+ 39
- sugar;	17	63	+ 46
- dairy products;	5	9	+ 4
- alcohol;	9	10	+ 1
- cereals;	81	80	+ 1
- sweets;	38	29	– 9
- meat products;	9	21	+ 12
- coffee, tea;	71	67	– 4
- beverage and juices.	12	3	– 9

Source: Hubeni et al., 2017, p.40.

In 1996, only one of the six families (16%) had the opportunity (!) to buy bread in trade institutions. Baking bread at home was acceptable for very limited budgets of rural households. And already 83% of rural households was buying bread in the trading network in 2016. An increase in purchases can be seen almost in all groups of food products. There was a significant increase even for meat purchase (+12%).

Improvement of general socio-economic conditions affected their responses to the question of hypothetical use of income growth. If in 1996 the physical survival of rural families was the priority, then in 2016 the improvement of the comfort and living conditions dominated, including better housing.

The follow-up research confirmed not only the obvious positive changes in the standard of living of rural residents, but also showed the special role of economic expectations in evaluating the perception of the socio-economic situation in the country and the level of prosperity of their families.

C. Attitude to entrepreneurship and its manifestations

The task of the questionnaire "C" during the basic and follow-up polling was to study the attitude of the rural population to entrepreneurship, its manifestations or conditions of conduct. We expected significant changes in the answers, because during the basic research (1996), entrepreneurship in Ukraine, especially in agriculture, only "was getting on its feet".

Follow-up research confirmed the slow stratification of villagers according to the direction of activity. Villagers no longer want the traditional exhausting combination of agricultural labour in the household and the running their own business /hired work. Thus, in particular, the number of respondents who prefers to work for hire with a simultaneous housekeeping is decreasing (-18%). The same percentage of respondents agrees either for only hired work (+13%) or starting own business (+5%). Our empirical observations confirm that rural people working for hire tend to be similar to urban workers in economic behaviour and motivation. The Ukrainian village is on the edge of significant structural and usual changes.

The attitude of rural people to wealth and the desire to get rich is also interesting:

Table 4. Wealth as a dream of the rural population, survey results, %

Question - answers	1996	2016	2016 +/- to 1996
Do you want to become rich?			
- yes, by all means;	4	5	+ 1
- yes, but only by fair means;	49	43	– 6
- I just want to improve slightly the quality of life;	51	49	– 2
- no, I don't want to be rich;	4	2	– 2
- I don't know.	2	1	– 1

Source: Hubeni et al., 2017, p. 47.

As we see, the villagers are conservative and cautious, they want just to improve their material situation slightly (49%), or they are looking to wealth got only "by fair means" (43%).

A positive change in the sociological sentiments is the recognition of the usefulness and positive nature of entrepreneurship as a phenomenon. During the follow-up poll, the thesis that "business (entrepreneurship) is useful and necessary for the state and society" was supported by as many as 68% of villagers (+ 24%). It is obvious that the public discussion and the empirical basis are reflected in the minds of the villagers and they increasingly understand the essence of entrepreneurship and its manifestations. Therefore, it is natural that the thesis about the "harmfulness of entrepreneurship" becomes less popular (8-10%).

Understanding of entrepreneurship and its perception by rural population has significantly improved. Entrepreneurial thinking, the reflection of the market economy in the public consciousness find development, understanding and support. The majority of rural residents understand the special role of the environment in business development, they accept competition, variety of subjects and non-agricultural entrepreneurship in their own village. They have no doubts about the usefulness of developing entrepreneurial initiatives

for the state and society. On the other hand, they realize their position in the "triangle of modern economy."

Conclusions

The conducted studies confirm the formation of rational thinking among the villagers about the organization of economic relations and the functioning of the agricultural land market. They expressed an interest in taking into account their opinions and expectations when carrying out economic reforms, especially agrarian ones.

Villagers, represented by the rural population of Lviv region, underwent substantial development in their awareness of the essence of economic reform. They feel or know the goal of economic transformation, and are aware of the challenges that the new economy and democracy are mounting.

Public sentiments are generally favourable for the continuation of reforms and modernization. Villagers feel the need of social dialogue. They are distinguished by the growth of rational expectations, the optimization of behaviour and the hierarchy of priorities.

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Food Security and Self-Sufficiency in Europe

Abstract. The submitted scientific paper deals with food security and self-sufficiency in Europe in EU-15 and EU-13 countries. The objective of this paper was to evaluate upon the basis of the Global Food Security Index, the overall food security situation in the European Union states. The countries are divided into two groups. The first is composed of fourteen selected states from the EU -15 and the second group is six selected states from the EU-13. In addition to the Food Security Index, the Food Affordability, Food Availability, and the Food Quality and Safety Indexes were also analyzed. The research data were obtained from the authors' own research based on the Global Food Security Index Report, and from FAO.

Keywords: food security, food affordability, food availability, healthy diet, quality, Europe

JEL Classification: I15, O13

Introduction

Hunger and inadequate food supply are still affecting a large part of the world's population with serious consequences for health and well-being, especially in children. Undernutrition and malnutrition in childhood interfere with physical and mental development, thus compromising whole lives (United Nation System). About 793 million people are undernourished globally, which over the last decade is lower by about 167 million, and compared with the years 1990–1992 is lower by 216 million. These declines are more pronounced in developing regions, despite significant population growth. In recent years, progress has been hindered by slower and less inclusive economic growth, as well as by political instability in some developing regions, such as Central Africa and Western Asia (FAO, 2015). This is a challenging factor since food security is an important component of the process of economic development (Fogel, 2004). Over the last few decades, improvements in food security have come from increases in agricultural productivity as well as from reduction in extreme poverty (Godfray et al., 2010).

Undernourishment means that a person is not able to acquire enough food to meet the daily minimum dietary energy requirements, over a period of one year. FAO defines hunger as being synonymous with chronic undernourishment. According to the FAO Food Summit held in 1996, *food security is a situation that exists when all people, at all times, have*

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physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 2002). Thus, under food security, no individual faces hunger or starvation. Alternatively, food insecurity arises when some individuals face limited or uncertain access to nutritionally adequate and safe food. Situations of undernutrition are pervasive (Chavas, 2017). Family food security is the application of this concept to the family level, with individuals within households as the focus of concern.

Measurement is typically indirect and based on food balance sheets and national income distribution and consumer expenditure data. Linking hunger and sub-nutrition with inadequate food intake allows the measurement of food insecurity in terms of the availability and apparent consumption of staple foods or energy intake (FAO, 2002)

Undernourishment or chronic hunger is the inability of persons to consume enough food sufficient to meet dietary energy requirements. Malnutrition, in all its forms, is a major impediment to development. Malnutrition occurs when a person´s diet contains too few or too many nutrients. Worldwide, annually 161 million children are stunted due to chronic malnutrition, 99 million children are underweight and 51 million children die due to acute malnutrition. The consequences of malnutrition range from increased risk of death, increased prevalence of diet-related non-communicable diseases and serious chronic health conditions (FAO, 2014).

According to Kadlečíková (2011) the same factors that are continuously causing the food crisis in less developed states still play an important role: agricultural productivity is low, the population growth rate is still high in many of the most food insecure countries; limited water availability and land tenure are also significant problems; in a world with changing climate, the frequency of floods and droughts is above long-term averages; another complication is linked to price volatility and to changing population patterns. Investments in agricultural research and development are much lower than what was recommended by experts during world food summits, and if the investments are realized then usually they are not directed toward the most important crops for the poor, but rather they support the development of biofuels, and land is used for energy crops.

FAO (2017a) Report identifies 15 trends affecting the world's food systems:

- A rapidly increasing world population marked by growth "hot spots," urbanization, and aging;
- Diverse trends in economic growth, family incomes, agricultural investment, and economic inequality;
- Greatly increased competition for natural resources;
- Climate change;
- Plateauing agricultural productivity;
- Transboundary diseases;
- Increased conflicts, crises and natural disasters;
- Persistent poverty, inequality and food insecurity;
- Dietary transitions affecting nutrition and health;
- Structural changes in economic systems and employment implications;
- Increased migration;
- Changing food systems and resulting impacts on farmers' livelihoods;
- Persisting food losses and waste;

- New international governance mechanisms for responding to food and nutrition security issues;
- Changes in international financing for development.

Priefer (2016) asserts that an important tool to ensure and maintain food security and safety is to reduce food waste.

The situation in the EU states is significantly more optimistic in comparison with the African, Asian and Latin American continents (including Caribbean countries). The purpose of this paper is to evaluate the food security situation in the European Union states divided on the two groups. In the first group the fourteen selected states from the EU-15 are evaluated and in the second group the six selected member states from EU-13 are evaluated, with intention to highlight the strengths and weaknesses of both groups.

Data and Methods

Using this definition adapted from the 1996 World Food Summit, the Global Food Security Index considers the core issues of affordability, availability, and quality across a set of 113 countries. The index is a dynamic quantitative and qualitative scoring model, constructed from 28 unique indicators, that measures these drivers of food security across both developing and developed countries. The overall goal of this study is to assess which countries are the most and the least vulnerable to food insecurity through the categories of Affordability, Availability, and Quality and Safety (Global Food Security Index Report). *Affordability* measures the ability of consumers to purchase food, their vulnerability to price shocks and the presence of programs and policies to support customers when shocks occur. *Availability* measures the sufficiency of the national food supply, the risk of supply disruption, national capacity to disseminate food and research efforts to expand agricultural output. *Quality and Safety* measures the variety and nutritional quality of average diets, as well as the safety of food.

The downloaded data are from the Report on Food Security Index and from FAO. The objective of this paper is to point out the food security and sufficiency of EU states. Data is divided into two groups- EU-15 and EU-13. The EU-15 states consist of Austria, Belgium, Denmark, France, Finland, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal, Spain, Sweden and United Kingdom. Into the EU-13 group are Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovak Republic and Slovenia. For the purpose of this paper, 14 states from the EU-15 and 6 states from EU-13 have been selected, which are monitored by the Global Food Security Index.

Results

Challenges of Agriculture and Food Production

The current trends and challenges are reflected in 17 sustainable development goals for the next 15 years with an aim to balance economic, environmental, and social issues. Agriculture is focused on hunger and malnutrition and closely linked to other sustainable development goals such as: the end of poverty in all its forms everywhere; 70% of rural

population is poor, gender equality is a great challenge; there is insufficient clean water and sanitation; it is important to use affordable and clean energy; rural populations need to have decent work and to ensure economic growth, responsible production and consumption; climate actions have to be taken into consideration and life should be economically and socially attractive. The sustainable development goals are linked to FAO Strategic Objectives: eliminate hunger, food insecurity and malnutrition; ensure productive and sustainable agriculture, forestry and fisheries; reduce rural poverty; create inclusive and efficient agricultural and food systems; and increase the resilience of livelihoods against disasters.

A big challenge for agriculture is, according to FAO (2017b), the eradication of extreme poverty, and ensuring that vulnerable people who escape poverty do not again fall back into it. This requires actions to reduce inequalities. Actually, it is about addressing inequalities both between and within countries, in levels of income, in opportunities, as well as in the ownership of assets, including land. Pro-poor growth strategies, which ensure that the weakest people will participate in the benefits of market integration and investments in agriculture, would improve their incomes and investment opportunities in rural areas and address the root causes of migration.

Social protection combined with pro-poor growth will help to meet the challenge of ending hunger and addressing the triple burden of malnutrition through healthier diets. Permanently eliminating hunger, malnutrition and extreme poverty also requires building resilience to protracted crises, disasters and conflicts, and preventing conflicts by promoting inclusive and equitable global development.

A rethinking of food systems and governance is essential for meeting current and future challenges. Vertically coordinated, more organized food systems offer standardized food for urban areas and formal employment opportunities. But they need to be accompanied by responsible investments and concern for smallholder livelihoods, the environmental footprint of lengthening food supply chains, and impacts on biodiversity. These concerns need to be addressed by making food systems more efficient, inclusive and resilient.

One of the greatest challenges is achieving coherent, effective national and international governance, with clear development objectives and commitments to achieving them. The 2030 Agenda for Sustainable Development embodies such a vision – one that goes beyond the divide of 'developed' and 'developing' countries. Sustainable development is a universal challenge and the collective responsibility for all countries, requiring fundamental changes in the way that all societies produce and consume.

Global Food Security Index

The Global Food Security Index considers the core issues of affordability, availability, and quality across a set of 113 countries. The index is a dynamic quantitative and qualitative scoring model, constructed from 28 unique indicators, that measures the above-mentioned drivers of food security across both developing and developed countries. The Global Food Security Index consists of four categories: Affordability, Availability, Quality and Safety and the Global ranking is a final score.

The Global Ranking

The ranking of EU-15 countries in terms of Global Ranking, Affordability, Availability and Quality and Safety according to the Global Food Security Index, is shown in Table 1.

Table 1. The Global and EU ranking of the Fourteen Selected States from EU-15 according to the Global Food Security Index for Availability, Affordability, Quality and Safety in 2016

Country	Global Ranking in EU countries	Global Ranking in world	Affordability in EU countries	Affordability in world	Availability in EU countries	Availability in world	Quality and Safety in EU countries	Quality and Safety in world
Ireland	1	2	1	7	1	2	7	9
Netherlands	2	4	4	10	5	7	5	7
France	3	6	10	19	3	4	2	2
Germany	3	6	3	9	2	3	13	20
United Kingdom	4	8	5	11	4	5	14	22
Sweden	5	10	7	14	6	12	8	11
Denmark	6	14	6	12	8	15	9	14
Portugal	6	14	13	29	7	13	1	1
Austria	7	16	2	8	9	17	12	17
Finland	8	17	9	18	10	18	6	8
Spain	9	19	11	20	11	19	4	6
Belgium	10	21	8	16	12	22	11	16
Italy	11	22	12	22	13	25	10	15
Greece	12	31	14	36	14	32	3	5

Source. Authors' own elaboration on the basis of the Global Food Security Index.

For EU-15, the best result in Global Ranking was reached by Ireland, which is ranked in second position in the world ranking and first in the EU-15 ranking. From the point of view of Global Ranking, the most serious situation is in Greece, which is on the 31st position and is in the last (fourteenth) place in the framework of EU-15 countries which are evaluated by the Global Food Security Index. Overall, the selected fourteen states from EU-15 are achieving very good results, but those ranked last are listed as Belgium, Italy and Greece. All of the twelve EU states are ranked in the first twenty countries around the world. This means that the Food security among the Western members of the EU is very high and makes them the strongest states in the world from the angle of food affordability, food availability and quality.

For EU-13 countries, the situation is less favorable. The best result is achieved by the Czech Republic with ranking on the 25th place in terms of Global Ranking worldwide. This situation is shown in Table 2. The least favorable position is occupied by Bulgaria. Its Global Ranking is on the 50th place, while within six selected EU-13 states Bulgaria occupies the last position. Slovakia has the 40th position worldwide, according to the Global Ranking. From the V4 countries (Visegrad group) which are Slovakia, Czech Republic, Hungary and Poland, Slovakia has the most moderate results. However, the Slovak Republic has the potential for better results, if it manages to use its natural and

human resources more effectively, as well as its comparative advantage. Nevertheless, to occupy the 40th position worldwide means a good level of food security, but it is the responsibility of each state to enhance its own potential with aims to support world food security through the WFP food aid, EU, ODA and other institutional and NGO activities.

Table 2. The Global and EU ranking of the Six Selected States from EU-13 according of the Global Food Security Index on Availability, Affordability, Quality and Safety in 2016

Country	Global Ranking in EU countries	Global Ranking in world	Affordability in EU countries	Affordability in world	Availability in EU countries	Availability in world	Quality and Safety in EU countries	Quality and Safety in world
Czech Republic	1	25	1	25	1	27	1	26
Hungary	3	34	2	30	4	47	4	33
Poland	2	29	2	30	2	29	2	30
Slovak Republic	4	40	3	33	3	45	5	45
Romania	5	42	5	42	5	48	3	31
Bulgaria	6	50	4	36	6	69	6	54

Source: Authors' own elaboration on the basis of the Global Food Security Index.

From the perspective of overall food security, the EU-15 has a visibly better situation than the EU-13. However, in general we can declare that the EU is self-sufficient and is rated very well, because all EU states are listed among the top fifty from all 113 of the surveyed countries on the list of the Global Food Security Index.

Food Affordability

Affordability measures the ability of consumers to purchase food, their vulnerability to price shocks and the presence of programs and policies to support customers when shocks occur. Table 1 shows the situation in this indicator for the selected fourteen states of the EU-15. The best results are again achieved by Ireland which occupies 7th position in the global ranking, while Germany is in 9th position. At the other end, the least favorable position is held by Greece at 36th, however, this can still be considered a very good result for the country, as well as for the rest of the states in the EU-15.

In the selected six states from the EU-13, the best position is found in the Czech Republic with regard to Food Affordability. It occupies 25th position in the global ranking. Romania is listed last at 42nd. Slovakia achieved a very good position in this indicator, listed 33rd, which actually means the third best position in frame of EU-13 countries.

Concerning the Food Affordability indicator, all EU states which were included into the evaluation of their Global Food Security Indicator are listed up to 40th position over the world. This result leads us to the statement that the food affordability in the EU states is achieving very satisfactory results. In addition to this, EU members have the highest food security level in the world.

Food Availability

Availability measures the sufficiency of the national food supply, the risk of supply disruption, national capacity to disseminate food and research efforts to expand

agricultural output. Table 1 exhibits the Global Ranking in the Food Availability for fourteen selected EU-15 countries. The global second place belongs to Ireland, third is granted to Germany and number four to France. The last place from this group (32) is Greece.

Table 2 shows the ranking for six selected states of the EU-13 with regard to the Food Availability Indicator. The best results from this group of states, are found once more in the Czech Republic. Poland has a very similar evaluation as it is ranked 29th in the global list, the Slovak Republic is listed as 45th followed by Romania at 48th. Bulgaria occupies the 69th place, which is weakest result from these states. In general, we can conclude that from the selected six states of the EU-13, the highest level of Food Security from the point of view of Food Availability is achieved in the Czech Republic, as well as in Poland. Somewhat more moderate results had been noted in Hungary and the Slovak Republic, and partially in Romania. From the perspective of Food Availability, the security situation is rather critical in Bulgaria. This country has difficulties with the smooth sufficiency of the national food supply and there exists the serious risk of food supply disruption.

Table 3. The Overall Score, Affordability, Availability, Quality and Safety of the Fourteen Selected States from EU-15 according to the Global Food Security Index in 2016

Country	Overall score	Affordability	Availability	Quality and Safety
Austria	79,3	81,9	75,6	82,8
Belgium	77,4	80,2	72,7	82,9
Denmark	80,0	81,3	77,7	83,4
Finland	78,9	79,8	75,4	86,0
France	82,5	79,7	82,7	88,7
Germany	82,5	81,7	83,8	81,3
Greece	71,5	69,6	67,8	86,3
Ireland	84,3	82,4	85,4	85,8
Italy	75,9	78,6	70,8	83,3
Netherlands	82,6	81,6	82,3	86,1
Portugal	80,0	76,2	79,9	89,7
Spain	77,7	78,9	73,6	86,2
Sweden	81,3	81,0	80,1	85,4
United Kingdom	81,9	81,5	82,6	81,0

Source: Authors' own elaboration on the basis of the Global Food Security Index.

The Food Quality and Safety

In Food Quality and Safety, the ranking of the selected fourteen states of EU-15, is different from the above-demonstrated results (Table 1). The best food quality and safety is in Portugal. For this indicator the country has achieved significantly better results than in

the case of previous indicators. Concerning food quality and safety, Greece is listed on the world in 5th place, which is the 3rd best place in EU-15 countries. Compared to previous indicators, where Greece was always rated as the country with the weakest results, for food quality and safety it has achieved the best results. Nevertheless, all fourteen selected states are listed among the 22 best-performing in the world with regard to food quality and safety.

From the selected six states of the EU-13, the first position in food quality and safety belongs again to the Czech Republic when we consider its world ranking at 26th. In this indicator the Czech Republic is followed by Poland, listed at 30th, Romania at 31st position and Hungary ranked at 33rd in the world. Surprisingly, Slovakia is on the 45th position and from the selected six states of the EU-13 it is in the second-to-last position. With regard to food quality and safety it seems that Slovakia must improve the variety and nutritional quality of its average diet, as well as the safety of food. Similarly, the weakest performance with regard to food quality and safety was noted in Bulgaria; however, from the global point of view its position for this indicator is not so critical, as it was earlier mentioned, as their weakest result was achieved in the indicator of food availability (ranking at 69th position).

According to the results shown in Table 3, the highest food security is attained in Ireland with a score of 84.3 followed by The Netherlands with a score of 82.6, France and Germany with identical results (scores of 82.5), the United Kingdom with a score of 81.9 and then Sweden with a score of 81.3. The lowest overall score was noted in Greece with a result of 71.5.

Table 4. The Overall Score, Affordability, Availability, Quality and Safety of the Six Selected States from EU-13 according to the Global Food Security Index in 2016

Country	Overall score	Affordability	Availability	Quality and Safety
Bulgaria	60,6	69,6	52,9	59,4
Czech Republic	73,9	77,5	70,0	75,9
Hungary	69,3	75,6	61,8	73,8
Poland	72,4	75,6	68,7	74,9
Romania	65,5	66,9	60,9	74,4
Slovak Republic	67,7	73,5	62,6	67,2

Source: Authors' own elaboration on the basis of Global Food Security Index.

With regard to the overall score of the Food Security Index, as well as the Affordability, Availability and Quality with Safety, the most pronounced results were achieved in 2016 by the Czech Republic (score – 73.9), followed by Poland (score 72.4), then Hungary (score 69.3), Slovakia (score 67.7), Romania (score 65.5) and ending with Bulgaria (score 60.6). The overall score on the Food Security Index in six selected states from the EU-13 is lower in comparison to the EU-15 states. Furthermore, we can claim that these states are not sufficiently utilizing their comparative advantages stemming from their rich natural resources, human capital and from their good geopolitical location.

Conclusion

The objective of this paper was to evaluate upon the basis of the Global Food Security Index, the overall food security situation in the European Union states. The countries are divided into two groups. The first is composed of fourteen selected states from EU -15 and the second consists of six selected states from the EU-13. In addition to the Food Security Index, also the Food Affordability, Food Availability, and Food Quality and Safety is analyzed.

Europe is a continent that is strong in food security, especially in quality and safety. This is confirmed also by the above analysis. The European countries are performing very well with regard to the Global Food Security Index, when from the 18 states included into our research the weakest are listed among the 50 best performing in the list out of 113 states. Therefore, Food Security as such is not a challenge for the European Union states. However, there are some critical areas which have to be carefully evaluated by concerned states with approval of follow-up steps. From Europe with regard to the Global Food Security Indicator, the best performing states are Ireland, The Netherlands and France. With regard to six states of the EU-13, the most impressive results were achieved by the Czech Republic (25), Poland (29) and Hungary (34). In general, we can state that the overall food security and safety situation is reasonably better in the EU-15 countries than in EU-13, despite the fact that the EU-13 states have a good potential for production of high quality food commodities. Slovakia is in last position in global ranking from the V4 countries, but in the 4th place from the 6 selected states of EU-13. Behind it is Romania and Bulgaria. The most critical results were achieved by Bulgaria. Despite the very positive outcomes of the conducted research, knowing that EU-15's results are more superficial, while the food security performance in EU-13 is less convincing, but still very good, the EU leaders, and the establishments of the individual states must to take into consideration that there is still room for improvement of food quality (Slovakia, Bulgaria, Romania), as well for the improvement of food availability (Czech Republic, Bulgaria, Hungary, Slovakia, Italy, Romania and Greece).

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Convergence of the Labour Productivity in European Union Agriculture

Abstract. The objective of the paper is to examine the changes in the level of diversification of the labour productivity in the European Union countries in the years 1998-2015, and then to determine whether there is any convergence of the labour productivity among these countries. The labour productivity has been calculated as a relation of the gross value added at constant prices per one full-time employee. The study used the Economic Accounts for Agriculture (EAA) and the Agricultural Labour Input (ALI). The study covered the European Union countries, broken down by the countries of the „old" EU (EU-15) and the countries admitted to the EU after 2004. In order to determine the changes occurring in these countries, sigma-convergence (σ) and beta-convergence (β) have been used. The study shows that after 2011 there was a process of convergence among the EU countries in terms of the labour productivity in agriculture.

Key words: labour productivity, convergence, UE

JEL Classification: C01, J21, R10, Q10

Introduction

All European Union countries (EU-28) are subject to the same common agricultural policy, however, agriculture in these countries varies significantly, both structurally and socially. This is affected by many factors, the most common are historical events i.e. the fact that the countries were subject to various legal and political systems, e.g. Communism, the level of economic development, as well as different natural and climate conditions, diversified agricultural intensity and different national agricultural policy (Baer-Nawrocka, 2010). This diversification of agriculture puts the weaker countries in an adverse situation while undermining their competitive capacity. This paper analyses – in the perspective of its transformation – the labour productivity, which is considered to be one of the important factors of economic growth and a basic determinant of the competitive capacity (Gołaś, Kozera, 2008; Mrówczyńska-Kamińska, 2013; Misala, Ślusarczyk, 1999; Poczta, 2003; Latruffe, 2010; European Commission, 2008; OECD, 2011). The low productivity of production factors, including labour, determines the difficult economic and income situation of farms (Gołaś, Kozera, 2008). Important was also to examine whether among the individual countries there is a process of reducing the level of the labour productivity in the agricultural sector, or just the opposite – this diversification grows. This is essential due

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to the implementation of the EU cohesion policy, whose task is to reduce disparities between the regions and to prevent the backwardness of disadvantaged regions. The main objective of the paper is to determine the changes in the EU countries due to the labour productivity in the agricultural sector. The specific objective is to assess the disparities among the countries of the old Union and those newly admitted after 2004. As the study hypothesis, the paper adopted the statement that in the analysed period (1998-2015) the level of the labour productivity in the agricultural sector is being aligned (beta-convergence).

Data

The study uses two EU statistics, namely, the Economic Accounts for Agriculture (EAA) and the Agricultural Labour Input (ALI)[3]. The Economic Accounts for Agriculture are macroeconomic accounts, which means that they apply to the entire agricultural sector. They are drawn up according to a unified methodology [4] developed by EUROSTAT, which makes it possible to make comparisons of the economic situation in agriculture among the Community countries. This analysis uses the gross value added [5] from the EAA at constant prices in million EUR, generated in agriculture of the individual European countries. This value has been reduced by subsidies to the agricultural production. The labour inputs in agriculture[6] have been taken from ALI and expressed in thousands AWU[7].The analysis covers the years 1998-2015, taking into account the availability of individual country data.

Methodology

In order to examine the labour productivity in the EU countries, the transformations in the labour productivity have been analysed in the context of their direction and growth rate of the changes in the level of the gross value added and agricultural labour inputs. From among the EU-28 countries, the countries of the old EU and the countries newly admitted after 2004 have been singled out[8]. The analysed feature was the economic labour productivity expressed as a ratio of the sum of produced products to incurred labour inputs (FTS) (Encyklopedia…, 1984). On the other hand, in order to determine the changes in the

[3] Labour input statistics is also available on the EUROSTAT website, in the tab of Economic Accounts for Agriculture (http://ec.europa.eu/eurostat/data/database).
[4] Methodology of the Economic Accounts for Agriculture is available on the EUROSTAT website: http://ec.europa.eu/eurostat/cache/metadata/en/aact_esms.htm
[5] Gross value added is the value of production of the agricultural sector less the value of direct consumption (mineral fertilisers, plant protection products, feedstuffs, energy, fuel, seed material, veterinary services, agricultural services etc.).
[6] Agricultural labour inputs mean paid labour (labour of permanent and odd hired workers) and unpaid labour (labour of family members and neighbours' help).
[7] Annual work unit (AWU) means an Full-time equivalent. It is calculated by dividing the number of hours worked annually by the annual number of hours corresponding to an Full-time equivalent. In Poland, the labour unit of 2,120 hours of work a year, i.e. 265 workdays, 8 hours each, has been applied. When calculating the labour inputs expressed in AWU (in accordance with the Eurostat methodology), a requirement was followed that there is no more than 1 AWU per 1 person, even if in fact this person works longer.
[8] Bulgaria, Romania joined the EU in 2007, Croatia in 2013, other countries in 2004.

European Union countries in terms of the labour productivity, sigma-convergence (σ) and beta-covergenence (β) have been used. Convergence is referred to as the development/imitation of the poorer countries in relation to the richer countries. In the analysed case, the countries of the old EU are perceived as the rich, developed countries, while the countries which joined the EU after 2004 are identified as the countries with the worse economic situation. In case of sigma-convergence, it is determined how the change occurs due to the labour productivity over the analysed period of time. To measure σ-convergence, we may use the standard deviation, coefficient of variation or Williamson and Theil coefficients (Cuadrado-Roura and Parellada 2002, Łaźniewska et al., 2011). This paper uses the classic approach to estimate sigma-convergence in a form of the standard deviation of the performance level of natural logarithms of the labour productivity level y_{it} to average values in the period t (t = 1, 2, ..., T) according to the formula:

$$\sigma = \sqrt{\frac{\sum_{i=1}^{N}(\ln y_{it} - ln\bar{y}_t)^2}{N}} \; dla \; t = 1, \dots, T \tag{1}$$

where:

N number of analysed objects (countries) during the period t;

y_{it} labour productivity level in agriculture of the European countries during the period t;

$\bar{y}_t$ average labour productivity level in agriculture of the European countries during the period t.

To analyse beta-convergence, the β factor obtained according to the following formula is most often applied:

$$ln\left(\frac{y_{it}}{y_{i0}}\right) = \alpha + \beta \ln(y_{i0}) + \varepsilon_i \tag{2}$$

where:

y_{i0} baseline labour productivity level in agriculture of the European countries during the period t = 0;

α absolute term

β coefficient of convergence;

ε_i random error with normal distribution N(0, σ^2).

In order to estimate the β coefficient, the classic method of least squares for linear regression has been used. If we obtain the negative value of the β coefficient of convergence, then we may talk about the occurrence of convergence of this type. It is necessary to check the relevance of the analysed coefficient i.e. to determine if it is different than zero. The paper estimated the value of the β coefficient by using the confidence interval according to the formula:

$$\beta \in (\hat{\beta} - t^{\alpha}_{(n-2)} S_{\beta}, \hat{\beta} + t^{\alpha}_{(n-2)} S_{\beta}) \tag{3}$$

$$S_{\beta} = \sqrt{\frac{S^2}{\sum_{i=1}^{N}(\ln y_{it} - ln\bar{y}_t)^2}} \tag{4}$$

where:

$\hat{\beta}$ estimator of the coefficient of convergence;
$t_{(n-2)}^{\alpha}$ α-quantile of Student's t-distribution with (n-2) degrees of freedom;
S_{β} standard deviation for $\hat{\beta}$;
S^2 residual variance for the regression function determined by formula 2.

Results

The use of production factors in agriculture determines its competitiveness both at the international and global level. Of particular importance in this respect is the efficient use of labour resources. The existing disparities in the labour productivity are a major problem in the economic development of the countries. They also lead to the disturbance of their competitiveness and put the disadvantaged regions in an adverse situation (Baer-Nawrocka, Markiewicz, 2012). The applied division of the countries into the countries of the old EU (EU-15) and the countries admitted to the EU after 2004 allowed to extract the main trends in the labour productivity taking place in these groups of countries. In general, for all the analysed countries, taking into account their different dates of accession to the EU between the years 1998-2015, there has been a 93.5% increase in the labour productivity in agriculture (6.6 million to EUR 12.9/1 FTE) (Table 1).

Table 1. Average labour productivity, gross value added at constant prices (2005 = 100), Total labour force input in thous. AWU in the years 1998-2015

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average annual rate of change (%)
Labour productivity (gross value added in mln euro/ total labour force input in thous. AWU) without subsidies on production																			
EU-15	13,29	14,82	15,32	15,35	16,24	16,11	18,23	18,11	18,10	18,55	19,94	20,66	19,24	20,23	19,63	19,95	22,60	24,37	0,03
countries admitted to the EU after 2004*	2,10	2,23	2,39	2,53	3,17	3,24	3,85	3,91	3,84	3,70	4,70	4,94	4,48	4,95	4,59	5,27	5,91	6,16	0,06
Avarage	6,65	7,29	6,97	7,16	7,86	7,90	9,13	8,89	8,81	8,78	10,19	10,64	9,78	10,52	10,00	10,76	12,13	12,87	0,04
Gross value added in mln euro, constant price (2005=100), without subsidies on production																			
EU-15	3052,18	3294,75	3310,91	3247,79	3361,64	3288,66	3640,29	3513,01	3439,97	3428,16	3591,36	3599,52	3345,70	3447,20	3330,73	3324,29	3746,45	4010,23	0,02
countries admitted to the EU after 2004*	766,25	773,41	550,77	555,69	577,77	556,49	624,24	638,46	600,51	542,12	666,36	679,25	565,71	616,16	567,55	644,90	709,20	714,39	0,00
Avarage	1755,96	1845,26	1774,59	1761,48	1536,89	1493,15	1662,60	1591,68	1529,72	1456,08	1642,90	1659,60	1465,92	1549,83	1464,61	1552,50	1729,86	1800,16	0,00
Total labour force input in thous. AWU																			
EU-15	229,69	222,28	216,17	211,64	207,04	204,08	199,64	193,94	190,03	184,79	180,15	174,20	173,87	170,44	169,67	166,60	165,75	164,57	-0,02
countries admitted to the EU after 2004*	226,74	177,45	195,17	185,88	182,23	171,56	162,32	163,17	156,29	146,43	141,78	137,44	126,35	124,59	123,63	122,28	119,99	115,96	-0,04
Avarage	228,50	202,08	206,57	199,78	195,62	188,92	182,10	178,99	173,55	165,87	161,19	156,04	149,92	147,36	146,48	144,32	142,67	139,88	-0,03

* Bulgaria, Romania joined the EU in 2007, Croatia in 2013, other countries in 2004.

Source: own elaboration based on Economic Accounts for Agriculture (EAA) and the Agricultural Labour Input (Economic accounts for agriculture - values at constant prices (2005 = 100) [aact_eaa03] without subsidies for production and Agricultural Labour Input Statistics: absolute figures (1 000 annual work units) [aact_ali01]). EUROSTAT. Access: 2017-04-25. For groups of states, geometric averages have been calculated.

It resulted only from a reduction in employment (-0.03%), as the average annual rate of change in the gross value added has not changed in the analysed years. In case of the „old" EU, an increase in the labour productivity amounted to 83.4% and, for all newly admitted countries an increase by almost 200% was recorded. It is worth noting that all groups of the countries recorded an increase in the labour productivity, however, the strongest growth rate was characteristic of the newly admitted countries (0.06%). In case of this group, an increase in the labour productivity was determined by an annual average decrease in employment by -0.04%, while the average annual gross value added has remained unchanged. The countries of the old EU were characterised by the lower growth rate of the labour productivity of 0.03%, but they have gained it thanks to an increase in the value added by 0.02% and a simultaneous reduction in the labour inputs by -0.02%. This means that the newly admitted countries acquire their possibilities of increasing the labour productivity mainly from a decline in employment in agriculture. In contrast, the developed countries improve their labour productivity also by generating economic surplus from agriculture. On the other hand, the average level of the labour productivity in the EU-15 countries for the entire analysed period remained at a much higher level than the average for all new countries. It should be noted that in 2015 the newly admitted countries were characterised by the labour productivity which was by nearly four times lower than that of the countries of the old EU (the difference in case of Poland was more than sevenfold). However, seventeen years before, in 1998, the same relation was more than sixfold, and for Poland more than eightfold. Therefore, it may be assumed that, in the analysed period beta-convergence has taken place among the European countries. The following map shows the changes in the labour productivity in the analysed countries. Despite the general upward trends in the labour productivity in the analysed groups of the countries, the situation at the level of the individual countries was diverse. Two countries from the group of the countries which joined the EU after 2004, Malta and Croatia showed an annual average decline in the labour productivity. On the other hand, the highest upward trend in the labour productivity was demonstrated by Lithuania (0.11%), Latvia (0.10%) and Estonia (0.09%). Poland demonstrated an annual average increase in the labour productivity of 0.04%. Poland is characterised by one of the lowest labour productivities (EUR 3.3 million/AWU), the lower labour productivity in 2015 was characteristic only of Croatia (EUR 3.2 million/AWU). The main causes of this situation in Poland include large and poorly qualified labour resources, low degree of land concentration and low equipment with capital assets, which in consequence led to the low productivity of production factors (Gołaś, Kozera, 2008). A consequence of this state of affairs, noticeable by the farming population is its low income. In contrast, a solution to this issue is seen in a reduction or complete elimination of the social role of employment in farms, in particular, in small farms (Kołodziejczak, 2016) through employment in non-agricultural sectors.

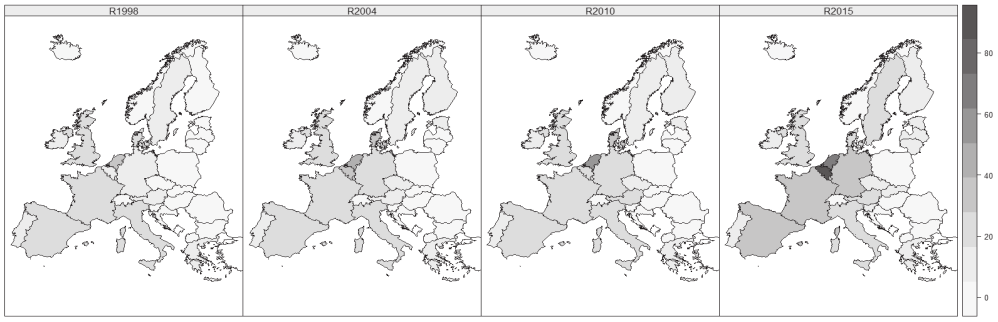

Fig. 1. Labour productivity level in agriculture for the EU-15 countries and for the countries admitted to the European Union in 2004, in the selected years

Source: own elaboration based on Economic Accounts for Agriculture (EAA): Economic accounts for agriculture - values at constant prices (2005=100) [aact_eaa03] without subsidies for production and Agricultural Labour Input Statistics: absolute figures (1 000 annual work units) [aact_ali01] Access: 25.04.2017.

The strong differentiation of the labour productivity is a consequence of the strong differentiation in the level of the gross value added in the analysed groups of the countries. In 2015, the average gross value added at constant prices and without production subsidies was almost sixfold among the groups of the countries (the difference amounted to EUR 3,295.84 million) for the benefit of the EU-15. However, in the year 1998 this difference was lower, nearly fourfold. This means that in terms of generating economic surplus, the newly admitted countries do not improved their situation but, on the contrary, they deteriorated it. In several countries, we may observe even a deterioration of results i.e. of an annual average decline in economic surplus. This problem applied to Malta (0.03%), Slovakia (-0.02%) and Croatia (0.03%). Also among the EU-15 countries, we may see the same problem, namely in Denmark (-0.02%) and Greece (0.01%). A different trend occurred in case of such countries as Lithuania (0.07%), Latvia (0.05%), Poland and Estonia (0.02%). Among the EU-15 countries, the strongest upward trend was identified in Belgium (0.09%), Finland (0.06%) and Sweden (0.04%). Despite the relatively small average annual change in the gross value added, Poland with EUR 6,351.5 million in 2015 was characterised by the highest added value in agriculture in its group and significantly exceeded the average for both groups of the European countries. This value was comparable to the gross value added of agriculture in Great Britain (EUR 6,776.9 million). On the background of the significant diversification in the level of the labour productivity and gross value added between the groups of the countries, the level of labour inputs is comparable between these groups of the countries. This is illustrated in Fig. 2. The level of labour inputs of 230 thousand AWU was comparable at the beginning of the study period and was systematically decreasing in both analysed groups of the countries. The number of FTEs in agriculture of the EU-15 decreased by 65 thousand AWU, and in the newly admitted countries by 110.8 thousand AWU. Despite lower average employment in agriculture in the group of the newly admitted countries, this group includes the countries with the highest employment in agriculture, i.e. Poland with employment of 1,937.1 thousand AWU and Romania with 1,193.0 thousand AWU. Among the EU-15 countries, comparably high employment only applies to Italian agriculture only (1,142.6 thousand AWU).

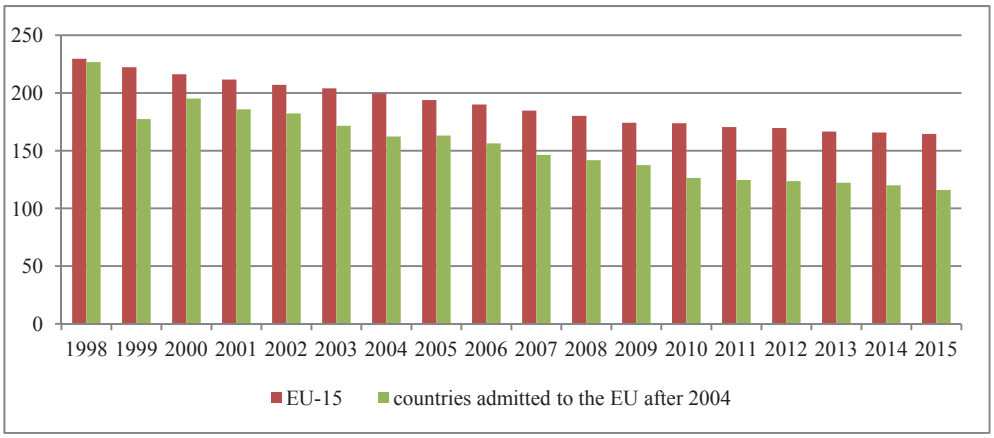

Fig. 2. Average total labour force input in agriculture of the EU-15 countries and newly admitted countries after 2004 (in thousand AWU).

Source: own elaboration based on EUROSTAT data. Agricultural Labour Input Statistics: absolute figures (1 000 annual work units) [aact_ali01] Accessed: 25 April 2017.

In the further part of this paper, we estimated sigma-convergence of the labour productivity in agriculture for the European countries in 2005, 2007, 2010 and 2015. Fig. 3 shows the evolution of the value for sigma-convergence for the EU countries calculated in accordance with formula 1. The way of the evolution of the value in the chart allows to identify two periods: from 2004 to 2009 and from 2009 to 2015. In the first identified period, we cannot talk about reducing the value of the standard deviation for the labour productivity in agriculture. However, after 2009 we may talk about the decreasing values of sigma-convergence which would suggest its occurrence in this period and would suggest the presence of beta-convergence (cf. Łaźniewska et al., 2011). For the analysed countries this means that in the first years there were spatial inequalities among the countries as regards the analysed labour productivity, then after 2009 this differentiation among the countries started decreasing. This resulted in the improved relationship of the labour productivity between the Western countries and the Central and Eastern European countries.

Fig. 4 shows the values of beta-convergence for the labour productivity in agriculture of the European Union countries in the years 2004-2015. On the vertical axis, the values of the estimated β coefficient have been marked. The baseline year is 2004 and then the β coefficients have been estimated for the individual years. For each coefficient, the confidence intervals have been calculated in accordance with formula 3. A horizontal line, intersecting the vertical axis, marks the value of zero. We assume that if the confidence interval for the β coefficient in the given year contains zero, we cannot determine the relevance of this coefficient, and thus beta-convergence. According to this reasoning, it should be noted that until 2010, we cannot talk about the presence of convergence for the labour productivity in agriculture. Only since 2011 a change has occurred and all obtained values of the β coefficients for the individual years are negative, and therefore, we can conclude the presence of real convergence for the labour productivity in agriculture of the European Union countries.

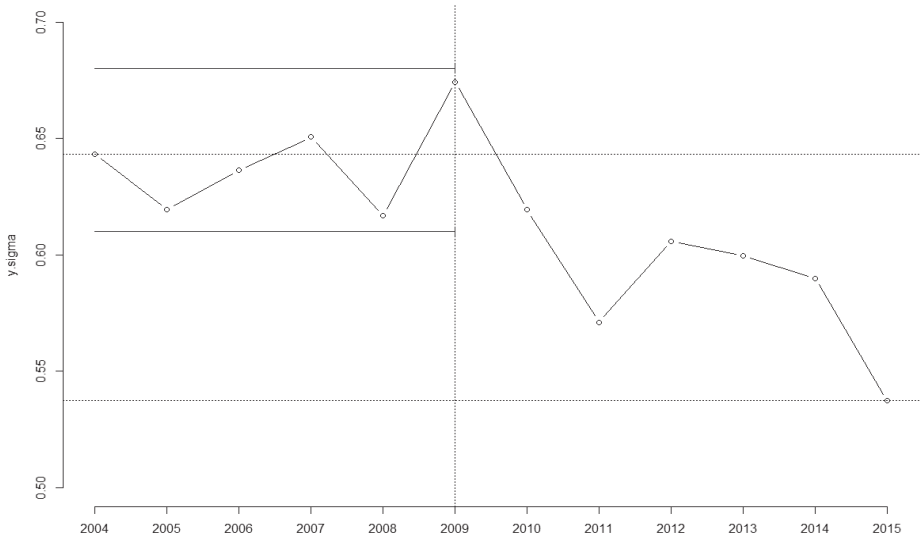

Fig. 3. Values of sigma-convergence for the labour productivity in agriculture of the European Union countries in the years 2004-2015.

Source: own elaboration based on Economic Accounts for Agriculture (EAA): Economic accounts for agriculture - values at constant prices (2005=100) [aact_eaa03] without subsidies for production and Agricultural Labour Input Statistics: absolute figures (1 000 annual work units) [aact_ali01] Accessed: 25 April 2017.

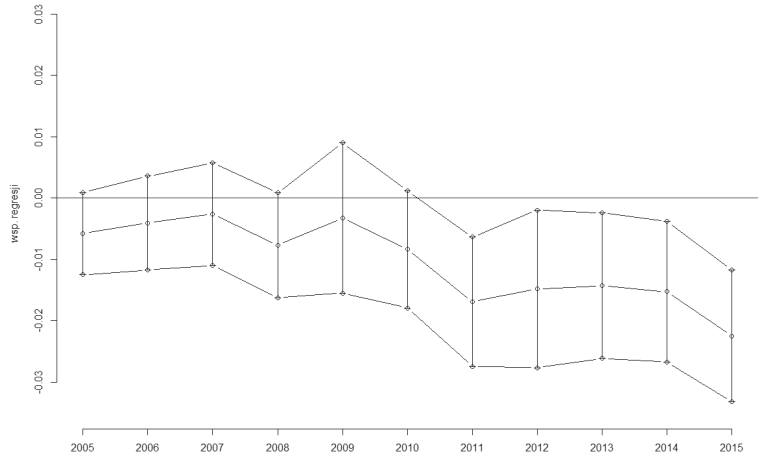

Fig. 4. Values of beta-convergence for the labour productivity in agriculture of the European countries in the years 2005-2015

Source: own elaboration based on Economic Accounts for Agriculture (EAA): Economic accounts for agriculture - values at constant prices (2005=100) [aact_eaa03] without subsidies for production and Agricultural Labour Input Statistics: absolute figures (1 000 annual work units) [aact_ali01] Accessed: 25 April 2017.

Conclusions

The analysis of changes in the labour productivity in terms of the direction and growth rate of changes in the level of the value added and labour inputs showed that in the European countries in the years 1998-2015 there were beneficial changes as regards the labour effectiveness. The distance between the countries of the old EU and newly admitted countries after 2004 was decreasing. However, the growth rate of this process was different. The countries which joined the EU after 2004 improved their productivity faster than the countries of the old EU, and they also reduced faster the labour inputs involved in agriculture. On the other hand, the increase in the labour productivity in their case was obtained only due to a reduction in the labour inputs. The average value added in their case has not improved in the analysed years. In turn, the EU-15 countries also increased the labour productivity due to the value added growth. It was noticed that in some countries the growth rate of changes in the analysed variables differed significantly from the averages for the identified groups of the countries. This was the case of Poland, Romania, Italy (the issue of labour inputs much above the average), Belgium, the Netherlands (the issue of the labour productivity much above the average for the EU-15 group). Both the level and growth rate of the studied phenomenon of the labour productivity, economic surplus and labour inputs involved in agriculture showed that both groups of the countries are decreasing the distance in terms of the labour productivity only, while increasing the distance in terms of the generated gross value added and labour inputs. However, it should be stressed that the gross value added used to calculate the labour productivity has been deprived of direct payments and presented in constant prices. Summing up the conducted study, we conclude that between the groups of the countries there are disparities both in terms of the labour productivity and the generated gross value added. The analysis of convergence allowed us to assess the presence of spatial inequalities among the countries when it comes to the labour productivity. The presence of beta-convergence indicates that the analysed two groups of the countries decrease the distance in terms of the labour productivity itself, which confirmed the hypothesis on aligning the level of the labour productivity in the agricultural sector, but only after 2011. But it has also been shown that the countries are increasing the distance in terms of the generated gross value added and labour inputs.

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Poland and the Czech Republic in the Process of Globalization

Abstract. The purpose of an article was to analyses complexity of the globalization process and its effects for the functioning of the Polish and Czech economies. In addition to the opportunities and threats of the globalization process, the study includes an analysis of the primary indicators for both economies, i.e. GDP, participation in foreign trade, flow of foreign investment and ranking of the KOF globalization index.

Key words: globalization, globalization indices, effects of globalization, threats of globalization, economic growth, Poland, Czech Republic

JEL Classification: F62, F63, O40.

Introduction

Globalization is a complex many-sided, multidimensional process, defined in different ways, reinforcing the international interdependence. When analyzing the process of globalization, you can note various attitudes and interpretations of that term, from economic to sociological, political, cultural or technical.

Globalization is visible in the continuous development of mutual relationships all over the world through its increasing range or intensity. This study aims to present the complexity of the globalization process and its effects for the functioning of the Polish and Czech economies. The analysis of the fundamental economic values will constitute an attempt to determine the opportunities and threats related to the process of globalization.

Term of globalization

The term of globalization gained popularity in 1990s, with the publication of many economic studies describing that process. Earlier, that phenomenon was accredited to the internationalization of economic life, where commercial correlations gradually developed, and later so did the production correlations, causing the production capacities to be transferred abroad.

Although the term of globalization is often used, it does not have an unequivocal definition. It penetrates through all the areas of socio-economic life, it integrates numerous sciences, becoming an interdisciplinary term. Currently, it is usually referred as the "expansion and acceleration of the pace of development of mutual relations in the world" (McGrew, 1992, p. 28). As indicated by the International Monetary Fund (IMF), globalization "constitutes the growing interdependence among the countries all over the

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world, resulting from the increase in the number and size of transactions covering the exchange of goods and services, as well as capital flows, as well as the fast and broad dissemination of technology" (Oziewicz-Michałowski, 2013, p. 298). It is also described as a form of integration, where the process spreads from smaller to larger forms, e.g. "in the past, local markets consolidated into national economies, while now national economies are integrated, one by one or consolidated in regional or subregional groups, into one global whole" (Bożyk, 2008: 359), but it is also the process of development of liberalized market of goods, services and production factors in the scale of the world as a whole, the process of "internationalization of economic activity, simultaneously at three levels: enterprises, sectors and global economy" (Rymarczyk, 2010, p. 440). That process takes place "thanks to the expansion and intensification of cross-border commercial, institutional, cooperative and informational relationships, which leads to the development of stronger interdependence in the global economy" (Zorska, 2001, p. 215-218) as well as numerous relationships and dependencies between the states and societies that comprise the current global system.

The participants in the globalization process – mainly the transnational corporations (TNC) more and more frequently demonstrate the tendencies for treating the whole world as the potential market for their activities. The production resources, capital and labor, are getting more and more mobile. "Economic globalization is the next step of the expansion of the international division of work, and makes that division global, where the roles and tasks are not divided "internationally" but "transnationally" or "supranationally" (Oziewicz-Michałowski, 2013, p. 301).

However, among the numerous views on globalization, there exist several characteristics of that process (Zorska, 1998, p. 16-18): (1) multidimensionality – visible in numerous fields of social life: in economy, politics, military sector, culture; (2) complexity and multithreading – the occurrence of phenomena that are intrinsically complicated; (3) integration – the merging of economies at multiple levels, in the scope of economic activities, policies, etc., the integration applies to states, enterprises and sectors; (4) international interdependence – the mutual, close international relationships both in the form of international coordination, but also asymmetric ones – providing the more benefits to only one party; (5) association with the development of science, technology and organization – the process of globalization results from the significant progress in the fields of science, technology and organization. The development of the communication tools, means of transportation, and application of computerization and internet links in the production and commercial activities, have been conducive towards the spread of products, information, people, manufacturing capacities and technologies, on a worldwide scale; (6) time and space compression – the shrinking of the world which is becoming a "global village" as a result of transportation, mass media (Internet and others) and mobility of people (job-seeking, tourism, studies). Many products from all over the world are available at a hand's reach, which results from the technological progress (Internet, fast planes), (7) dialectic character – visible in the presence of opposites and opposite tendencies and processes in the global economy, e.g. globalization vs. regionalization or integration vs. disintegration; (8) multi-level character – process of merging of economic activities at the level of: states, regions, branches, markets, companies.

The globalization process is understood in different ways, by hyperglobalists it is perceived as "the fall of sovereign national states resulting from the fact that global forces deprive the governments of the possibility to control their economies and the social life of

other countries", while skeptics dismiss the ideas of globalization in favor of the view indicating that the main forces shaping the modern world order are states and the geopolitical system (McGrew, 2008, p. 18).

Globalization stimulating factors

In economic literature, there are usually listed three factors determining the development of the globalization process: (1) scientific and technological progress, (2) international competition, (3) economic state policy.

Scientific and technological progress – mainly consists in the implementation of changes, improvements and innovations in the work organization of enterprises, in particular in procurement, production and distribution. It allows the implementation of modern (among others: electrical, IT, telecommunications) technologies which leads to the development of the new system of flexible specialization. The new solutions allow to accelerate and better organize the flow of goods and information, in a more efficient and coordinated manner. "Technology diffusion allows to equalize (improve) the technological capacities in various countries, it causes the development of IT, telecommunications and transportation. It leads to the so-called technoglobalism (globalization of technology), i.e. the growing internationalization, development, application and spread of technology" (Rymarczyk, 2010, p. 444).

International competition – it mainly develops as a result of technical progress and of the changes in supply and demand – manufacturers' market transforms into consumers' market. The enterprises that want to obtain clients in numerous countries need to adapt to changes through fast application of state-of-the-art technologies. They must be flexible enough to be able to adapt fast to the changing surroundings, to predict and anticipate the appearing changes. In order to reach clients, the enterprises need to accelerate their reactions to market changes – so-called compression of time (application of flexible production systems, reducing the product life cycle, conduct of joint research works) and space (impact on the flow of products and on the integration of the entities located in different countries).

The economic policy of a state and the economic processes launched or modified by it – the economic policy of a state is mainly understood as the integration, development and assumption by a state of beneficial conditions of international cooperation, joint assumptions of economic policies. "Thanks to the free trade exchange, development and liberalization of capital flows, production factors, goods and services on an international scale, it is possible to expand the scope of investments, to conduct geographically scattered (both on a global and regional scale) but functionally integrated activities of the globally competing companies." (Rymarczyk, 2010, p. 445).

The literature also presents the division of the factors stimulating the globalization process ***from the macro- and microeconomic point of view*** (Niemiec, Wróblewski, 2003, p. 52): (1) from the macroeconomic point of view: (a) technological progress, (b) assimilation of countries in terms of the level and character of development, market infrastructure, etc., (c) standardization of supply on a global scale, (d) liberalization of trade exchange and capital flows, (e) inclusion of the countries undergoing systemic transformation, e.g. Poland and the Czech Republic, in the global economy; (2) from the microeconomic point of view: (a) aspiration of enterprises to improve the economic

effectiveness of their activities, (b) evolution of production processes (new technologies, innovations), (c) increase in the costs of research and marketing activities, (e) changes in the international strategy of corporate competition.

Entities undergoing globalization

The following entities undergo globalization in the modern global economy: (1) states, (2) transnational corporations (TNC) and large international banks, (3) international institutions.

States aim for improving the international competitiveness of their national enterprises, while at the same time looking after the security of trading. A state develops beneficial conditions for doing business both within its territory and abroad.

Transnational corporates are now the main entities in globalization that dominate in the structure of the global economy, and constitute a significant driving force of globalization. Nowadays, transnational corporations are some of the most important entities of the global economy – their financial potential and gigantic economic capabilities are no longer comparable to other enterprises, but to the whole states (Kaczmarek, 2014, p. 39).

International institutions – promote international trade, develop international agreements, co-finance international projects, settle trade disputes among the states. The most important international economic organizations are: UN – United Nations, WTO – World Trade Organization, formerly GATT, IBRD - International Bank for Reconstruction and Development, IMF – International Monetary Fund.

Effects of globalization

In the modern global economy, we distinguish among the following symptoms of globalization: (1) Development of the global financial market; (2) Institutionalization of international trade; (3) Mcdonaldization – internationalization of economic activities on a global scale; (4) Sudden increase in foreign direct investments (FDIs); (5) Domination of transnational corporates in the global economy; (6) Geographic disjunction of the value added chain on a global scale; (7) Development of knowledge-based economy; (8) Development of the fourth sector of economy – services; (9) Redefinition of the meaning of state.

The age of globalization has changed the relationship between the tangible and intangible values present in every product. Currently, it is knowledge that constitutes a significant part of product's value. It determines the tendencies in the global trade, where the vast share of products constitute highly-processed goods. Knowledge-based economy is the new stage in the development of the global economy, where the information society plays a significant role. In turn, the economy itself should be subject to the following activities: (1) Fast transition to knowledge-based economy through research and innovations, and development of proper skills and qualifications; (2) Development of the legal basis for the efficient functioning of the information society; (3) Development of entrepreneurship; (4) Increase in employment and professional activation; (5) Care of the natural environment; (6) Liberalization and integration of telecommunications, power engineering, transportation, etc.

Since the second half of the 20th century, the new form of management based on the Internet, i.e. e-economy, has been developing more and more resiliently.

Another effect of globalization is the development of the fourth sector of the economy, i.e. the economic activity defined as the "creation by business entities of added value on the basis of no tangible input or its trace amount, which means that the whole input is of intellectual character" (Flejterski-Wahl, 2003: 33). That sector is identified as knowledge management, and it includes: information processing, research and development, as well as management.

The globalization process has completely changed the role of states in the global economy. The strengthening of transnational corporations, their internationalization and globalization, have created the development of numerous economically-sound entities that overwhelm the national economies as the creators of economic activity. The expansion and consolidation of the free market leads to the implementation of the processes of privatization, deregulation and desocialization in the economy. Those processes result in the transformation of the sovereignty of states, which is an unavoidable result of globalization.

"The new role of states in terms of economy, should consist in the conduct of suitable economic policies in response to the challenges of globalization (i.e.: improvement of state finances, decrease in inflation and unemployment, increase in innovativeness and competitiveness of domestic entities)" (Rymarczyk, 2010, p. 463-464).

Threats of globalization

The phenomenon of globalization is perceived on the one hand as a certain form of socioeconomic development of the world and on the other as the greatest threat to the world. Currently, there exist both many proponents and opponents to that process. The globalization opponents – antiglobalists emphasize the negative phenomena of that process: (1) deregulation of the natural environment, in particular in developing countries, with industrial projects that are detrimental to the environment; (2) destruction of local cultures of niche character; (3) development of national-ethnic antagonisms; (4) the unsolved problems of the Third World – poverty, hunger, illiteracy.

Table 1. List of selected pro-globalist and anti-globalist opinions

Globalization	
according to pro-globalists	according to anti-globalists
limits the number of hungry people in the world	increases the number of hungry people in the world
reduces the income differences on a global scale	increases the income differences on a global scale
Improves the growth and development even in the poorest countries	Reduces the growth and causes recession in poor countries
Reduces unemployment both in rich and poor countries	increases unemployment both in rich and poor countries
Causes the influx of FDIs, which is beneficial for everyone	Causes FDIs, which is destructive for the host country
Improves the quality of the natural environment	Drastically deteriorates the quality of the natural environment
Develops the cultural and ethnic diversity of the world	Kills the cultural and ethnic diversity of the world
Strengthens the notion of state	Destroys the notion of state and the associated values
Facilitates control of crime	Allows the development of international criminal networks
Allows to fight with international terrorism	Causes the development of international terrorism
Is the only opportunity for global development	Is the pathway to global catastrophe
Develops global civic society	Destroys the sense of community and belonging

Source: Fleterski S., Wahl P.: Ekonomia globalna. Synteza. Difin, Warsaw 2003, p. 198.

The alterglobalists also indicate the imperfections of that process, such as: (1) the developing difference between the wealth of developed and developing countries; (2) the excessive significance of transnational corporations in international trading; (3) the economic neocolonialism executed by international institutions (World Bank, IMF, WTO and UN); (4) so-called californization of demand, lifestyle; (5) lack of the so-called fair trade.

Measure of the level of globalization of the economies of Poland and the Czech Republic

The globalization process is a complex phenomenon, and so it is difficult to research. The measurement of the share of the economy in the globalization processes, is highly complicated. However, literature provides economic and social measures of globalization. The economic measures include those associated with the opening of economies and those reflecting the level of affluence of societies, e.g. GDP or GNP per capita. The share of a country in the globalization processes is measured through such indices as: (1) the size of foreign trade, (2) the influx of foreign capital, (3) the share of production and export of foreign enterprises, in the total production and export of the country, (4) the relationships with global financial markets through contracted credits, flow of portfolio investments and share of foreign investors in the stock exchange, (5) flow of technologies, (6) flow of people.

This study analyzes the selected indices, with the results presented below. It follows from the 2015 analysis of the economic strength of economies that it is the highly developed states that dominated, including USA with 24.4% share in the world GDP in the first place, Germany in the fourth and Great Britain in the fifth position. It should be noted that China occupied the second position, with 14.78% in the world GDP. The Polish economy has 24th position in the ranking, with 0.65% in the world GDP. The Czech Republic is in the 50th position, with 0.25% (table 2 and chart 1). In order to accelerate their development and to more effectively participate in the globalization processes, both Poland and the Czech Republic should improve the freedom of business activities, lower the entry barriers for foreign investors, etc.

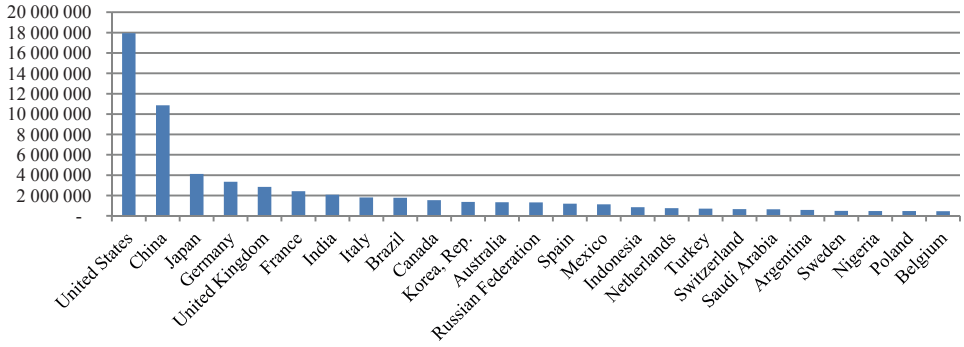

Fig. 1. Ranking of 25 of the world's largest economies by GDP in 2015, in USD million

Source: own study on the basis of the GDP ranking 2016. IBRD (2016 b): World Development Indicators, The World Bank http://data.worldbank.org/data-catalog/GDP-ranking-table.

Table 2. Gross domestic product ranking in 2016

Ranking	Economy	GDP in USD million	Share in the world economy
1	United States	17,946,996	24.42
2	China	10,866,444	14.78
3	Japan	4,123,258	5.61
4	Germany	3,355,772	4.57
5	United Kingdom	2,848,755	3.88
6	France	2,421,682	3.29
7	India	2,073,543	2.82
8	Italy	1,814,763	2.47
9	Brazil	1,774,725	2.41
10	Canada	1,550,537	2.11
11	Korea, Rep.	1,377,873	1,87
12	Australia	1,339,539	1.82
13	Russian Federation	1,326,015	1.80
14	Spain	1,199,057	1.63
15	Mexico	1,144,331	1.56
16	Indonesia	861,934	1.17
17	Netherlands	752,547	1.02
18	Turkey	718,221	0.98
19	Switzerland	664,738	0.90
20	Saudi Arabia	646,002	0.88
21	Argentina	583,169	0.79
22	Sweden	492,618	0.67
23	Nigeria	481,066	0.65
24	Poland	474,783	0.65
25	Belgium	454,039	0.62
26	Iran, Islamic Rep.	*425,326*	0.58
27	Thailand	395,282	0.54
28	Norway	388,315	0.53
29	Austria	374,056	0.51
30	United Arab Emirates	370,293	0.50
31	Egypt, Arab Rep.	330,779	0.45
32	South Africa	312,798	0.43
33	Hong Kong SAR, China	309,929	0.42
34	Malaysia	296,218	0.40
35	Israel	296,075	0.40
36	Denmark	295,164	0.40
37	Singapore	292,739	0.40
38	Colombia	292,080	0.40
39	Philippines	291,965	0.40
40	Pakistan	269,971	0.37
41	Chile	240,216	0.33
42	Ireland	238,020	0.32
43	Finland	229,810	0.31
44	Portugal	198,931	0.27
45	Greece	195,212	0.27
46	Bangladesh	195,079	0.27
47	Vietnam	193,599	0.26
48	Peru	192,084	0.26
49	Kazakhstan	184,361	0.25
50	Czech Republic	181,811	0.25

Source: own study on the basis of the GDP ranking 2016. IBRD (2016b). World Development Indicators, The World Bank: http://data.worldbank.org/data-catalog/GDP-ranking-table.

Table 3. Selected economic indices for Poland and the Czech Republic in the selected years

Selected indices	2005	2010	2012	2013	2014
			Poland		
GDP (in USD billion)	304	479	500	524	545
GDP per capita (in USD thousand)	7.9	12.3	12.9	13.6	14.1
Unemployment rate	17.7	9.6	10.1	10.3	9.0
Deficit (% of GDP),	-2.5	-5.5	-3.4	-1.3	-1.3
			Czech Republic		
GDP (in USD billion)	136.0	207.0	206.8	208.8	205.0
GDP per capita (in USD thousand)	13.2	19.6	19.6	19.8	19.5
Unemployment rate	7.9	7.3	7.0	7.0	6.1
Deficit (% of GDP)	-0.9	-3.6	-1.6	-0.5	0.6

Source: Rocznik statystyki międzynarodowej. Central Statistical Office, Warsaw 2015: www.stat.gov.pl.

It follows from the analysis of the indices for Poland that its GDP has been dynamically rising since 2005, with USD 545 billion in 2014. The GDP per capita has doubled from USD 7,900 to USD 14,100. In the researched period, the unemployment rate in Poland dropped to 9% in 2014. In that period, the Czech economy did develop, but the rate of development was slow, with even a decrease in GDP in 2014 in comparison with the previous year. GDP per capita in the Czech Republic is higher than in Poland, and in 2010 its average level was ca. USD 19,600. The Czech Republic also records a lower unemployment rate, i.e. 6.1% in 2014, with a decreasing tendency (table 3).

Share of the economies of Poland and the Czech Republic in foreign trading

Polish foreign trade has been dynamically developing, both in terms of exports and imports. In 2014, Poland exported the goods for USD 222.3 bn., while imported the goods for USD 225.8 bn., so the balance of trade was negative. In 2015, the value of trade decreased. Poland continues to be included in the globalization processes by increasing the balance of trade. Our main trade partners are the countries of the European Union, including Germany in the first position, Great Britain and the Czech Republic. We mainly import from Germany, China and Russia. Since 2005, there has been observed a growing share of exports and imports in the GDP, but it does not exceed half of the GDP value, which is the case in the Czech Republic. Since joining the European Union, the Czech Republic has been recording a positive balance of trade. Poland recorded a positive balance of trade only in 2015. The products mainly exported from Poland are parts for machines and devices, including for tractors. In 2015, the condition of Czech trade improved: export due to the devaluation of the Czech currency, and import – due to the decrease in the prices of raw materials. For many years, the most important export partners of the Czech Republic have been Germany, Slovakia and Poland, and import partners – Germany, China and Poland. The main export products are cars and parts for mechanical vehicles - in 2015 they constituted almost 19% of total Czech exports (WTO, 2015). The terms of trade indices in

both countries demonstrated a similar tendency in the years 2010-2012, when the terms deteriorated, and an improvement since 2013 (table 4).

Table 4. Foreign trade indices of Poland and Czech Republic in selected years

Indices	2005	2010	2012	2013	2014
Poland					
FOB export (USD bn.)	89.3	159.7	184.6	206.1	222.3
CIF import (USD bn.) in current prices	101.5	178.0	198.4	208.7	225.8
Share of foreign trade in GDP:					
1. Exports of goods and services	34.9	40.5	45.1	46.1	46.9
2. Imports of goods and services	35.9	42.3	45.3	44.2	45.4
Ratio of the value of goods and services to the value of domestic demand	35.5	41.5	45.2	45.1	46.1
Terms of trade	99	98	99	103	103
Czech Republic					
FOB export (USD bn.)	77.9	133.0	157.1	162.3	173.8
CIF import (USD bn.) in current prices	76.3	126.6	141.1	144.3	152.1
Share of foreign trade in GDP:					
1. Exports of goods and services	62.3	66.2	76.6	77.3	83.8
2. Imports of goods and services	60.0	63.1	71.7	71.5	77.1
Ratio of the value of goods and services to the value of domestic demand	61.4	65.1	75.4	75.9	82.7
Terms of trade	106.4	97	99	101	102

Source: Rocznik statystyki międzynarodowej. Central Statistical Office, Warsaw 2015: www.stat.gov.pl.

FDI in Poland and the Czech Republic

The start of business activities both in Poland and the Czech Republic is determined by a number of legal regulations for various kinds of activities. Both countries encourage foreign investors to invest in their territory by offering incentives.

Table 5. Indices of direct foreign investments in Poland and the Czech Republic in selected years

Indices	2005	2010	2011	2012	2013
			Poland		
FDI (in USD bn.)	10.2	13.8	20.6	6.0	-6.0
Direct investments abroad by domestic entities (in USD bn.)	3436	7226	8154	726	-4,852
Foreign direct investments in the country (in USD million)	10,293	13,875	20,615	6,058	-5,038
			Czech Republic		
FDI (in USD bn.)	11.6	6.1	2.3	7.9	4.9
Direct investments abroad by domestic entities (in USD bn.)	-19	1,166	-328	1,790	3,294
Foreign direct investments in the country (in USD million)	11,653	6,140	2,317	7,984	4,990

Source: Rocznik statystyki międzynarodowej. Central Statistical Office, Warsaw 2015: www.stat.gov.pl.

As follows from the data in tables 5 and 6, Poland is the leader in the influx of direct foreign investments. Those investments amounted to over USD 213 bn. in 2015. In 2015, Poland benefited from 234 greenfield investments, which was twice as many as in the Czech Republic. The balance of foreign investment flows is asymmetric in both countries, i.e. in both cases the influx of foreign investments is higher than the investments abroad by domestic entities (table 5).

In comparison with the Czech Republic and Eastern Europe, Poland has definitely good indices of shareholders' power and transaction transparency. Unfortunately, the index of manager's responsibility index is worst – the management do not identify themselves with their companies, and do not assume the responsibility for their decisions (table 7).

Table 6. Indices of capital flows in Poland and the Czech Republic in the years 2010 and 2013-2015

Indices	2010	2013	2014	2015
		Poland		
FDI flows (in USD m)	12,796	3,625	12,531	7,489
FDI Stock	187,602	229,167	205,581	213,071
Number of Greenfield Investments	323	268	234	234
FDI flows (% of GFCF)	-	3.7	11.7	7.8
FDI Stock (% of GDP)	-	43.7	37.7	44.9
		Czech Republic		
FDI inward flow (in USD m)	6,141	3,639	5492	1,223
FDI Stock (in USD m)	128,504	134,085	121,512	113,057
Number of Greenfield Investments	190	151	89	113
FDI flows (% of GFCF)	-	69	10.7	2.6
FDI Stock (% of GDP)	-	64.4	59.2	62.2

GFCF – gross fixed capital formation

Source: UNCTAD (2016): World Investment Report 2016, Investor Nationality: Policy Challenges. Genewa. http://unctad.org/en/PublicationsLibrary/wir2016_en.pdf.

Table 7. Comparison of selected states in terms of protection

List	Poland	Czech Republic	Eastern Europe & Central Asia	USA	Germany
Index of Transaction Transparency[1]	7.0	2.0	7.0	7.0	5.0
Index of Manager's Responsibility[2]	2.0	5.0	5.0	9.0	5.0
Index of Shareholders' Power[3]	9.0	8.0	6.0	9.0	5.0
Index of Investor Protection[4]	6.0	5.0	5.9	8.3	5.0

[1] The higher the index value, the higher the transparency of the transaction conditions
[2] The higher the index value, the higher the responsibility borne personally by managers
[3] The higher the index value, the easier it is for shareholders to undertake legal acts
[4] The higher the index value, the higher the level of investor protection

Source: IBRD (2016a) *Doing Business 2016 Measuring Regulatory Quality and Efficiency* (2016). World Bank Group 13th edition (http://www.doingbusiness.org/~/media/GIAWB/Doing%20Business/Documents/Annual-Reports/English/DB16-Full-Report.pdf#page=6&zoom=auto,-91,762.

Globalization indices

Several indices may be used for determining the level of globalization of an economy: (1) "Foreign Policy" globalization index – developed by A. T. Kearney, (2) CSGR globalization index – by the Centre for the Study of Globalisation and Regionalisation at the University of Warwick, (3) KOF globalization index – developed by A. Drehar working in Konjunkturforschunggsstelle Swiss Economic Institute.

Table. 8. KOF Globalization Index in 2016

No.	State	Globalization index (in %)	State	Economic Globaliza-tion	State	Social Globaliza-tion	State	Political Globaliza-tion
1.	Netherlands	91.70	Singapore	96.06	Austria	91.30	Italy	97.53
2	Ireland	91.64	Ireland	93.08	Singapore	91.15	France	97.29
3	Belgium	90.51	Luxembourg	91.80	Switzerland	91.10	Belgium	96.51
4	Austria	89.83	Netherlands	90.89	Ireland	90.98	Austria	96.37
5	Switzerland	87.01	Malta	90.28	Netherlands	90.77	Spain	95.99
6	Singapore	86.93	United Arab Emirates	88.39	Belgium	90.45	United Kingdom	94.95
7	Denmark	86.44	Hungary	86.85	Puerto Rico	90.36	Sweden	94.65
8	Sweden	85.92	Estonia	86.11	Canada	89.26	Brazil	94.31
9	Hungary	85.78	Belgium	85.95	Cyprus	88.21	Netherlands	94.01
10	Canada	85.67	Bahrain	85.51	Denmark	87.29	Switzerland	93.41
11	Finland	85.47	Mauritius	85.23	France	87.14	Canada	93.17
12	Portugal	85.08	Slovak Republic	83.63	United Kingdom	86.08	Egypt	93.01
13	Norway	84.24	Austria	83.25	Portugal	85.59	Argentina	92.88
14	Cyprus	84.07	Cyprus	83.11	Norway	85.49	Turkey	92.53
15	Spain	83.73	Czech Republic	82.89	Sweden	84.63	Norway	92.26
16	Slovak Republic	83.62	Georgia	82.56	Germany	84.53	United States	92.19
17	Czech Republic	83.60	Finland	82.23	Finland	83.84	Denmark	92.12
18	Luxembourg	83.55	Malaysia	81.46	Australia	83.43	Russian Federation	92.10
19	France	82.61	Portugal	81.35	Spain	83.23	Greece	92.05
20	United Kingdom	81.97	Denmark	81.17	Slovak Republic	82.63	Germany	91.94
21	Australia	81.93	New Zealand	81.05	Czech Republic	82.40	Finland	91.89
22	Greece	80.40	Panama	80.87	Lithuania	80.89	India	91.78
23	Poland	79.90	Latvia	80.79	Hungary	80.79	Hungary	91.19
24	Italy	79.59	Sweden	80.56	Greece	80.43	Nigeria	90.72
25	Malaysia	79.14	Brunei Darssalam	79.33	Qatar	79.54	Ireland	90.69
36/34/31			Poland	75.72	Poland	76.92	Poland	89.37
42							Czech Republic	86.16

Source: Own study on the basis of the data from KOF (2016): Globalization Index 2016, http://globalization.kof.ethz.ch/.

The globalization index published by "Foreign Policy" consists of four indices: economic integration, personal contacts, technological connectivity and political engagement. That index provided the image of the globalization processes taking place in the specific levels of the given country, but was flawed, for example due to lack of the cultural aspect of globalization. The CSGR index was developed by B. Lockwood and M. Redoano, on the basis of 16 indices. It took into account the application of the cultural

aspects of globalization. The KOF Globalization Index covers: (1) the economic aspect of globalization: the flow of goods, services and capital on long distances, limitations on trade and the aspect of economic policies, (2) the social aspect of globalization: the personal contact indices (e.g. international tourism or the average number of international phone calls), information flow indices (number of Internet and cable TV users), cultural proximity (international trade in books, number of McDonald's restaurants and Ikea stores in the given country), (3) political aspect of globalization: participation in UN peacekeeping missions, membership in international organizations, number of embassies in the given country (Czech, 2011, p. 52).

The KOF Globalization Index ranges from 0 to 100: the higher the value, the more globalized the given economy. The calculation of that index consists in calculating the components for each state. Weights of the respective aspects: "economic aspects – 36%, social aspects – 38%, political aspects – 26%. The variables within the respective aspects also bear specified weights. By multiplying the value of the respective variable elements by their weights, we arrive at the values of the respective variables – after adding them, we arrive at the value of the given dimension, which we then multiply, for the last time, by the weight assigned to the dimension calculated by us. At the end, we add the values of all the dimensions, thus arriving at the KOF Index value" (KOF, 2016).

On the basis of the data from 2000, the KOF Index considered the Scandinavian countries to be most globalized. The Czech Republic was in the 22nd position with the index value of 79.27, while Poland – in the 29th position, with 71.71. Much more interesting information is provided by the same ranking published in 2015. The leader was then the Netherlands, before Ireland, Belgium and Austria. United States was in 35th position in 2015, 11 places behind Poland. The Czech Republic held 17th position, with the index of 83.60. In the globalization ranking, Poland is in the 23rd position with the index of 79.90. Taking into account the economic and social aspects, we are listed in the 36th and 34th position in the ranking of over 200 states, and in the 31st position in political aspects. The Czech Republic is more economically and socially globalized than Poland – with 15th and 21st position in the rankings, respectively. Political globalization looks much worse in the Czech Republic, giving it the 42nd position (table 8).

Conclusion

Globalization is a phenomenon characterized by both positive and negative effects. The benefits of globalization for the economies of Poland and the Czech Republic include the free flow of goods and services which mean for those countries an increase in GDP and higher level of development. The growing exports of highly processed products is particularly beneficial. Another benefit is the inflow of direct foreign investments – as indicated above both Poland and the Czech Republic are gladly selected by investors. Greenfield investments are particularly important, as they are conducive towards the increase in the number of jobs, implementation of new technologies, etc. They also result in the inflow of new technologies to the post-communist countries which continue to suffer from lack of their own capital. The coming translational corporations include the economies of both states in the network of global relationships, thus making them become modernized, and compete more resiliently in the domestic and global markets.

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Human Capital on the European Labour Market

Abstract. Efficient use of human capital and taking care of its quality in the global labour market is becoming a priority. This is primarily due to the need to function in a multicultural environment, growing competition and population aging.
This article is an attempt to systematise knowledge about human capital and its use in the labour market. Attention is being drawn to the effective use of capital, including implementation of European strategies, as well as trends and challenges facing key employment issues. In addition, an effort has been made to identify key employee competencies reflecting global labour market trends. The article shows the importance of quality and investment in human resources, which is associated with the use of EU projects and programmes targeted at young people on the labour market.

Key words: human capital, European Union, labour market, competence

JEL Classification: J24, J62, M12, M14, M54, O15, O34

Introduction

Human capital is the basic source of creating value in a global, knowledge-based economy. The uniqueness and specificity of human capital comes down to the fact that it is the only capital that cannot be copied, which is attributable to its individualism and uniqueness (Król, 2016, p. 61).

The emergence of the European Union was connected with the opening of labour markets, free movement of people, information, knowledge, goods and services, and thus improved access to employment but, at the same time, the need to increase flexibility and mobility of employees. On the one hand, membership in the EU became a great opportunity in terms of development of human capital and, on the other hand, it also brought many new challenges and problems to the global labour market.

The aim of this article is to discuss the issues of human capital in the European labour market in the context of its mobility, quality and development, and to present key trends and challenges emerging in this area.

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Efficient use of human capital - European strategies

In order to improve spatial, occupational and qualification mobility of employees, EU member states take joint action, including, among others, within the framework of the European Employment Strategy. Preparing employees for a "better" entry into the labour market is related both to increased competitiveness of EU companies and joint efforts in the fight against unemployment. After all, there is a common goal to be achieved, i.e. to make the use of human capital in the European labour market more effective. The basis for the creation of the European Employment Strategy was the formulation of the so-called White Paper guidelines in 1994 - "Growth, Competitiveness, Employment" - on how to help people seeking employment. As a result of discussion related to these issues, a new document was created, "Employment", this time as part of the Treaty of Amsterdam, thus providing the legal basis for a more engaged role of the EU in shaping the employment policy. Finally, in 1997, at the Luxembourg Summit, Government Heads of EU member states launched the European Employment Strategy (EES), also known as the "Luxembourg Process", by adopting the main employment guidelines and focusing primarily on preventive actions. The EES was based on four key pillars: employability of jobseekers, entrepreneurship, adaptability of companies and employees in a changing environment, and equal opportunities in the labour market (women - men, people with disabilities, migrants, etc.) (Szymańska, 2004, p. 4).

As part of a strategy to improve job seekers' employment opportunities, the focus was primarily on assistance targeted at young and unemployed adults, with such support being offered to young people - up to 6 months (training, retraining, internships and employment), and adults - up to 12 months (further vocational improvement and guidance). In pursuit of these goals, focus should be given to strengthening cooperation between the government, employers and employee organisations, and working out agreements that would enable the target group to participate in practical and vocational training, internships, etc. As a result, assistance could be offered to at least every fifth unemployed individual, and the number of school dropouts could be reduced. Another pillar of this strategy is related to the development of entrepreneurship – i.e. supporting people who set up their own businesses and create new jobs. The purpose is to concentrate on activities aimed to improve the process of setting up and running economic activity, by simplifying the relevant procedures, reducing taxes and costs which are not salary-related, and making use of volunteering and social cooperation. As for the third pillar - adaptability, the strategy focuses here on flexible working arrangements in cooperation with social partners and encouraging participation in training. The last pillar of the strategy is the equalisation of opportunities in the labour market by improving, among others, activation of women or people with disabilities. This could be achieved by offering, for example, support in taking care of children or the elderly, or flexible working hours (Szymańska, 2004, p. 5-6).

In 2000, the European Council developed the Lisbon Strategy - a long-term programme for the socio-economic development of Member States. The objective of this strategy was to create a dynamically developing knowledge-based world economy, aiming at full employment and building an information society.

The employment policy of the individual Member States is coordinated by the European Council and involves defining priority objectives for the implementation of employment policy in the EU Member States, on an annual basis, as well as implementing the National Action Plans, monitoring the situation on the basis of the Joint Employment

Report (performance indicators, formulating new guidelines and recommendations to be implemented taking into account the specificity of the country concerned) (Funck, Pizzati, 2002, p. 315).

In mid-2009, work on the Europe 2020 strategy was launched. It is an EU programme aimed at growth and socio-economic development in connection with the global economic crisis, globalisation, the aging of society and the need for reasonable management of resources. This strategy should contribute to the creation of a world-wide low-carbon economy using environmentally-friendly technologies while ensuring careful use of natural resources in order to create new green jobs and enhance social cohesion. Unlike the Lisbon Strategy, Europe 2020 emphasises additionally the need for sustainable development. Three key priorities were adopted within the framework of Europe 2020: smart growth (economy based on knowledge and innovation through development and improved quality of education and R&D spending), sustainable growth (resource-efficient economy + modern technologies + environmental protection + new jobs), and inclusive growth (high-employment economy, vocational activation and social inclusion) (GUS (Central Statistical Office) 2014, p. 70).

Trends and challenges in the European labour market

The labour market is influenced by a number of factors, including: economic, social, cultural, technological and political (Męcina, 2013, p. 3). These are the main determinants of dynamic and often difficult-to-predict changes on the European labour market. According to the European Commission, such key factors also include the process of European and international economic integration, the development of new technologies (information and communication), aging population, low employment and high long-term unemployment rates, and the development of segmentation in the labour markets (insiders – protected employees, and outsiders – unprotected employees). The European Commission also points to five key issues in the employment and social areas of Member States. These issues include: rising unemployment rates; the increasing percentage of young people out of school, employment and training; the decline in household incomes; the increasing risk of poverty among people in the productive age; and the increase in inequality in the labour market (Frączek, 2014, p. 106-107).

The labour market in the European Union is very heterogeneous, which is due to the varying dynamics of the economic development of individual Member States (Kacprzak, 2014), the applied models of public policy, and the previously mentioned demographic, cultural and social factors. Undoubtedly, in the coming years, the shape of the EU labour market will be influenced by many different factors. First of all, we should mention structural changes, which are currently being implemented, related to deindustrialisation, increasing employment in the service sector and privatisation of enterprises. Moreover, technological and scientific progress also affects the shape of the EU labour market. Technological changes, such as computerisation and digitalisation, are undoubtedly reflected in the specific character of work of today's businesses, including increased competency requirements, employment reduction, and methods of recruitment of employees and evaluation of their competencies. High volatility, increasing unpredictability and randomness is also noticeable on the labour market. Increased vulnerability and susceptibility to unemployment can be observed as well. The increasing problems related to

inequality in the labour market (women-men, younger-older, skilled-unskilled, disabled, migrants, differences in income...), population aging and migration of human capital (outflow of specialists, excess or shortage of employees in particular industries, sectors and professions) are the next challenges that need to be addressed in the implementation of the European Union's employment policy (Frączek, 2014, p. 123-124).

Another important issue is the need and ability to adapt and work in multicultural environments and the related increase in the importance of cultural competence of employees in the European labour market. There are clear signs of growth and improvement of professional activity of women and people with disabilities. In the area of employment of migrants, aggravating problems can also be observed. In the European labour market, there may be potential problems attributable to employers' awareness of hiring foreigners (fear of complicated formalities, communication problems, conflicts associated with cultural differences, etc.). There is also a risk of reverse class mobility (increase in social status in the migrant's home country and degradation in the host country), difficulties in transferability of experience acquired abroad (partial, severe, very severe), mobility of specialists in the European labour market (brain exchange, brain drain and brain waste.)

There is also a real need to change the orientation of employment and labour market policies based on the use of public co-management mechanisms (Frączek, 2014, p. 124).

Human capital - forecasts and demand

In 1975, the European Centre for the Development of Vocational Training (Cedefop) was established in Thessaloniki. It is a European Union organisation dedicated to promoting the development of education and vocational training in the EU. It is engaged in conducting regular research on forward-looking trends in the European labour market. According to its forecasts, by 2020, the demand for specialists (engineers, scientists and healthcare experts) and medium technical staff will increase. A significant decrease is forecast for the agricultural, mining, fisheries and crafts sectors, whereas growth is anticipated in the business and services sector (welfare, personal services, healthcare, catering, hospitality services and distribution - by more than 14 million) and public services (by more than 5 million). During this period, about 20 million new jobs could be created, while approx. 80 million will be vacated by retirees. At the same time, the statistics show a decrease, by approx. 6 million, in the number of people in working age (15-64 years), and an increase in the population aged 45+, which is linked to the phenomenon of aging society and indicative of a significant problem that may arise, namely, deficiency of employees in the European labour market (Łazarz, 2011, p. 55-57).

According to the forecasts, in the coming years, there will be further changes in the nature, i.e. profile, of the workplace and the work organisation itself. In addition, further increase in the activity of women, youth and people with disabilities in the labour market is to be observed, and the working conditions provided by employers are to be better adapted to their needs. A further gradual increase in self-employment is also anticipated. International experience, cultural awareness, communication skills, adaptability and coping skills will be increasingly important in shaping and developing human capital. From the point of view of both the labour market and employers in the EU, key employee competencies reflecting global trends (including, among others, environmental and health

protection, climate-related aspects) can be identified. The following types of competencies can be distinguished: cultural and social competences, such as intercultural skills, teamwork, personal development planning, entrepreneurship and innovation; technical competencies including, for example, ICT skills at user and expert level, skills and knowledge related to new processes and products emerging in the market; skills related to health, climate and sustainable development; skills related to operating, assembling and repairing machines; and management skills - intercultural management in an international environment, as well as management of the international value chain, international finance and sustainable development (implementation and management of policies, solutions/projects which are climate- and environmentally-friendly (Kacprzak, Król, 2015, p. 41).

In the European labour market, the appreciated and desired competencies, as mentioned before, are innovation competencies, manifested above all by awareness of the need for, and skills in regular, lifelong learning, as well as awareness, ability and willingness to initiate and implement changes, and to create, implement and adapt innovations. In addition, what is noticeable about such an employee, is the easiness in accepting even the most unexpected changes coming from the environment and a high degree of susceptibility to external factors that determine such attitudes and behaviours (Król, 2017, p. 42).

A desired competence profile of migrants can be also identified from the employer perspective. It should include such features as experience, creativity, innovative approach, flexibility, mobility, openness to others, cultural and interpersonal competence, as well as communication skills in at least one foreign language.

According to the data held by the European Commission, every ninth specialist who decides to work in his/her profession within the EU, but outside his/her place of residence, is a Polish citizen (Kukliński, 2015).

Quality and development of human capital in the European perspective

When looking at human capital as an indicator of the position of a person in the labour market, the following dependencies can be observed: the higher the level of human capital, the more certain the position of an individual on the labour market. This idea seems to be equally well expressed in the definition proposed by H. Król and A. Ludwiczyński, which defines human capital as the knowledge, skills, capabilities and potential for development and introduction of innovations, demonstrated by people working in the company. It is also the human factor in an organisation, i.e. the combination of intelligence, skills and expertise, which gives the organisation its specific character (Król, Ludwiczyński, 2006, p.116-117).

The creation of human capital and its quality are largely dependent on the healthcare system, education and employment policy, both at a national and international level. The EU is making efforts towards a dynamically developing knowledge-based world economy, centred around a society focused on lifelong learning. The EU strategies, and measures implemented within their framework, focus mainly on investing in R&D, education and training. There is no uniform European education model and the Member States are able to create it at their own discretion, on the basis of the European Commission's guidelines and

financial support from the EU. The Member States, signatories of the Bologna Declaration (19.06.1999), agreed to take measures in order to establish the European Higher Education Area, which would greatly facilitate the comparability, compatibility and coherence of European programmes (staff exchange, student mobility, comparability of competences). Poland also became involved in the implementation of these solutions, among others, by introducing a Diploma Supplement, the European Credit Transfer System, the Qualification Framework; establishing the Polish Accreditation Committee; or joining the Erasmus Student Exchange Programme (Pomianek, 2011, p. 87).

There are some clear trends in European education, including, among others, increased number of children in pre-school education, increased number of students in higher education, a gradual increase of interest in scientific and technological faculties, a widespread and systematic evaluation of the quality of education, the disappearance of differences in access to new technologies, computers and the internet, the promotion of the concept of lifelong learning), and creation of Third-Age Universities at higher education facilities (Pomianek, 2011, p. 88-89). In the face of development of the private education market, an important challenge is to ensure the same level and quality of education as in public institutions.

Table 1. EU internship and vocational training programmes

PROGRAMME	TARGET GROUP	IMPLEMENTED FORM(S)
ERASMUS+	school students, graduates of vocational training institutions, university students, lecturers	practical training, internships, co-financing of trips
LEONARDO DA VINCI	vocational school students, unemployed, youth, people entering the labour market	overseas practical training
CEEPUS	Cooperation between universities in Central European countries	e.g. overseas internships, one-semester programmes of study, language courses
VULCANUS – practical training programmes, Japan	for engineering and science students from the EU Member States	industrial practical training in Japan
eTwinning	Young people aged 3-19	Electronic media – it encourages to explore and use information and communication technologies (ICTs)
ORGANISATIONS	**TARGET GROUP**	**IMPLEMENTED FORM(S)**
AISEC a non-governmental student organisation	Youth	AISEC a non-governmental student organisation run by students Youth development and management of projects (marketing, information technology, intercultural education, etc.), overseas practical training, participation in international conferences
AMICUS	public institutions, non-governmental organisations - youth volunteering as the basis	attempt to evaluate European cooperation projects - civil service, volunteering

Source: Authors' own elaboration.

Other important measures, aimed at improving the quality of human capital and its development, include establishment of international R&D collaboration between universities and companies. This is an opportunity for students to gain experience (internships, practical training, volunteering) and develop their practical skills. EU institutions, such as the European Commission, the Council of the European Union, the European Parliament and the European Court of Justice, also provide opportunities for practical and vocational training. For example, the European Commission regularly organises internships, with duration of 3 to 5 months, for holders of Bachelor or Bachelor in Engineering degrees, and very good knowledge of an EU foreign language (English, French or German) and another language from a different Member State (Pomianek, 2011, p. 52-54).

Several practical and vocational training / internship programmes are available in EU companies and non-governmental organisations, as detailed in Table 1.

EU programmes are also of great importance for the development and quality of human capital. Examples of such programmes implemented in Poland include, among others, the Operational Programme: Human Capital (OP HC) 2007-2013, one of the key programmes financed from the European Funds. It has enabled NGOs, entrepreneurs, labour market institutions, as well as local and central government administration to implement a number of projects on a fairly large scale, thus improving competences of employees and individuals involved in economic activity, activating the unemployed in a difficult situation, facing the threat of social exclusion, and facilitating the procedure for setting up your own business.

On 17 December 2014, the European Commission approved the Operational Programme: Knowledge Education Development (OP KED) 2014-2020. The programme covers six priorities - young people on the labour market, effective public policies for the labour market, economy and education, higher education for the economy and development, social innovation and transnational cooperation, health support and technical assistance. The budget of the OP KED comprises EUR 4.4 billion from the European Social Fund, and EUR 252.4 million from the dedicated budget line of the youth employment initiative. (www.kapitalludzki.gov.pl)

Summary

Human capital was also affected by the worldwide globalisation and integration processes which resulted in the creation of the European Union. Today, it is difficult to predict what new challenges and problems we will have to face, however, by investing in human capital, it will be possible to find a quick solution in any difficult situation. Atypical situations require unconventional thinking and action, hence the particular importance of employee competence in the area of creativity and innovation (Król, 2017, p. 36).

EU Member States recognise the essence and role of human capital in the growth and socio-economic development of countries. Therefore, they undertake a number of joint actions as part of different strategies, the objective of which is to make the use of human capital more effective. For many people, the open European labour market has become an opportunity to pursue a career, or an opportunity to improve their social status and standard of living. However, this has also led to a number of problems and conflicts, especially in connection with the migration of human capital. For most of us, working and learning in a

multicultural environment has become commonplace. There is an actual need to further define employment, education and training policies and modify labour markets, not only in individual countries, but also at the Community (EU) level. Undoubtedly, the solutions implemented so far have already brought some visible and measurable benefits. Such solutions include, for example, the aforementioned programmes of international exchange of lecturers and students, strengthening of international cooperation in the field of R&D, or some very successful projects implemented within the framework of the OP HC (Operational Programme: Human Capital) and OP KED (Operational Programme: Knowledge, Education Development).

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Functioning of "Organics Cluster" in the French National and Regional Market of Organic Food

Abstract. The main aim of this study is to identify a model organic food cluster situated on the territory of a selected European Union country and its operation effects. In the first part of the study a selected food market of France is characterized as a reference point of further analyses and studies. The data was obtained from French domestic reports which cover years 2007-2016. Dynamics of changes has been defined as well as the trends characteristic of the analyzed period. The method of least squares has been used. Moreover, a definition and the importance of clusters has been presented on the basis of the literature of that topic. The part of the study includes a description of functioning of a selected French organic food cluster is described and evaluated. The method of case study has been used. It has been found that in 2007-2016 the eco-sector in France has developed significantly. A distinctly rising linear trend in the number of organic farms, ecological companies, ecologically cultivated land, the size of the market and degree of French people's knowledge of organic food labels has been reported for the eco-branch in France. As many as 112 projects have been implemented in the analyzed cluster. Those projects involved innovative and export undertakings which allowed to achieve a competitive advantage on the domestic market and even abroad. Positive effects also include possibility of experience exchange and financial support particularly important for young entrepreneurs.

Key words: cluster, organic food, organic farming, organic market, integration, France

JEL Classification: Q13, Q17, M31

Introduction

In literature there are many definitions of clusters (Kacprzak, 2014). According to the most popular definition of Porter (2001) it is: "geographical concentration of interrelated companies, specialist suppliers, service providers, companies and organizations of related sectors (for example universities, normalization committees and trade associations) in particular areas, competing with each other though cooperating at the same time". According to the definition a cluster needs to fulfill the following three conditions: Concentration of organizations functioning within the same or related sectors in a specific area, interaction of these organizations and existence of vertical and horizontal bonds connecting the cooperating parties (Duczmala, Potwory, 2010). It is estimated that in Poland there are only few ecological agri-food clusters and sometimes they end up unsuccessfully. Low dynamics of integration activities applies to all Polish agriculture (Prus, 2006, 2008), both conventional and organic. Clustering takes only a little advantage of the potential of the Polish ecological agriculture (Kacprzak, 2014). Therefore, it is good

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to look for positive examples in other countries. Such an example could be used as a point of reference for Polish organizations as part of e.g. the benchmark method, involving comparison of an organization with other companies successful in a given field, learning from them and taking advantage of their experiences to use them in practice (Loda, 2012). In Europe, most of the clusters are situated in the well developed countries of UE-15, among which France and Luxemburg have the best developed cluster oriented policy implemented at the domestic level (Pilarska, 2010). The number of clusters puts France in third place as compared to other European Union countries. Only Germany and Italy are higher in the ranking. The total number of 125 clusters are reported to be located in France (Pilarska, 2013).The main aim of this study is to identify a model organic food cluster functioning on the territory of a selected European Union country and its operation effects. The following part aims have been determined:

- presentation of the concept and importance of clusters,
- characteristics of the organic food market in a selected European Union country,
- identification of operation effects of a selected organic food cluster.

Research methods

Overview on the French Organic Market

In the first part of the study, the French market for organic food is characterized in order to provide a background for further research and analyses. The data come from French domestic reports from 2007-2016 (including reports provided by AgenceFrançaise pour le Développement et la Promotion de l'AgricultureBiologique). The dynamics of change and trends characteristic of this period have been defined on the basis of the obtained data. The method of the least squares was used in the study. Parameters of the trend function equation (linear, square) were determined by means of this method (using Excel 2007 Microsoft Office). As a study area, the Rodan-Alpian regional organic food market has been selected as case study (currently Overnia-Rodan-Alpian).

Literature review

In the second part of the study a general review on the definition and importance of clusters in the food sector is presented based on current literature.

Case study

The last part of the study focuses on the presentation and evaluation of the selected cluster. The method of case study analysis has been used. The selection case study area was done on multiple, step-wise approach. The first step involved choosing a country on the basis of size of the organic market. Initially, three countries from the top of the European ranking report 'The World of Organic Agriculture. Statistics and Emerging Trends 2017', were taken into consideration, that is, Germany, France and the UK (Willer, Lernound, 2017).

Next, in the second step the European Observatory of Clusters was used (www.clusterobservatory.eu). Initial selection of clusters was made according to the sector-based criterion – 'organic food'. It was found that most clusters, that is three, are located on the territory of France. On the basis of Innovation Clusters in Europe Report, a cluster located on the territory of a region characterized by the highest level of innovativeness and with the biggest number of strong clusters, as compared to other regions of France, was chosen for analysis. It is Rodan-Alpian (currently Overnia-Rodan-Alpian) region

(Innovation Clusters in Europe, 2013). It was also the cluster policy and the number of cluster structures that affected the choice of a cluster to be analyzed (Brodzicki, Szultka, 2002). Primary data on the selected cluster was obtained by using an online survey with the use of a measuring instrument – survey questionnaire addressed to the director of 'Organics Cluster', which was supplemented by secondary data from a website 'Organics Cluster'. The survey was carried out in 2017.

Characteristics of the organic food market in France

The organic food sector in France developed rapidly during the last few years. A constant growth in the number of organic farms, the area of ecological plant production and the number of entrepreneurs involved in the organic sector has been reported. At the end of 2016 the number of ecological food producers in France was 32 326 and in relation to 2007 it increased by 2.7 times (fig. 1). Most organic farms were established in 2010 (4158) and recently in 2016 (3442). The highest dynamics of change in relation to the previous year was observed in 2010 (by 25%). The share of the number of ecological farms in the total number of farms in France has also been constantly increasing and today it accounts for 7.27% (tab. 1) (Agence Bio, 2017A).

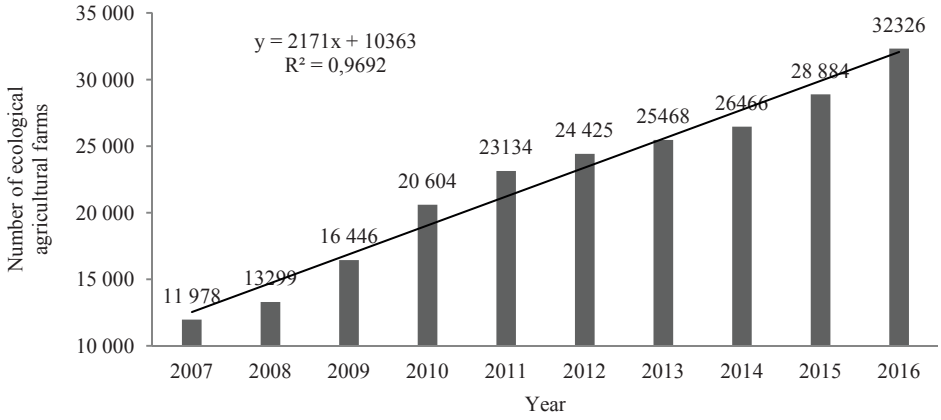

Fig. 1. Number of organic farms in France in 2007-2016

Source: own research according to Agence Bio/OC In: AgenceBio 2017.

The area of organic farmland has increased along with an increase in the number of organic food producers (fig. 1, fig. 2). In 2017 it is 1537000 ha and has grown as compared to 2007 by 953876 ha, that is 2.8 times. Between 2007-2016 the highest growth in relation to the previous year was observed for 2016 – by 214798 ha. The highest dynamics of change was observed in 2010 (by 25%). The share of organic farmland related to the agricultural usable area in France is 5.7 % (tab. 1) (Agence Bio, 2017A).

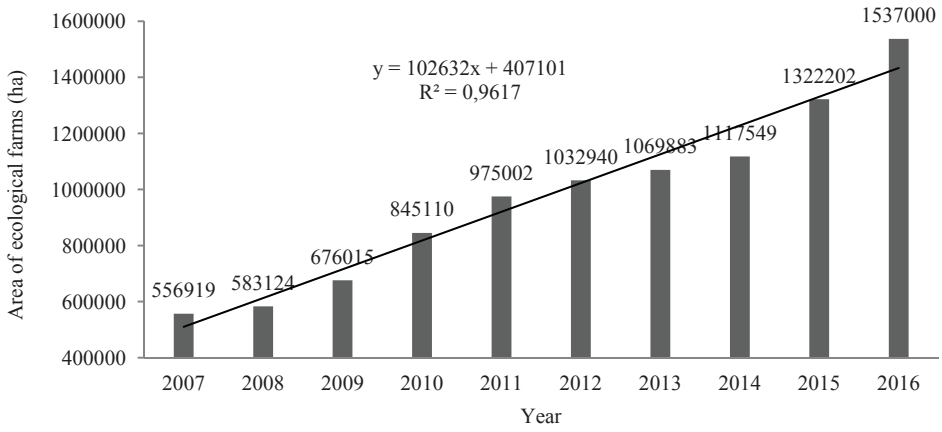

Fig. 2. The area of ecological farms in France, in 2007-2016

Source: own research according to Agence Bio/OC In: La bio change d'échelleenpreservantsesfondamentaux! Agence Bio 2017.

In 2016 the number of the processing companies in the organic sector (including manufacturing and trade, but excluding farms) was 14859 and increased in relation to 2007 by 2.3 times. Moreover, an analysis of data for 2007-2016 shows that the highest number of new business entities (1700) were registered in 2010. This year also features the highest dynamics of change as compared to the previous year, that is an increase by 19% (Agence Bio, 2017A).

In 2016, the largest group of all the registered businesses (14859) represented manufacturing companies (10 627, 71.52%), half of which accounted for companies involved in bakery, confectionery products and other cereal products (fig. 3).

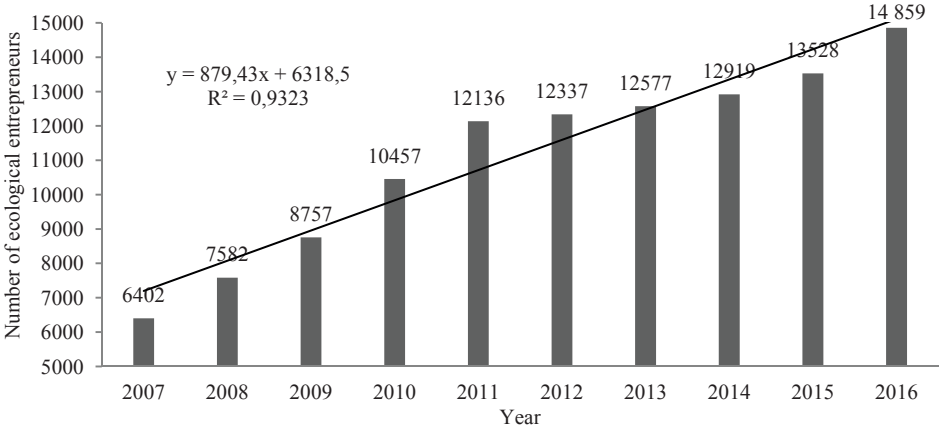

Fig. 3. Number of ecological entrepreneurs (manufacturing companies, trade companies, exporters and importers) in 2007-2016

Source: see fig. 2.

Table 1. Share of the number of farms and ecological croplands in France in 2007-2016

Year	Share of organic farms related to the total number of farms in France	Share of organic farmland related to total usable agricultural area
2007	2.11	2.03
2008	2.41	2.14
2009	3.07	2.48
2010	3.96	3.12
2011	4.58	3.60
2012	4.98	3.82
2013	5.34	3.96
2014	5.79	4.14
2015	6.50	4.91
2016	7.27	5.70

Source: see fig. 2.

In 2016 the general trade in organic food was 7 billion euro and was systematically increasing in the analyzed period (fig. 4) (Agence Bio/CSA, 2015). On the French market organic food is available in different sales channels. In 2015 the retail sale was prevailing and the sale of organic products in supermarkets (2 469 million euro), accounted for 42.87% of the total amount of organic food sold in France (in 2016, 3 024 million euro). However, the trade in organic products in specialist organic stores in 2015 was 2019 million euro which put this kind of sale in second place (35.06%). Direct sale was found to be the third significant point of sale (13.41%). Sale of organic products in bakeries was not of high importance (4.76%) and neither was the catering industry (3.91%). A change in the hierarchy of distribution channels importance was observed in the period analyzed. In 2007, still most of the sales were carried out through specialist distribution channels. From the following year and up to today, supermarkets became the most important outlet. The shares of the remaining distribution channels did not change (Agence Bio, 2017A; 2017B).

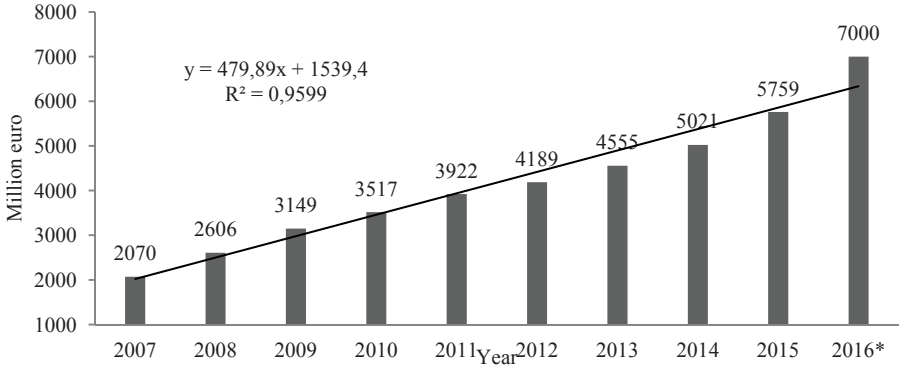

Fig. 4. The value of organic food sale in France in 2007-2016

Source: own research according to Baromètre de consommation et de perception des produitsbiologiquesen France 12ème édition – 1ère chase, Agence Bio/CSA.

According to the latest research almost 9 in 10 of French citizen (89%) state that they have eaten organic products during the last 12 months. The share of regular consumers who consume organic food at least once a month is constantly increasing and has reached 69% (Agence Bio, 2017A).

The French who consume organic food, mostly buy organic fruits and vegetables (78%). The next category of products which consumers choose are dairy products (71%). In addition, organic eggs are in high demand (65%), too. Slightly more than half of the French organic consumers choose cereal products (51%), whereas almost half of the respondents (49%) are interested in organic meat (poultry, beef, veal and pork, sausages and lamb) (Agence Bio, 2017A).

In France like in all European countries, organic food must be labeled with the EU-Organic label (Rozporządzenie Rady, 834/2007). Consumer awareness about this label is steadily growing though it still has not exceeded 50% of the respondents. Additionally, in France there is a national labelling for organic agriculture (AB), which is facultative (fig. 5). Knowledge of this labelling is common among French consumers (98%) (Agence Bio/CSA, 2015).

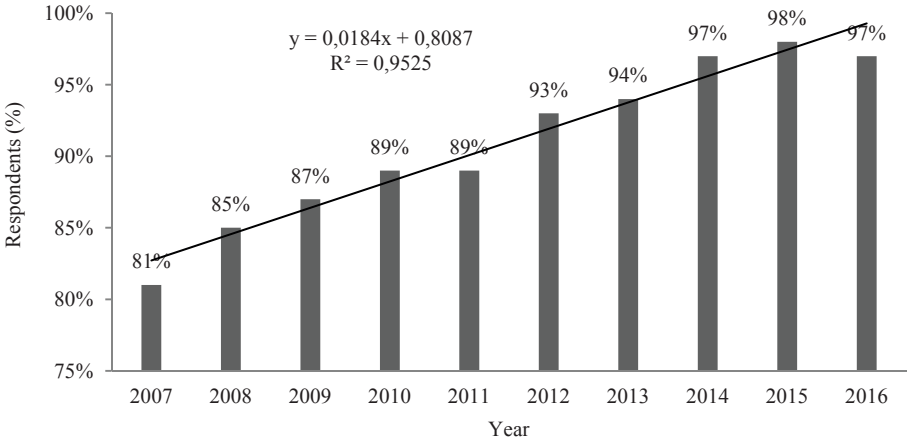

Fig. 5. Familiarity of French consumers with the national labelling AB (Agriculture biologique) 2007-2016 (% respondents)

Source: Own research according to Baromètre de consommation et de perception des produitsbiologiquesen France *12ème édition – 1ère chase, Agence Bio/CSA. S.20,* Le marche de la bio en France(2017). AgenceFrançaise pour le Développement et la Promotion de L'agricultureBiologique, 2017.

A linear trend in foundation of number and area of organic farms, number of organic entrepreneurs, size of organic food sale with distinct upward tendency was observed in this period. The value of determination coefficients indicated good consistence of the determined trend lines with empirical data (R^2 from 0,932 to 0,969).

Importance of clusters

Literature provides a number of benefits connected with participation in a cluster. Seven areas of benefits have been defined as well as their specificity resulting from the

cluster functioning. These areas include: economic cooperation, innovations and technology, policy of authorities, cluster expansion, research and network creation, cooperation with institutions, education and training. Possibilities of using partners' experiences, access to high quality services, strengthening position in relation to suppliers and customers, possibility to obtain the benefit of specialization have been listed as components of the area of economic cooperation. The following subarea were assigned to the topic of innovation and technologies: diffusion of innovation within a cluster, combining financial means for investments, facilitating introduction of new technical solutions, determination of technical standards and introduction of innovation. Regarding the policy of authorities, the following factors determined: better cooperation with local authorities, supporting funds for public purposes, EU funds and cluster initiatives, infrastructure development, improvement in legislation. The next area of benefits is the expansion of clusters. This area involves creating a region brand, collective promotion of cluster products, presentation of cluster companies at fairs and exhibitions, promotion of the cluster companies, export, supporting expansion of the cluster companies on the domestic market, arrival of new cooperating companies, investigating new export markets. Benefits that are provided by the area "research and network creation" include: development of a network between companies and relations between people, submitting reports on the subject of clusters, improving awareness of companies on the subject of membership in clusters. As regards cooperation with other institutions, the following issues are focused on: significance of cooperation with experts and research centers, access to services offered by technological centers and to information about the market. The last area 'Education and trainings' includes access to specialist training courses in the field of technology, management, the adjustment of the educational system to the needs of the cluster participants and access to highly qualified staff (Plawgo, Klimczuk, 2009).

Case – Study - Characteristics of the French „OrganicsCluster" (Overnia – RodanAlps)

The cluster named "Organics Cluster" has existed in France since 2011. It is situated in the Rodan-Alpian region (currently Overnia – Rodan Alps). This region is characterized by a high level of innovation and well developed clusters as compared to the region of Europe. It is also the leader in the sector of organic products in France. This is reflected by the fact that the region is known as the French region with the largest number of organic farms as many as 2968 organic farms in its area. Organic processing is well developed as well, in the region in early 1053 organic processors exist. Distribution of organic products puts the analyzed region in second place of the rankings in whole France. According to statistics (Organic cluster, 2017), there are 317 specialist organic stores and 251 wholesale stores which offer organic products in their assortment. The purpose of a newly founded cluster is to strengthen the region and improve its competitiveness. According to the surveyed director, this goal is being pursued, "Organics Cluster" contributes to the development of the region and protection of the natural environment.

The cluster operation is organized as an association. 170 business entities make up the cluster and the number of its members is constantly increasing, as compared to 2012, when it was almost 3 times smaller (60 entities). Among cooperating organizations there are organic farms, food production companies as well as companies producing organic

cosmetics and cleaning supplies. Such a differentiation of members, according to the director, is of unique character on a world scale. According to the director the major advantages of the 'Organics Cluster" include reception of regional support by the cluster members in order to use it for commercialization of products, innovation, and marketing on a national level and in the region, use of (exclusively) market research concerning organic products, access to the network by young entrepreneurs, making implementation of innovation subsequently easier and exchange of experiences. No disadvantages of the cluster were mentioned by the director.

The cluster has received public support for its functioning in the amount of 1 million euro from regional funds for SMEs (small and medium companies).

The major goals of a cluster include (Organic cluster, 2017):

- information – providing information to enable businesses to be competitive on the market,
- supporting businesses through organization of training courses (training in marketing, export, innovation),
- consolidation to improve efficiency (combining e.g. trade functions, common exhibitions, promotion e.g.)

Implementation of 112 projects as part of innovative (Bio'Innov) and export (Bio'Innov) actions was considered to be the most important outcome of the cluster. The projects were connected, among others, with promotion of organic projects (15 participating firms), providing firms with support to develop distribution channels and create environment friendly packaging (85 firms), organization of economic mission to Germany (8 firms) and creation of shared stalls e.g. in Dubai (6 firms). Additionally, 35 new solutions have been prepared to be later used by 180 companies (Organics Cluster en Rhône-Alpes, 2017). According to literature, well-functioning clusters are conductive to innovation and its diffusion, due to which the cluster members gain competitive advantage on the domestic market and even abroad (Figiel Kuberska., Kufer, 2014). The analyzed cluster is an example of such a situation.

A brand was created with graphics and word content referring to the geographic region and the bio-industry to promote the cluster (fig.6). Recently a regional brand has also been created as organic products (fig. 6) (Organic cluster, 2017).

A B

Fig. 6. Brand Organics Cluster in France (A) and Regional organic brand (B)

Source: http://www.organics-cluster.com/, http://www.organics-cluster.com/hotline/charte-bio-rhone-alpes-developpement-secteur-produits-biologiques/.

Organics cluster has also undertaken international cooperation as part of Inter – cluster organic, together with Aegean University, Aegean Organization of Exporters, Association of Organic Agriculture from Turkey, EkoConnect Organization from Germany, Organization for Organic Products from Greece, and in result of this the following projects have been implemented:

- Creation of an online platform to facilitate cooperation (for farmers, manufacturers, traders, associations, higher education schools and other organizations connected with the organic food market);
- Development of a system enabling comparison of processing of organic products with conventional ones;
- Preparation of an online platform for the sale of products;
- Selection and presentation of model examples of organic production and cooperation of businesses in the region.

So far five workshops have been organized in Turkey, Germany, France and Greece in order to provide the public with information on the effects of cooperation, a number of brochures have been published in English, French, German and Turkish as well as catalogues and posters (Inter-Cluster Organics, Developing European Inter-Cluster, 2012). Creation of a network of clusters is one of the latest market trends (Figiel, Kuberska, Kufel, 2014).

Conclusion

According to many authors this is the lack of intergration between the production and distribution chain links of organic products that is an obstacle in the development of the organic food market in Poland (Zuba, 2012).

Clusters are one form of possible integration for organic market users. Today integration is forced by market processes, globalization and constantly increasing market competition. The analyzed Organics-cluster in France is developing rapidly which proves its being successful. It needs to be mentioned that its organic farm-members have produced many positive outcomes, have taken advantage of the region support for commercialization, innovative and marketing actions on the territory of France and the region, the results of exclusive market research, easier (especially for young entrepreneurs) innovation implementation, and experience exchange. It was found that the total number of innovation and export related projects implemented in the selected cluster was 112. Thanks to them the cluster members can gain competitive advanatages on the domestic market and even abroad.

The presented Organic cluster can be a reference model of possible integration of the organic food market users worth following by the Polish organic food branch.

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Changes in Consumer Food Preferences in EU Countries from 2001-2013

Abstract. This paper attempts to rank EU countries according to changes in consumer food preferences between 2001 and 2013. The size of these changes was determined using a synthetic rate created for this purpose. This rate was intended to accommodate changes in consumption levels in 9 product groups per capita. It turns out that we may use the greatest possible measure of the structure's dissimilarity as an analogy to the Gini coefficient, to express this rate. Using the "ar" measure to compare structures of food consumption in two separate three-year time periods for each country, scientists may rank and group the countries according to the value of changes in consumer food preferences.

Key words: dissimilarity of structures, synthetic rate, ranking, multidimensional data analysis, grade data analysis, consumer food preferences, EU

JEL Classification: C01, C18, Q10

Introduction

Consumer food preferences are an important indicator for agricultural production, especially when it comes to finding new markets. Obviously, these preferences are modified in the long run. However, due to geographical, climatic, cultural and other conditions these changes will not proceed diametrically. But, undoubtedly, consumption of various food products is changing in each country as borders open up, as in the case of countries that joined the European Union, or due to increased nutritional awareness of consumers (Małysa-Kaleta, 2003). For example, in Poland after 1990, there was an increase in the diversity of food consumption (Grzelak, Gałązka, 2013) whereas research in the Mediterranean countries indicates a gradual resignation from traditional food in this region (Balanza et al., 2007). This paper attempts to analyze the total changes in consumer food preferences in EU countries between 2001 and 2013. To avoid listing individual product groups, one approach applied to this issue may be to compare structural profiles in two extreme time periods for each country and to build a synthetic rate that will definitely determine the value of these changes. Thus, the aim of the study is to rank the EU countries according to the value of changes in consumption of different group of food products in EU countries between 2001 and 2013 and to divide countries into groups according to similar level of changes in food consumption over the years.

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The study used data in kg per capita on the consumed products in each country. The data came from the United Nations Food and Agriculture Organization (FAO) (www.fao.org). There is also information on the annual consumption of food products in the European Union between 2001 and 2013, divided into 14 product groups. To clarify obtained results some of the groups were excluded and some were combined. However, this did not affect the reliability of the study. Thus, 9 different variables were identified: x_1 - Cereals - without beer, x_2 - Sugar and sweeteners, x_3 - Legumes and vegetables, x_4 - Fruits - without wine, x_5 - Meat and offal, x_6 - Milk without butter, x_7 – Eggs, x_8 - Fish and seafood, x_9 - Potatoes and potato products.

The methods and tools used in this study are techniques of Multidimensional Data Analysis and Grade Data Analysis. The averages of variables from three consecutive years of two separate periods (years 2001-2003 and 2011-2013) were used in the comparative study. Then, one of the synthetic rates was used, which considered consumption levels in the product groups counted per capita. Calculation of this rate was based on the "ar" measure used for measuring the differentiation of two structures (Gastwirth, 1971; Arnold, 1987; Binderman et al., 2014).

Certain problems related to measuring the dissimilarity of two structures

First of all, since the structures of particular product groups will be compared in two separate three-year periods, we need to specify some problems related to the measurement of the structures' dissimilarity.

Regarding the measure of structure similarity, many proposals may be found in the literature, one of which seems to be especially popular – "Minkowski Metric" (Zimmermann, 1968; Jain, Dubes, 1988; Binderman et al., 2013; De Amorim, Mirkin, 2012). For example, if we have two structures: **X** and **Y**,

where: $x_i \geq 0$, $\sum_{i=1}^{n} x_i = 1$, $y_i \geq 0$, $\sum_{i=1}^{n} y_i = 1$

Minkowski Metric of order p between two points has the following formula:

$$d(\mathbf{X},\mathbf{Y}) = \left(\sum_{i=1}^{n} |x_i - y_i|^p \right)^{\frac{1}{p}} \tag{1}$$

It meets 2 conditions:

1. The distance d between objects of the same structure is equal to 0, so: $d(x,x) = 0$;
2. The distance between object Y and object X is the same as between X and Y and is not less than 0, so: $d(x,y) = d(y,x) \geq 0$.

Sometimes there may be doubt about the fulfillment of the third condition by the structures' dissimilarity rate (it is easy to explain by referring to the concentration measurement) (Zimmermann,1968):

3. The distance measure changes according to the assumed "transfer sensitivity" in the concentration rates, where the increase of the dissimilarity coefficient with the constant transfer rate (ϵ) is the greater, the "richer" the transfer object is:

$$\bigwedge_{n\geq k>j>i\geq 1} d\left(x, x_{ij,\varepsilon}\right) \leq d\left(x, x_{ik,\varepsilon}\right) \tag{2}$$

where: $x = \left(x_1, \ldots, x_i, \ldots, x_j, \ldots, x_k, \ldots, x_n\right)$

$x_{ij,\varepsilon} = \left(x_1, \ldots, x_i - \varepsilon, \ldots, x_j + \varepsilon, \ldots, x_k, \ldots x_n\right)$

$x_{ik,\varepsilon} = \left(x_1, \ldots, x_i - \varepsilon, \ldots, x_j, \ldots, x_k + \varepsilon, \ldots x_n\right)$

In this study, this postulate will be relevant, but it will not be exactly used in this sense (but studies in which the transfer of consumption in relation to time for particular groups of products is important and are also possible).

Building the dissimilarity rate of structures that fail to meet the third condition may be based on the concentration rate, e.g.: G - Gini coefficient (3), which is doubled in area (P_A) between the diagonal of the square representing the egalitarian distribution, and the Lorentz curve – f(t) (Fig. 1) (Gini, 1914; Glasser ,1962; Gastwirth, 1971; Arnold,1987):

$$G = 2 \cdot P_A = 1 - 2 \cdot \int_0^1 f(t)dt \tag{3}$$

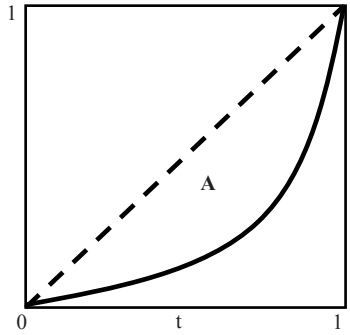

Fig. 1. Lorenz curve – explanatory figure

Source: Authors' own elaboration.

By analogy with the Lorenz curve, the dissimilarity of the Y-structure to the X-structure may be presented as a broken line joining some points. These points have coordinates being, in this case, the subsequent cumulative structures (Binderman et al., 2014; Koszela, 2016):

$$(0;0), (x_1, y_1), (x_1 + x_2; y_1 + y_2), \ldots, (x_1 + \ldots + x_n; y_1 + \ldots + y_n) \tag{4}$$

For example, we may compare structures of product groups (w) that are part of the annual consumer consumption in Denmark and in Poland in years 2011-2013 (Table 1).

If we join vertices of corresponding cumulative structures of components included in annual consumer consumption of concerned countries, we obtain the desired L1 (Fig. 2) and we are able to determine the structural dissimilarity for Poland and Denmark.

Table 1. Average annual consumption of product groups in kg/person and their structures for Denmark (DK) and Poland (PL) in years 2011-2013

	Denmark (DK)			Poland (PL)		
2011-2013	kg/pers	% (w_{DK})	w_{DK} cum.	kg/pers	% (w_{PL})	w_{PL} cum.
x1	134.03	15.44%	15.44%	151.36	19.35%	19.35%
x2	54.73	6.30%	21.74%	44.19	5.65%	25.00%
x3	113.21	13.04%	34.78%	120.96	15.46%	40.46%
x4	115.18	13.27%	48.05%	57.22	7.32%	47.78%
x5	83.93	9.67%	57.72%	78.81	10.08%	57.86%
x6	267.83	30.85%	88.57%	201.30	25.73%	83.59%
x7	15.26	1.76%	90.32%	8.14	1.04%	84.63%
x8	23.00	2.65%	92.97%	10.20	1.30%	85.93%
x9	61.00	7.03%	100.00%	110.02	14.07%	100.00%
Total	868.17	100.00%		782.19	100.00%	

Source: Authors' own elaboration.

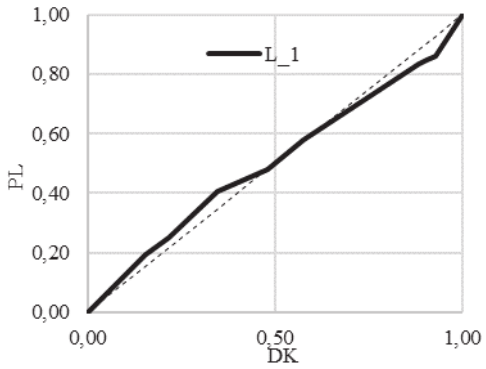

Fig.2. Curve of cumulative structures for Denmark and Poland (2011-2013)

Source: Authors' own elaboration.

The dissimilarity measure of the structure **Y** to the structure **X**, also by analogy, but this time with the Gini coefficient, is the "ar" measure (5) (Gastwirth, 1971; Arnold, 1987; Binderman, 2014). In his case C(t) is an analogy for f(t) in formula (3).

$$\mathrm{ar}(\mathbf{Y}:\mathbf{X}) = \mathrm{ar}\left(C_{[\mathbf{Y}:\mathbf{X}]}\right) = 1 - 2\int_0^1 C_{[\mathbf{Y}:\mathbf{X}]}(t)\,dt \tag{5}$$

$$\text{for L1}: ar(\mathbf{PL}:\mathbf{DK}) = ar\left(C_{[\mathbf{PL}:\mathbf{DK}]}\right) = -0.004$$

However, the value of the ar measure depends mainly on the arrangement of the individual features. Different features arrangement (Table 2) results in different curve (Fig 3 – compare L1 and L2) and different value of ar measure.

Table 2. Cumulative structures for Denmark and Poland for 2 different component arrangements (2011-2013)

L1			L2		
X	$w_{DK\ cum}$	$w_{PL\ cum}$	X	$w_{DK\ cum}$	$w_{PL\ cum}$
x_1	0.15	0.19	x_4	0.13	0.07
x_2	0.22	0.25	x_6	0.44	0.33
x_3	0.35	0.40	x_8	0.47	0.34
x_4	0.48	0.48	x_5	0.56	0.44
x_5	0.58	0.58	x_2	0.63	0.50
x_6	0.89	0.84	x_7	0.64	0.51
x_7	0.90	0.85	x_9	0.72	0.65
x_8	0.93	0.86	x_1	0.87	0.85
x_9	1.00	1.00	x_3	1.00	1.00

Source: Authors' own elaboration.

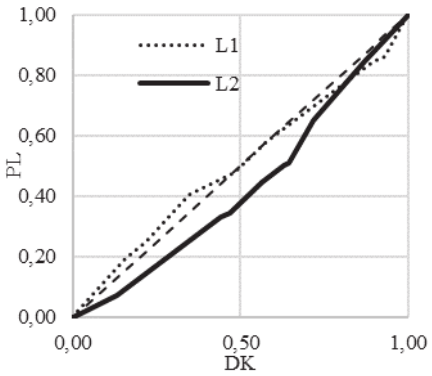

Fig.3. Curves of cumulative structures for Denmark and Poland for 2 different component arrangements (2011-2013)

Source: Authors' own elaboration.

$$\text{for L2}: ar(\mathbf{PL}:\mathbf{DK}) = ar(C_{[\mathbf{PL}:\mathbf{DK}]}) = 0.141$$

Since the value of ar dissimilarity measure depends on a curve (broken line), i.e. feature arrangement, it is worth considering how to get the greatest value of the dissimilarity of two structures. It turns out that when we put the components in a non-decreasing order in relation to the quotient of corresponding structures (Table 3), we will find the largest possible area of the figure bounded by the curve (Fig. 4 - L_{max}) and the diagonal of the square. It will give the greatest possible ar dissimilarity rate (in this case between Polish and Danish food consumers). This rate may be marked with ar_{max} (7) and since it always has a positive value, treat it as both a measure of dissimilarity and distance (Borkowski, Szczesny, 2005; Ząbkowski, Szczesny, 2012).

$$\mathrm{ar}_{\max}(\mathbf{Y}:\mathbf{X}) = \mathrm{ar}_{\max}\left(\mathrm{C}_{\max[\mathbf{Y}:\mathbf{X}]}\right) = 1 - 2\int_0^1 \mathrm{C}_{\max[\mathbf{Y}:\mathbf{X}]}(t)\mathrm{d}t \tag{7}$$

Table 3. Cumulative structures for Denmark and Poland to order components non-decreasingly in relation to the quotient of corresponding structures (2011-2013)

L max							
X	DK			PL			w_{PL}/w_{DK}
	kg/pers	% ($_{wDK}$)	$w_{DK\ cum.}$	kg/pers	% (w_{PL})	$w_{PL\ cum.}$	
x_8	23.00	2.65%	2.65%	10.20	1.30%	1.30%	0.4921
x_4	115.18	13.27%	15.92%	57.22	7.32%	8.62%	0.5514
x_7	15.26	1.76%	17.67%	8.14	1.04%	9.66%	0.5924
x_6	267.83	30.85%	48.52%	201.30	25.73%	35.39%	0.8342
x_2	54.73	6.30%	54.83%	44.19	5.65%	41.04%	0.8962
x_5	83.93	9.67%	64.50%	78.81	10.08%	51.12%	1.0422
x_3	113.21	13.04%	77.54%	120.96	15.46%	66.58%	1.1858
x_1	134.03	15.44%	92.97%	151.36	19.35%	85.93%	1.2535
x_9	61.00	7.03%	100.00%	110.02	14.07%	100.00%	2.0019
Total	868.17	100.00%		782.19	100.00%		

Source: Authors' own elaboration.

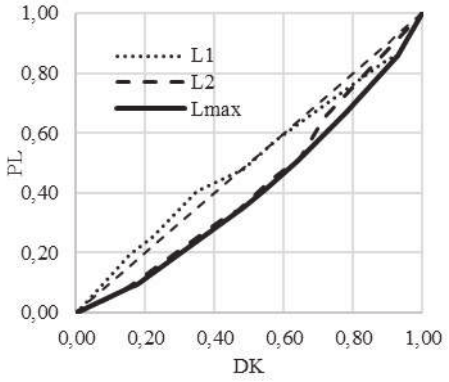

Fig. 4 Curves of cumulative structures for Denmark and Poland for 3 different component arrangements and (2011-2013)

Source: Authors' own elaboration.

The ar_{max} value, which is the measure of the greatest dissimilarity between Poland and Denmark in the period 2011-2013, to order the components non-decreasingly in relation to the quotient of corresponding structures, in this case is:

$$\text{for } L_{max} : ar_{max}(\mathbf{PL} : \mathbf{DK}) = 0.187$$

However, it raises a question: why may the ar_{max} measure sometimes be more useful to measure the structural dissimilarity (distances) of compared objects – in this case the structures of product group consumption in EU countries? We will use an example to explain this issue. We need to measure the dissimilarity of two theoretical objects P1 and P2 to another theoretical object P0. Table 4 shows sample structures in each product group for the compared objects.

Table 4. Theoretical data for sample objects P1 and P2 compared to another sample object P0

X	P0 % (w_{P0})	P1 % (w_{P1})	P2 % (w_{P2})
x_1	13.00%	**17.00%**	**15.00%**
x_2	7.00%	**3.00%**	**5.00%**
x_3	10.00%	10.00%	**8.00%**
x_4	10.00%	10.00%	**12.00%**
x_5	10.00%	10.00%	**12.00%**
x_6	30.00%	30.00%	**28.00%**
x_7	5.00%	5.00%	**3.00%**
x_8	5.00%	5.00%	**7.00%**
x_9	10.00%	10.00%	10.00%
Total	100.00%	100.00%	100.00%

Source: Authors' own elaboration.

It turns out that the structural dissimilarity rate of objects P1 and P2 to the object P0, defined, e.g. as Minkowski Metric in the Euclidean space (8), is identical despite the intuitively clear differences between the compared objects.

$$d(\mathbf{X},\mathbf{Y}) = \left(\sum_{i=1}^{n} |x_i - y_i|^2 \right)^{\frac{1}{2}} \tag{8}$$

$$d(\mathbf{P0},\mathbf{P1}) = 0.05657 \qquad d(\mathbf{P0},\mathbf{P2}) = 0.05657$$

When we order the components non-decreasingly in relation to the quotient of corresponding structures (Table 5) and use the ar_{max} measure (formula 7), the dissimilarity rates in both cases will be different.

Table 5. Theoretical data arranged non-decreasingly in relation to the quotient of corresponding structures for exemplary objects P1 and P2 compared to the exemplary object P0

X	P0 % (w_{P0})	P1 % (w_{P1})	X	P0 % (w_{P0})	P2 % (w_{P1})
x_2	7.00%	**3.00%**	x_7	5.00%	**3.00%**
x_6	30.00%	30.00%	x_2	7.00%	**5.00%**
x_8	5.00%	5.00%	x_3	10.00%	**8.00%**
x_4	10.00%	10.00%	x_6	30.00%	**28.00%**
x_5	10.00%	10.00%	x_9	10.00%	10.00%
x_3	10.00%	10.00%	x_1	13.00%	**15.00%**
x_9	10.00%	10.00%	x_5	10.00%	**12.00%**
x_7	5.00%	5.00%	x_4	10.00%	**12.00%**
x_1	13.00%	**17.00%**	x_8	5.00%	**7.00%**
Total	100%	100%	Total	100%	100%

Source: Authors' own elaboration.

As expected, object P1 is more similar to P0 than P2 because of the lower ar_{max} value:

$$ar_{\max}(\mathbf{P0}:\mathbf{P1}) = 0.072 \qquad ar_{\max}(\mathbf{P0}:\mathbf{P2}) = 0.108.$$

Results

To determine the significance of changes in consumer preferences, we may calculate the ar_{max} rate analogously by comparing the food consumption structures for individual EU countries in the two separate periods – 2001-2003 and 2011-2013. For example, for Poland, determining the value of these changes means calculating the ar_{max} value for relevant non-decreasing arrangement of the components in these two periods in relation to the quotient of corresponding structures (Table 6).

Table 6. Average annual consumption of product groups in kg/person, their structures and cumulative structures for Poland (PL) in years 2001-2003 (PL1) and 2011-2013

	PL1 (2001-2003)			PL2 (2011-2013)			w_{PL2}/w_{PL1}
X	kg/pers	% (w_{PL1})	$w_{PL1\ cum.}$	kg/pers	% (w_{PL2})	$w_{PL2\ cum.}$	
x_7	11.55	1.45%	1.45%	8.14	1.04%	1.04%	0.7181
x_9	130.55	16.39%	17.84%	110.02	14.07%	15.11%	0.8583
x_2	45.98	5.77%	23.61%	44.19	5.65%	20.76%	0.9790
x_3	123.67	15.52%	39.13%	120.96	15.46%	36.22%	0.9962
x_1	153.45	19.26%	58.39%	151.36	19.35%	55.57%	1.0047
x_6	195.97	24.60%	82.99%	201.30	25.73%	81.31%	1.0462
x_5	75.92	9.53%	92.52%	78.81	10.08%	91.38%	1.0573
x_8	9.04	1.13%	93.65%	10.20	1.30%	92.68%	1.1489
x_4	50.57	6.35%	100.00%	57.22	7.32%	100.00%	1.1526
Total	796.70	100.00%		782.19	100%		

Source: Authors' own elaboration.

In this case the ar_{max} dissimilarity rate indicating the value of changes in Polish consumers preferences over the 10-year period is:

$$ar_{\max}(\mathbf{PL1}:\mathbf{PL2}) = 0.04032.$$

Table 7 shows the ar_{max} dissimilarity rates for each EU country. They compare (as in the Polish example) the structure of food consumption in two extreme periods 2001-2003 and 2011-2013. Calculating the ar_{max} rates allows us to create a ranking that values countries where the changes were most important. If we treat the ar_{max} rates as synthetic rates Q_i describing the values of changes in a food consumption structure in years 2001-2013, we may divide these countries into groups. The method of distribution may be, e.g. quite clear division used by Professor Kukuła (Kukuła, 2010, 2012, 2014a, 2014b; Ząbkowski, Szczesny, 2012). After the arrangement of synthetic variable Q_i according to non-decreasing values (in this case $Q_i = ar_{max}$), we may calculate the range $R(Q_i)$ for this variable:

$$R(Q_i) = \max Q_i - \min Q_i = 0.18299.$$

If we decide to divide the objects into 3 groups, we need to determine the size of the division parameter k according to formula:

$$k = \frac{R(Q_i)}{3} = 0.06100$$

And then divide all objects into groups according to the following pattern:

Group 1 for: $Q_i \in (\max Q_i - k, \max Q_i]$ in our case (0,14351 , 0,20451]

Group 2 for: $Q_i \in (\max Q_i - 2k, \max Q_i - k]$ in our case (0,08251 , 0,14351]

Group 3 for: $Q_i \in (\max Q_i - 3k, \max Q_i - 2k]$ in our case (0,02151 , 0,08251]

Table 7. Ranking of the EU countries according to armax rate presenting the value of changes in food consumer preferences in two extreme periods 2001-2003 and 2011-2013.

Ranking	Country	$ar_{max} = Q_i$	Groups	Ranking - cont.	Country - cont.	$ar_{max} = Q_i$	Groups
1	HR	0.20451	1	15	FR	0.05783	
2	LT	0.12020		16	GR	0.05714	
3	BG	0.11824		17	NL	0.05589	
4	IE	0.10422	2	18	SE	0.05541	
5	ES	0.09261		19	SI	0.05435	
6	DK	0.08719		20	GB	0.05221	
7	SK	0.08434		21	RO	0.04766	3
8	EE	0.07820		22	PL	0.04302	
9	LU	0.07510		23	FI	0.03845	
10	LV	0.07508		24	PT	0.02971	
11	HU	0.07366	3	25	IT	0.02800	
12	AT	0.06258		26	CZ	0.02468	
13	MT	0.06059		27	DE	0.02152	
14	BE	0.05901			k	0.06100	

Source: Authors' own elaboration.

In the first group with the highest level of the investigated complex phenomenon, the biggest change in terms of nutritional preferences was found in Croatia. The second group with moderate nutritional preferences includes: Lithuania, Bulgaria, Ireland, Spain, Denmark and Slovakia and the third group, with the least significant changes, comprises of the rest of the EU countries (including Poland).

Summary

The method used in this paper to compare the consumption structures of different food product groups is one of many options for multidimensional analysis, but it is quite clear and produces quite good results as it is more sensitive to minor differences between the structures. The attempt to group European countries for food consumption in 1993 and 2000 was carried out with cluster analysis by Dudek and Orłowski (Dudek, Orłowski, 2006). However, despite changes in the consumption of food products in individual countries, the sets of countries in obtained concentrations in 2000 and 1993 were almost identical.

The results of this study indicate that the structure of food consumption changed very slowly over a period of 10 years. The most visible difference, compared to other countries, may be observed in Croatia, which creates a separate, one-element group, indicating that its nutritional preferences have changed most strongly compared to other surveyed countries. This can be explained by the fact that in 2013 Croatia became a member of the European Union, and in the process of trying to obtain this privilege, it has undergone many economic changes, gained more access to other food products and export food prices decreased. As a result, its structure of consumption has become similar to other states of the EU. Analysis of this country example showed that the greatest change was observed in the consumption of potatoes and its products (x9). From a 15% share in a group of investigational products, its consumption decreased to 6% (comparison on Fig.5). The consumption of dairy products increased significantly (from 25% to 32%) and we observed a slight increase in meat consumption. This would confirm the research conducted over the past 40 years in the Mediterranean countries, which shows that in this region the consumption of milk and its products has constantly increased to the detriment of other products, such as cereals. (Balanza et al., 2007; Notarnicola et al., 2017).

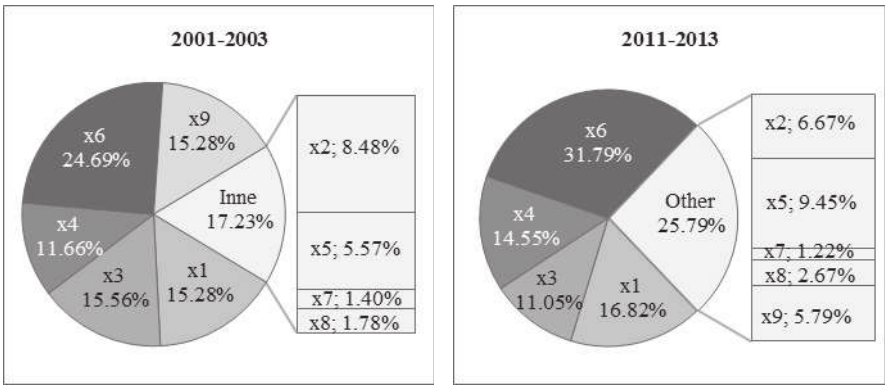

Fig. 5. The consumption of particular groups of products in Croatia (2001-2003) and (2011-2013)

Source: Authors' own elaboration.

A group of countries with average changes includes 6 countries: Lithuania, Bulgaria, Ireland, Spain, Denmark and Slovakia. The changes in the largest group (20 countries, including Poland) over ten years were very slight, and the structure of the food products has not actually changed, but the population has had similar nutritional preferences for years. The authors think that it would be interesting to do research in the future on the similar field but designed for food producers as useful information for defining possible food markets.

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The Plant Production in Norway

Abstract. A problem of the Norwegian agricultural policy, a description of the current types of subsidies for plant production and ongoing changes in the plant production in the years 2001-2016 is presented in this paper. There are also short information about topography of Norway and climate conditions. The main aim of the publication is to characterize changes in the plant production in the considered period. There is not too many publications about the Norwegian agriculture and plant production. The data from Statistiska Sentralbyrå (Statistics Norway) were used in the quantitative analysis. The results indicate the slight changes in the plant production in Norwegian agriculture i.e. decrease of number of holdings with plant, decrease of area of crops and size of yields.

Key words: plant production, climate conditions, topography, subsidies, agriculture in Norway

JEL Classification: Q12, Q15, Q20, Q21, Q24, Q29,

Introduction

Present publication is about a plant production in Norway. This study is a continuation of researches which have been conducted in a framework of "Scholarship and Training Fund Mobility Projects In Higher Education. Individual Training Programme For Staff Training Mobility" in Østfold University College in Norway. It is a continuation of published discussions devoted to the Norwegian agriculture, agricultural policy and Norwegian livestock production.

Agriculture in Norway is a challenging task. Norwegian topographic and climatic conditions gives some obvious challenges when it comes to self-sufficiency, security and especially profitability in the field of agricultural production (Vaale-Hallberg, 2012). Norway is both one of the northernmost countries in the world and at the same time one of the most mountainous. A significant part of the country is occupied by the Scandinavian Mountains. The average altitude is 460 m, and 32 per cent of the area is above the tree border.

The climate of Norway is very diverse. On the south-western and partly southern coast the climate is moderate sea. In the lowlands in the south-east is moderate cold. The sub-polar climate occurs on the north-west coast, while the continental climate is in the valleys and highlands below the tree line and on the north coast. Mountain tundra occurs above the tree line in all mountain areas. Arctic tundra occurs on Jan Mayen and the Svalbard archipelago, including Longyearbyen, as well as on the coastal belt from Cape North to Vardø. Arctic climate occurs only on Svalbard and Jan Mayen above 400 m above sea level (Uleberg, 2014).

Norway is geographically large in relation to its population and has diverse habitats. It is one of the least densely populated countries in Europe, with 17 inhabitants per km^2.

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Built-up land (including roads) amounts to only about 2 per cent. A total of 3 per cent is agricultural land and 23 per cent is productive forest. A further 13 per cent is unproductive forest, while fresh-water resources and glaciers make up 7 per cent. The approximately 50 per cent that remains consists of mountains, plateau, bogs and moors (Statistics Norway, ssb.no). Many of habitats are not rugged with harsh climates. It causing significant challenges for agricultural and economic activity, even with modern technology and conveniences (Kozioł-Kaczorek, 2016b; OECD, 2016).

Norwegian holdings are typically small-scale farms requiring high input of labour, or are only suitable as grazing land for cattle or sheep. to Because of the climatic conditions, the season is short and there is high risk of damage to harvest. Moreover, Norway has one of the world's highest costs of living, and next-to-full employment. Thus, it is difficult to produce an average level of income based on competition with products from countries more suitable for industrial farming. As part of the compensation Norwegian agriculture is among the most subsidized and protected areas of food production in the world (Kozioł-Kaczorek, 2016b; OECD, 2016). The authorities generally counteract all attempts at reducing the high import tariff (Gaasland, 2009). Norway's comfortable fiscal position, thanks to oil wealth, gives it great possibilities on how to go about supporting agriculture and the rural sector (Hemmings, 2016).

The unfavourable topographic and climatic conditions, mentioned at the beginning, particularly affect the plant production, its type and structure. The aim of this paper is to present short characteristic of plant production in Norway, and changes in it during last years.

Review of the literature

The total agricultural and forest area is 80 124 km^2, that is a 26 per cent of land of the mainland part of Norway. The agricultural area in use covers 9 859 km^2 (3,2 per cent of land) of which fully cultivated is 8 103 km^2 (2,7 per cent of land). It is sufficient to ensure the supply of the population of Norway in the meat, dairy product, vegetables and grain products to a certain extent (www.ssb.no, 2016; Kozioł-Kaczorek, 2016b). The share of agriculture in GDP was only 1.6 per cent in 2015. The agriculture share in employment was 1.8 per cent. The agro-food export was only 0.8 per cent of total export while the agro-food import was around 9.1 per cent of total import (Hemmings, 2016).

Table 1. The empirical distribution of areas of farms in 2016.

Area (ha)	Number of holdings	Structure ratio
less than 4,9	5366	13,1%
5,0 - 9,9	7147	17,4%
10,0 - 19,9	10990	26,8%
20,0 - 29,9	6966	17,0%
30,0 - 49,9	6294	15,3%
50 and more	4301	10,5%

Source: Own accounts based on Statistics Norway (www.sssb.no, 2017).

The agricultural area covers 9 859 km^2 which is around 3,2 per cent of land. The fully cultivated area is 8 103 km^2 (2,7 per cent of land). The structure of agriculture in Norway is measured by numbers of holdings. In 2016 the total number of holdings was 41 064 (www.ssb.no, 2016; Kozioł-Kaczorek, 2016a; Kozioł-Kaczorek, 2016b). Most of them were farms with an area between 10 ha and 20 ha, and it was around 27 per cent of total number of holdings. The empirical distribution of areas of farms in 2016 is presented in a Table 1.

Most of the holdings are located in low-lying areas close to the main urban centres. The spatial distribution of holdings in generally in 2016 is presented on a map on the Figure 1.

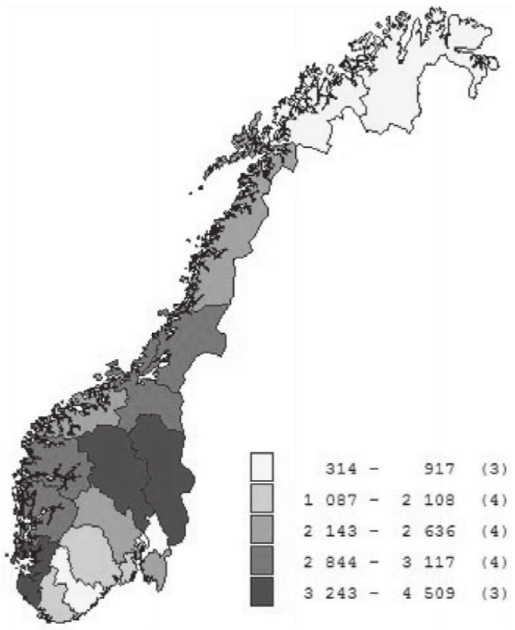

Fig. 1. The map of the spatial distribution holdings in generally (left map) and of the spatial distribution of holdings specialised in livestock farming (right map)

Source: Statistics Norway (www.sssb.no, 2017).

Spatial distribution of farms is determined by both topographical and climatic conditions. The short growing season is one of the limiting factors for agriculture in Northern Norway today. It limits the variety of possible crops and the yield potential. Consequently grassland occupies more than 90 per cent of the cultivated land in this area (Volden et al., 2002). The growing season is limited by the short and insufficient photoperiod which limits growth even if the temperature is sufficiently high. The most crops grown today are adapted to the long day light conditions at high latitudes, thus it can't be cultivated in this region. The weather conditions during winter also affects the soil situation in spring and thereby the possibilities for an earlier growing season start (Uleberg, 2016). Frequent "frost on snow-free soil" lead to thick layers of frozen soil, which keep soil temperatures low throughout spring even if other conditions favour an early start of the season. The winter conditions are the limiting factor for enhanced production potential in

Northern Norway and the possible expansion of available crops might be limited by their ability to survive winter. Increased precipitation combined with more variable temperatures in winter cause snow to melt and refreeze, increasing problems with ice cover and encasement (Uleberg, 2016; Höglind et al., 2010; Bélanger et al., 2002). Similarly, periods of thaw and rain falling on frozen ground induce extensive and prolonged icing resulting in winter damage of pastures (Uleberg, 2016). Such overwintering problems are common in Northern Norway today, especially in the coastal regions of Troms and Nordland. These are important factors to consider when introducing new species and varieties. Because of climatic conditions, there is high risk of damage harvest (Uleberg, 2016).

As was mentioned before, the agriculture in Norway is a challenging task, especially the challenging task is the plant production. It's caused by both, mountainous areas and climate conditions. Nevertheless, there is a political consensus on having agriculture throughout the country. Wherefore, the agricultural production in Norway is strongly dependent on agricultural policy, which is based on (among other) the White Paper No. 9 (2011 – 2012) "On Norwegian agriculture and food production" approved in April 2012 (Kozioł-Kaczorek, 2016b). Furthermore, the objective of Norwegian agricultural policy is also to ensure self-sufficiency and security in the field of agricultural production (especially food production). It is a main reason for which the Norwegian agricultural policy is still strongly state regulated through legislation and economic instruments (Kozioł-Kaczorek, 2016b; Forbord et al., 2014; Dramstad et al., 2010). The key policy instruments supporting agriculture include domestic market regulation, budgetary payments, support measures, certain product price, welfare schemes and also border measures (Kozioł-Kaczorek, 2016b; Hemmings, 2016). The most important support for holdings comes via direct and indirect assistance for farmers. There is a lot of individual mechanism. The key types of support comprises output-based support, transport subsidies, acreage-based payments and headage payments (Kozioł-Kaczorek, 2016b; Hemmings, 2016). The mentioned above core support mechanisms are augmented by a lot of other programmes that, for example, compensate farmers in the event of natural disasters or losses due to predators. Furthermore, farmers can also benefit from a special tax relief (Hemmings, 2016). There are different kind of types of support for holdings with the plant production. The first one is output-based payments for fruit and vegetables, cereals (Hemmings, 2016). Another one type are transport subsidies i.e. various schemes supporting transport of grains. The next type are acreage-based payments. Further types of support are financial assistance with labour input and other national payment schemes include: organic farming support, natural disaster compensation, compensation programmes for losses due to predators and other losses (Hemmings, 2016). There are also regional environmental programme and income-tax deduction. Positive income balances are not taxed up to a maximum tax saving of NOK 44 900 (i.e. around EUR 4 900 at an exchange rate of 9.2) per farmer (Kozioł-Kaczorek, 2016b; Hemmings, 2016).

Except budgetary support, every year, the Government and organizations of farmers negotiate the annual agriculture agreement, which sets out i.e. the target prices that ought to be obtained for agricultural products, taking into account the market conditions, import restrictions and applicable market regulation. In order to achieve the annual set target prices, effective customs barriers are placed to avoid outstripping from foreign products being low-priced compared to Norwegian products (Vaale-Hallberg, 2012; Gaasland, 2009).

Methods and data

As mentioned earlier, the purpose of the publication is a short description of plant production in Norway, and changes occurring in it during last years.

The data used in the analysis were collected through a website of Statistiska Sentralbyrå (Statistics Norway). The collected data include information about the structure of agriculture i.e. the number of agricultural holdings, their size and type of farming and the input of agricultural area in use and number of livestock. Furthermore, the set of data include information about cereals and oil seeds (area and yields), horticultural production (area and yields), production of potatoes and forage plants (area and yields). The used definitions of the main concepts and variables were taken from Statistics Norway. Thus, an agricultural holding is understood as a single unit both technically and economically, which has single management and which produces agricultural products. The holding is independent of municipality boundaries. The agricultural holding's headquarter must be located to an agricultural property. An agricultural area in use is an agricultural land that is harvested at least once during a year, including planted area of permanent crops, where no harvest has been produced so far. Includes also arable land included in the crop rotation system with no intention to produce a harvest during the year, but which will be harvested the next year. The type of farming of a holding is determined by the contribution ratio of the different crop and livestock enterprises to its total agricultural production (ssb.no).

Statistical data analysis methods have been used in quantitative research.

Results

In 2016, there were 11 173 holdings with area of grain and oil seeds in Norway, and it was around 0,84 per cent less than in 2015. The changes in number of holdings with area of grain and oil seed in the period from 2001 to 2016 are presented on the Figure 2.

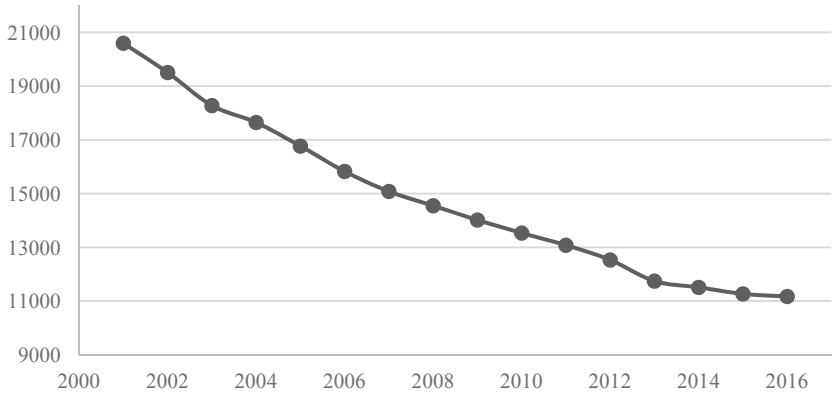

Fig. 2. The changes in number of holdings with area of grain and oil seed.

Source: Statistics Norway (www.sssb.no, 2017).

During fifteen years the number of holdings with area of grain and oil seed was decreasing annually on average about 4 per cent. The spatial distribution of the number of holdings with area of grain and oil seeds is presented on the Figure 3.

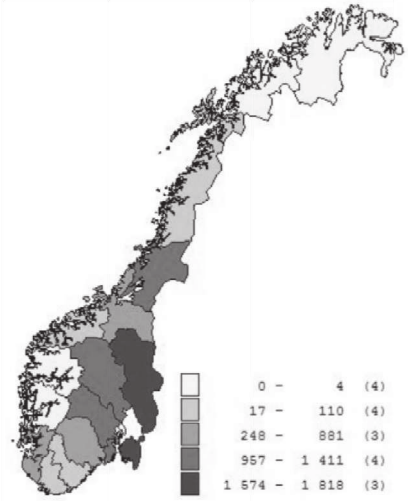

Fig. 3. The map of the spatial distribution of holdings with area of grain and oil seeds.

Source: Statistics Norway (www.sssb.no, 2017).

As can be seen, the biggest number of holdings is located in Hedmark county in eastern of Norway and Østfold county in southern of Norway. Same spatial distribution is of course for the total area of grain cultivation. The total area of grain cultivation was 284 490 ha in 2016, and it was about 0,83 per cent more than in 2015. The area of grain cultivated has decreased by average of 0,95 per cent over the last fifteen years. Because of the short growing season in Norway, mainly barley is grown - around 48 per cent of total area of grain cultivated. Due to the share in the area of cereal crops on the second and third place are oats (26 per cent of total area of grain cultivated) and wheat (23 per cent of total area of grain cultivated). The total area of barley cultivation was 137 180 ha in 2016, and it was about 11,27 per cent more than in 2015. The area of barley cultivated has decreased by an average of 1,68 per cent over the last fifteen years. The total area of oats cultivation was 75 970 ha in 2016, and it was about 20 per cent more than in 2015. The area of oats cultivated has decreased by an average of 0,74 per cent over the analysed period. The area of wheat cultivation was 66 790 ha in 2016, and it was about 22 per cent less than in 2015. The area of wheat cultivation was increasing annually on average about 0,33 per cent over the last fifteen years. The described above changes in: the total area of grain, the area of barley, the area of oats and area of wheat in the period from 2001 to 2016 are presented on the picture 4.

The size of cereal yields over the last fifteen years has remained at the same level. In the 2016 the yields of barley was about 574 000 tones, the yields of oats was about 330 000 tones and the yields of wheat was about 286 000 tones.

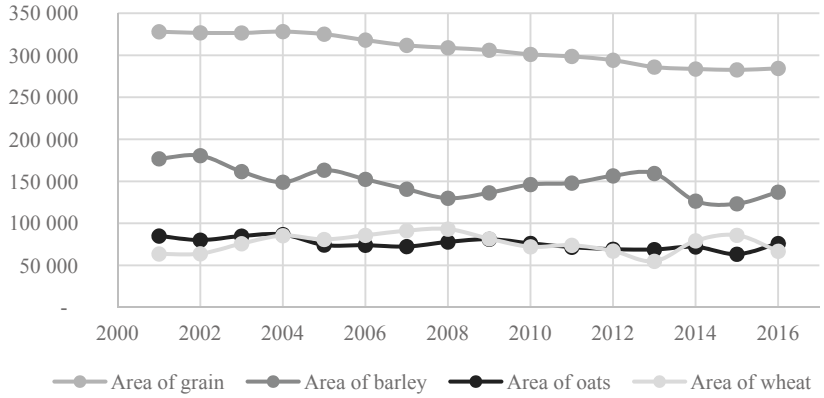

Fig. 4. The changes of area of holdings with area of grain and oil seed.

Source: Statistics Norway (www.sssb.no 2017).

In 2016, there were 1 875 holdings in Norway with crop of potatoes, and it was about 4 per cent less than in 2015. The changes in number of holdings with crop of potatoes in the period from 2001 to 2016 are presented on the Figure 5.

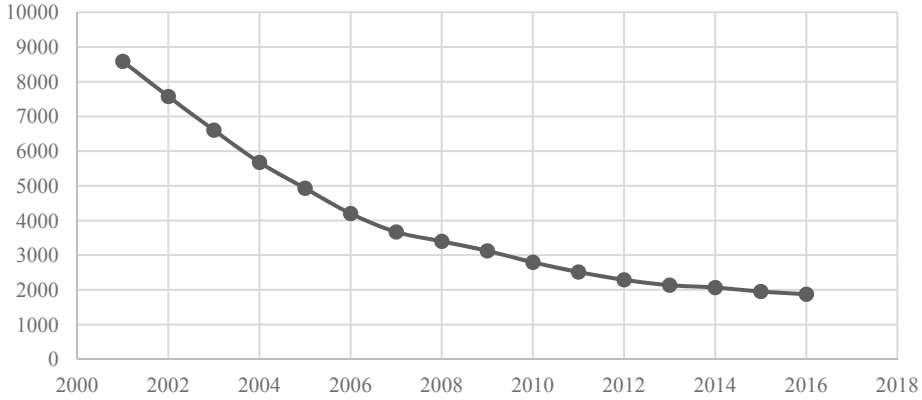

Fig. 5. The changes in number of holdings with crop of potatoes.

Source: Statistics Norway (www.sssb.no, 2017).

During last fifteen years the number of holdings with crop of potatoes was decreasing annually on average about 9,65 per cent. The spatial distribution of the number of holdings with area of grain and oil seeds is presented on the Figure 6.

As can be seen, the biggest number of holdings with the crop of potatoes is located in Hedmark county in eastern of Norway, Oppland county in central of Norway and in Nordland county in northern. The size of potatoes yields over the last fifteen years has remained at the same level. In the 2016 the yields of potatoes was about 363 200 tones.

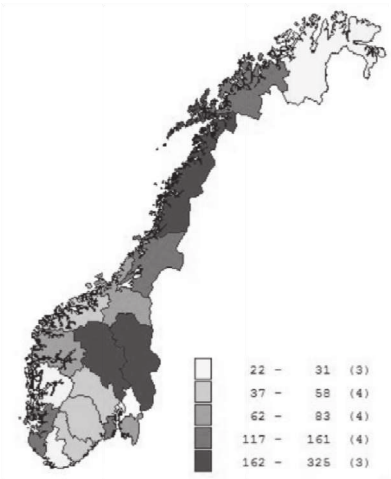

Fig. 6. The map of the spatial distribution of holdings with crop of potatoes.

Source: Statistics Norway (www.sssb.no, 2017).

The last branch of plant production (food production) is horticulture (also with the greenhouse production). Due to climatic conditions and soil quality, gardening is limited to some fruits and vegetables. The largest area has carrot crops (1 608 ha, 8 per cent more than in 2015), strawberry plantations (1 532 ha, 6 per cent less than in 2015) and apple orchards (1 351 ha, 2 per cent less than in 2015). A slightly smaller area is occupied by onion cultivation (827 ha, 2 per cent less than in 2015) and cauliflower (644 ha, 17 per cent more than in 2015). The average annual changes of area of mentioned above crops are presented in the Table 2.

Table 2. The average annual changes of area.

Crop	Average annual change of area
carrot	2,46%
strawberry	1,62%
apples	-0,93%
onion	4,81%
cauliflower	7,37%

Source: Own accounts based on Statistics Norway (www.sssb.no, 2017).

Only in case of apple orchards the area was decreasing gradually during last 6 years. The biggest increased of area is for crop of cauliflower. Areas of the other fruits and vegetables crops are presented in Table 3.

Table 3. Areas of the other fruits and vegetables crops

Area (ha)	Kind of crop
10 - 100	table swedes, plums, broccoli, raspberry, other lettuces field-grown, iceberg lettuce, winter cabbage, black currant, brussels sprouts, leek, sweet cherries, beetroots, radishes, chinese cabbage, early cabbage
100 - 500	root celery, sweet corn, pears, turnips, other berries, ridge cucumber, cherries, red cabbage, celery, bilberry

Source: Own accounts based on Statistics Norway (www.sssb.no, 2017).

The average annual changes of area of mentioned above crops are presented in the Table 4. The results are ordered due to the size and direction of changes.

Table 4. The average annual changes of area of the other fruits and vegetables crops

Average annual change of area (per cent)		Crop
decrease of	4 - 8	chinese cabbage, other berries, pears, sweet cherries, ridge cucumber
	0 - 4	iceberg lettuce, bilberry, celery, broccoli, early cabbage, cherries, red cabbage
increase of	0 - 4	early cabbage, cherries, red cabbage, table swedes, red cabbage, table swedes, plums
	4 - 8	leek, winter cabbage, root celery, brussels sprouts
	8 - 10	beetroots
	11,36	other lettuces field-grown
	24,71	radishes

Source: Own accounts based on Statistics Norway (www.sssb.no, 2017).

The biggest decrease of the area of crop concerns chinese cabbage and other berries. On the other hand, the largest increase of the area of crop is for radishes. The changes of size of yield in horticulture are presented in the Table 5.

Table 5. The changes of size of yield in horticulture

Average annual change of area (per cent)		Crop
decrease of	26,69	bilberry
	13,72	cherries
	11,28	pears
	9,7	chinese cabbage
	0 - 6	ridge cucumber, other berries, red cabbage, early cabbage, sweet cherries, turnips, table swedes
increase of	0 - 8	strawberry, sweet corn, celery, broccoli, apples, brussels sprouts, carrot, plums, iceberg lettuce, winter cabbage, cauliflower, raspberry, onion, leek, root celery
	8 - 9	radishes, black currant
	14,78	beetroots
	23,85	other lettuces field-grown

Source: Own accounts based on Statistics Norway (www.sssb.no 2017).

Let us notice that both, structure of changes of area of crop and the structure of changes of size of yield are not the same. And it is quite obvious, because size of yield depends on a lot of significant determinants, not only area of crop.

Conclusions

Mountainous terrain, unfavourable climate, short vegetation period and weak soils naturally limit the possibilities of crop production in Norway. Moreover, the high cost of living and next-to-full employment makes that the agriculture production is costly and unprofitable. Only a very few industrial farmers in Norway are able to produce an average level of income based on the own production. The vast majority of holdings has to be a beneficiary of numerous aid programs and subsidies. Almost in every area of plant production there is a noticeable decrease in both the area of crops and the size of crops.

Because of the climate conditions, the short vegetation period and topography the majority of crop production is concentrated in the southern part of Norway, especially in Hedmark county. In the northern part of Norway the plant production almost doesn't exist.

It is obvious that the subject of agricultural production has not been exhausted. Further research and publications are planned on this issue.

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The Elasticity of Agricultural Income in the EU Member States Under Different Cost Structures

Abstract. The aim of this paper was to determine whether the EU countries which vary in terms of their cost structure in agriculture, differ also with regard to the influence of capital-labour ratio and land supply per worker on labour profitability. It was assumed that data concerning the presence and character of those differences can contribute to better understanding of the nature of agricultural development in the EU countries. The main sources of data used in this paper were the Economic Accounts for Agriculture (Eurostat) and the FAOStat database. The study covered the period of 2004-2014. In the article it was shown that agriculture in the EU countries is varied in terms of cost structure, and in the cluster II, including mostly the countries of the so-called "new" EU, intermediate consumption is of relatively larger significance for their cost structure. In the countries of the "old" EU an important role is played by the depreciation of buildings and external services. Stronger influence of capital-labour ratio on the payment to the factor of labour was observed in the cluster II countries. In those countries, increasing capital expenditures was a more efficient strategy to increase income.

Key words: agricultural income, cost structure, European Union, income elasticity

JEL Classification: O13, Q10, Q14

Introduction

European agriculture displays a strong relationship between the endowment of the factors of production and their productivity. Hence, beneficial relationships between individual production factors determine high productivity in agriculture (Baer-Nawrocka, Markiewicz, 2013). From a theoretical point of view, labour productivity is a predictor of labour profitability. Productivity depends, in turn, on the value of capital-labour ratio and land supply per worker (Bezat-Jastrzębowska, Rembisz, 2015). The former factor is particularly important, which has been proven empirically (cf. Gołaś, 2010). Capital-labour ratio is the capital equipment per unit of labour, where capital can be understood from a resource-based view (e.g. total assets), as well as from a stream-based view. In this latter view, capital is usually understood as agriculture-related costs. In this case the volume of intermediate consumption, and sometimes the amount of depreciation or other costs (e.g. interest, rents, compensation of employees), is used. The strength of the cost approach is supported by the fact that assets of an agricultural holding tend to be partially non-productive (e.g. empty utility buildings).

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Agriculture-related costs are a complex category and are the subject of numerous studies. Two approaches competing in the course of research into costs in agriculture can be named; the synthetic approach, involving estimating costs (and then income) of all activities in an agricultural holding, and the analytical approach, where a stronger emphasis is put on estimating precise costs and profits of particular directions of production. Currently, the synthetic approach is prevalent (Ziętara, 2009).

Difficulties in cost analysis are associated with the use of private means of production in agriculture, because such means often are not actually paid. An increasing degree of interrelation between agricultural holdings and the market, which is, as a matter of fact, an indicator of the modernization of agriculture, leads to an increase in external financing in the capital structure of a holding (Gołębiewska, 2010). According to Kulawik (1996), agriculture is characterized by difficulties in generating equity, which means it has to be supported with external capital. This results in a change in the capital (cost) structure; however it is not a negative phenomenon, because agricultural holdings using external financing may take advantage of the financial leverage effect (Szymańska, 2009). It can be stated that the more external factors (actually paid ones) there are in cost structure, the more accurate are income accounts. Otherwise, the amount of income recorded in databases is distorted by the fact that the estimated value of one's own means of production involved is not subtracted. This phenomenon inspires attempts at designing methods of estimating the cost of using one's own means of production, including the valuation of one's own work and the cost of using private arable land (Goraj, Mańko, 2011). The authors of this article assume that agriculture in the EU displays varied structures of operating costs among the member states. This variation within microstructures constitutes a quantifiable reflection of qualitative changes occurring in the economy (Kukuła, 2010, p. 16). The final verifier of the adequacy of a structure, however, is the economic result, which can be represented by the generated income (Goddart et al., p. 485). It is determined by, among others, the relation between resource relationship and their elasticity. In the paper elasticity of agricultural income is assessed. It is defined as a change in income which occurs with the change of resource relationships. For example, if the elasticity equals 0,5 it means that with the 1% increase in the inputs relationship, agricultural income increases for 0,5%. This situates our research among the others concentrated on finding determinants of agricultural income. Many determinants have been identified as so far, including contract farming (Nadolny, Dzatora, Nguyen, 2015), socio-cultural and education factors (Panda 2015), agricultural policy (Hansen, Teuber, 2011, Severini, Tantari, 2013) or trade distortions (Anderson, Martin, Van der Mensbrugghe, 2006). The conducted research is about to extend the list above for determinants of a structural nature. However, structures in agriculture can be assessed in many dimensions. Earlier studies sought the impact of relations in agricultural production factors (Baer-Nawrocka, Markiewicz, 2013), diversification in produced commodities (Goletti, 1999), agrarian structure (Manjunatha et al., 2013; Czyżewski, Staniszewski, 2016) or structure of agricultural support (Czyżewski, Smędzik, 2017). This paper is going to expand this research agenda, by evaluating the impact of another dimension of agricultural structures – the cost structures. According to our best knowledge similar research on a macroeconomic scale has not been conducted as so far. The aim of this paper was to determine whether the EU countries which vary in terms of their cost structure in agriculture, differ also with regard to the influence of capital-labour ratio and land supply per worker on labour profitability. The data concerning the

presence and character of those differences will contribute to a better understanding of the nature of agricultural development in the EU countries, by defining its determinants.

Data and methods

The study conducted can be divided into two stages. The first one involved dividing the EU countries into groups, the criterion being the cost structure of agricultural activity. On the basis of data from the Economic Accounts for Agriculture (EAA) three dimensions of this structure can be distinguished: I – general cost structure, II – intermediate consumption structure, III – the structure of consumption of fixed capital (the components of particular dimensions are listed in detail in Table 2). Those structures were characterized by averaged data from the period 2004-2014. The degree of similarity among the structures was calculated with a formula proposed by Kukuła (2010, p. 29):

$$v_{pl} = \frac{\sum_{i=1}^{k} |\alpha_i - \beta_i|}{2}$$

where, α is the vector of state a's structures, β is the vector of state b's structures.

To make the comparison, this coefficient uses the so-called Manhattan distance[3], and its measure is normalised – it ranges from 0 to 1, where 0 indicates maximum correspondence while 1 indicates maximum divergence. Through estimations three distance matrices were obtained, values of which were then averaged. Particular structure dimensions were assigned the following weight: I – 0.5; II – 0.25; III – 0.25, which reflect their importance. They were selected in such a way, since dimensions II and III constitute an analytical continuation of the components of dimension I. The synthetic distance matrix was then used in a cluster analysis, performed with Ward's method[4]. The statistical significance of the differences between two sample means in each type of cost were tested using Student's *t*-test (if the variable in each cluster had normal distribution) or non-parametric Mann-Withney U test (in other cases). The assumption of homogeneity of variance of variables between the clusters was evaluated using the Levene's test and the Brown-Forsythe test. If the assumption was rejected we also used a non-parametric approach.

In the second stage of the study the elasticity of changes in agricultural income (payment to the factor of labour) in response to the changes in capital-labour ratio and the supply of land per labour unit were estimated. The clusters of countries indicated in the first stage were used. The elasticity was estimated with panel regression models[5]. The first panel included 12 countries over the period of 11 years, the other 13 countries over the period of

[3] This name stems from the method of calculating the distance necessary to move from one spot in a city to another when the only possible movement is along straight lines intersecting at right angles (Stanisz, 2007, p. 116).

[4] In this method, the distance between points is calculated with the analysis of variance approach. It is aimed at minimizing the sum of squared deviations within clusters. This method is used as a very effective one, although it promotes little clusters (Stanisz, 2007, p. 122).

[5] Panel regression is a method to analyze two-dimensional (typically cross-sectional and longitudinal) panel data. The data are usually collected over time and over the same individuals and then a regression is run over these two dimensions.

11 years (2004-2014). Luxembourg and Latvia were excluded from analysis due to the lack of data on the structure of consumption of fixed capital (in EAA they were entirely classified as "other"). The original values of the dependent variable were replaced with moving averages covering 3 observed periods between 2005 and 2013 and 2 observed periods in 2004 and 2014. This procedure was chosen because incomes in agriculture are subject to fluctuation on a yearly basis due to their dependence on the global economic situation and weather conditions, which cannot be accounted for by changes in expenses alone. A stream-based (cost-based) approach to capital was applied. Since agricultural holdings often have considerable assets uninvolved directly in production, a cost-based approach to capital appears to be justified and it has been used in other studies within the field of agricultural economics (Niezgoda, 2009a; Niezgoda, 2009b; Nowak, Wójcik, Krukowski, 2015). In the aforementioned papers, capital was understood as a sum of costs, which in this case includes the cost of hiring workers, interest and rent. This approach is justified when microeconomic data (e.g. FADN) are used, and the income of agricultural entrepreneurs is modelled (in the FADN database the relevant category is *net income,* while in Eurostat – *entrepreneurial income*)[6]. In a macroeconomic approach, which considers the entire supply of land and labour, a more adequate income category is value added (optionally factor income, including subsidies), which is generated also by people who are not owners of a holding and land, which does not belong to a farmer. Then, there is no need to include the cost of land and labour in the capital flow. When panel-type data are used, the sum of income can be modelled in relation to supplies spent (a Cobb-Douglas-type function) or payment to one of the factors of production can be modeled in relation to the relations among the remaining factors of production. In this article the latter approach was taken. A relative weakness of using a traditional Cobb-Douglas-type function in macroeconomic studies is the little variation in inputs in agricultural production over short periods. It particularly applies to land supplies in highly developed countries. Definitions of variables used in the models are presented in Table 1.

In order to estimate the parameters of the function for the payment to the factor of labour, raw input data were logarithmised and a panel regression model was estimated. The adequacy of chosen models (least squares model, fixed effects model, random effects model) was tested with the Breusch–Pagan test and the Hausman test with statistical significance at the 0.05 level (Kufel, 2011). In all cases the most accurate model specification was the random effects model (*Random effects-RE)*. The models were estimated using the PCSE (Beck-Katz) robust standard errors procedure. Therefore, the model equation was constructed as follows:

$$ln(AGRICULTURAL\ INCOME_{it}) = \beta_0 + \beta_1 * ln(CAPITAL/AWU_{it}) + \beta_2 * ln(TAA\ /AWU_{it}) + v_i + \varepsilon_{it}$$

where: v_i is random drawings from a given probability distribution,
ε_{it} is net random error.

[6] When net income is modelled, it is sometimes possible to include the entire supply of land and labour used by agricultural holdings in explaining variables, assuming "methodological rationality of farming families or management" (Niezgoda 2009b).

Table 1. Definitions and sources of variables used in the analysis

Variable	Description	Source
Agricultural income	Factor income as a measure of income generated by all production factors in agriculture. The formula is: net value added at basic prices + other subsidies on production minus other taxes on production. Net value added is calculated by subtracting depreciation and total intermediate consumption from the value of agricultural output.	Economic accounts for agriculture – values at real prices in euro, chain linked volume (2010) [aact_eaa04]
Capital	Total sum of total intermediate consumption and depreciation.	Economic accounts for agriculture – values at real prices in euro, chain linked volume (2010) [aact_eaa04]
Labour (**AWU**)	Total Annual Work Units (thousands). 1 AWU corresponds to the work performed by one person who is occupied on an agricultural holding on a full-time basis. It may differ between member states but usually it is circa 2000h per year.	Agricultural Labour Input Statistics [aact_ali]
Total agricultural area (**TAA**)	Total agricultural area in thousands of hectares.	FAOStat/Inputs/Land

Source: Author's own elaboration based on Economic Accounts for Agriculture, Eurostat and FAOStat.

The research methods applied in the paper lead to conclusions about the influence of the cost structure on the agricultural income in an indirect way. They test whether in groups of countries where these structures are significantly different, the income elasticity if the capital-labour ratio and land supply per worker is also different. These elasticities are treated as specific intermediary variables. The justification for such a methodology is the complexity of the cost structure in agriculture. Without the "a priori" adoption of a certain benchmark, it is not possible to transform this data into a synthetic indicator, expressed on a nominal scale, which would allow for their direct use in regression models. On the other hand, placement of all elements of the cost structure in the regression equation was impossible due to the limited number of observations.

Cluster analysis results

The cluster analysis conducted (Fig. 1.) allows for distinguishing two groups of countries and two outliers – Latvia and Luxembourg. This accounts for their separate clustering.

The remaining 25 countries were divided into two clusters. In the first one, 10 out of 12 countries are "old" EU countries. The remaining two are Bulgaria and Hungary. Cluster II contains most of the "new" member states (which joined the EU after 2004), with the exceptions of Portugal, Spain, Ireland and Belgium. A detailed breakdown of the structures in particular clusters is presented in Table 2.

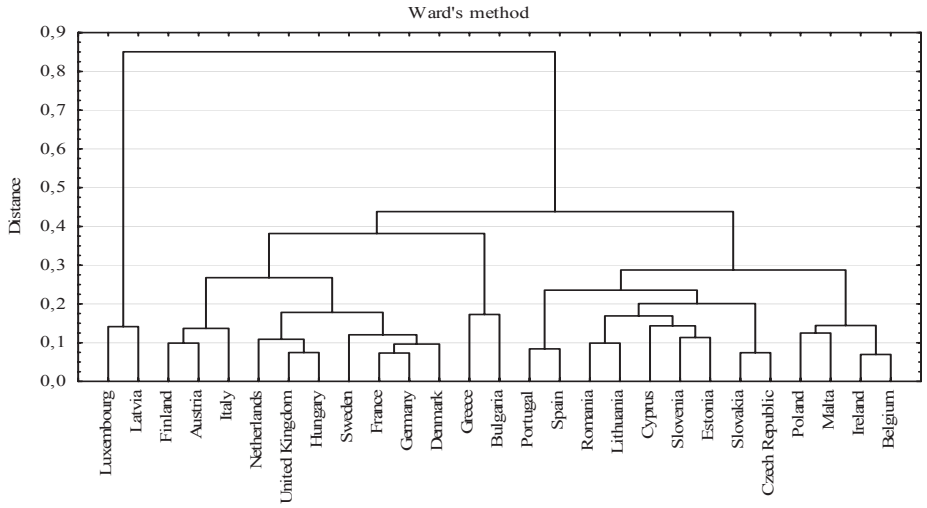

Fig. 1. The results of cluster analysis of EU Member States based on the structure of costs in agriculture sector in years 2004-2014

Source: Author's research based on Eurostat data (access: March 31st 2017).

When it comes to general cost structure (Dimension I), in both cases intermediate consumption is prevalent, but its percentage share was higher by 6 p.p. in Cluster II. At the same time, Cluster I exhibited a higher percentage of consumption of fixed capital (by 5 p.p.). Both differences were statistically significant. The structure of intermediate consumption (Dimension II) is also convergent but to a lesser extent. Costs of feedstuffs play a dominant role, however their percentage share is much higher in Cluster II (by 9 p.p.). In Cluster I, however, costs of agricultural services (5 p.p. more) and other goods and services (3 p.p. more) were more important. The first two differences were statistically significant. Regarding the structure of consumption of fixed capital (Dimension III), Cluster I is characterized by a higher share percentage of depreciation of buildings, while Cluster II – by a higher share percentage of plantations. In the case of this cluster, however, a restriction concerning outliers must be made. In Cluster I, Greece is a problematic case, where all consumption costs are counted as depreciation of agricultural equipment. In Cluster II, the percentage share of plantations is inflated by Spain and Portugal, which diverge from other EU countries in this respect. Nevertheless, the division allowed for identifying two groups of countries. In the first one, agriculture is better equipped with fixed capital, in particular buildings, and external services are used more often. In the other group the most important agricultural cost are current expenses, mostly feedstuffs.

Table 2. Characteristics of identified groups

Dimen-sion	Types of costs	Cluster I		Cluster II		t-Student or Mann-Withney U Test**
		Mean (in %)	CV *	Mean (in %)	CV*	
I	**(1) total intermediate consumption**	**65**	**10%**	**71**	**8%**	**0,035**
	(2) fixed capital consumption	**17**	**32%**	**12**	**39%**	**0,035**
	(3) compensation of employees	10	29%	12	40%	0,222
	(4) other taxes on production	1	86%	1	95%	0,384
	(5) rents and other real estate rental charges to be paid	**4**	**31%**	**2**	**53%**	**0,001**
	(6) interest paid	3	67%	2	61%	0,221
II	(7) seeds and planting stock	5	29%	5	39%	0,412
	(8) energy; lubricants	13	35%	13	29%	0,532
	(9) fertilisers and soil improvers	7	33%	7	41%	0,834
	(10) plant protection products, herbicides, insecticides and pesticides	4	36%	4	46%	0,710
	(11) veterinary expenses	3	46%	3	47%	0,684
	(12) feedstuffs	**34**	**14%**	**43**	**19%**	**0,004**
	(13) maintenance of materials	6	23%	5	37%	0,165
	(14) maintenance of buildings	2	54%	3	48%	0,192
	(15) agricultural services	**8**	**29%**	**3**	**59%**	**0,000**
	(16) financial intermediation services indirectly measured	2	54%	2	92%	0,221
	(17) other goods and services	16	28%	13	50%	0,131
III	(18) fixed capital consumption: equipment	62	27%	62	8%	0,943
	(19) fixed capital consumption: buildings	32	46%	27	34%	0,356
	(20) plantations	2	137%	7	127%	0,183
	(21) other	3	134%	4	127%	0,568

Group I: Finland, Austria, Italy, Netherlands, United Kingdom, Hungary, Sweden, France, Germany, Denmark, Greece, Bulgaria;
Group II: Portugal, Spain, Romania, Lithuania, Cyprus, Slovenia, Estonia, Slovakia, Czech Republic, Poland, Malta, Ireland, Belgium;
* CV- coefficient of variation;
** p value lower than 0,05 means that one can reject the null hypothesis that there are no stastically significant differences between mean of given variable between clusters. Non-parametric approach was used in variables: 4, 5, 6, 8, 12,13, 16, 20,21.

Source: Research conducted by the authors based on Eurostat data (access: March 31st 2017).

Elasticity analysis results

In the second stage of the study, a function of income (payment to the factor of labour) in relations to capital-labour ratio and supply of land per a unit of labour was estimated (Table 4). The first step was to estimate the function including both explained variables; the next step involved using only the variable which was statistically significant. Descriptive characteristics of the levels of used variables in both clusters of countries are presented in Table 3.

Table 3. Descriptive statistics of the variables used in models

Types of costs	Cluster 1			Cluster II		
	Mean	SD**	CV* (%)	Mean	SD**	CV* (%)
Agricultural income/AWU (thousand EURO)	22.63	11.96	53	12.64	9.00	71
Capital/AWU (thousand EURO)	57.67	43.28	75	24.22	23.21	96
UAA/AWU	27.50	15.62	57	17.93	11.86	66

* CV- coefficient of variation,
** SD- standard deviation.

Source: Research conducted by the authors based on Eurostat and FAOStat data (access: 31.03.2017).

In Cluster I (including most of the so-called EU15 countries), the average payment to the factor of labour in the 2004-2014 period amounted in EUR 22.63 thousand, while in Cluster II it was EUR 12.6 thousand, which is 44% less. Cluster II was characterised by a higher coefficient of variation, which points to a higher heterogeneity of the panel. There were also observable differences in capital-labour ratio. In Cluster I, it was EUR 57.67 thousand in capital value per each AWU, while in Cluster II – only 24.3 thousand per AWU (57.3% less). In both clusters the values of capital-labour ratio were widely varied among individual countries and in studied years, however bigger differences were observed in Cluster II. Cluster I was also characterised by a more profitable ratio of factor of land to factor of labour. There were 27.5 ha per each person employed full-time, while in Cluster II it was 17.9 ha (nearly 35% less). The differences between the clusters within this variable were relatively lower, similarly to the variation within individual clusters, which is accounted for by a lower coefficient of variation.

In both clusters, the direction of influence of land to labour ratio on payment to the factor of labour was consistant with the predictions, however the lack of statistical significance at the level of at least 0.1 does not allow for a substantive interpretation of the regressor value. Another fact pointing to the lack of the significance of this variable is that including only one explaining variable in a model does not negatively influence the explanatory power of the model (cf. R^2 values). No statistical significance of the influence of land to labour ratio on incomes observed in the model can partially stem from little variation in this variable in the studied period. According to the Herlemann Stamer model (1963), the process of land concentration (an improvement in the ratio of the factors of land and labour) is the last important stage of the agricultural development cycle.

The estimated models indicate an important role of the stock of capital in relation to available labour force in explaining payment to the factor of labour. In Cluster I, a 1% increase in capital to labour ratio led to a 0.66% increase in payment to the factor of labour. When it comes to Cluster II, a 1% increase in capital to labour ratio resulted in payment to

the factor of labour increasing by 0.81%. It can be concluded then, that agricultural income in the countries of Cluster II reacted stronger to changes in the stock of capital in relation to available labour force. Additionally, in the case of models for Cluster II, a better R^2 fit value was obtained. In all estimated models, within variance was lower than between variance and theta value was close to one, which means that the models explain the variation in the explained variable more accurately within individual countries than among countries.

Table 4. The results of agricultural income per AWU model estimation

Variable	Cluster I		Cluster II	
	(1)	(2)	(3)	(4)
Number of observation	*132*	132	143	143
constant	0.474	0.491	-0.098	-0.046
	(0.191)	(0.151)	(0.187)	(0.166)
CAPITAL / AWU	0.652***	0.661***	0.757***	0.810***
	(0.067)	(0.042)	(0.071)	(0.046)
TOTAL UAA/AWU	0.015	-	0.078	-
	(0.89)		(0.082)	
Type of effects	RE	RE	RE	RE
Hausman test p value	0.74	0.60	0.07	0.69
Within variance	0.012	0.012	0.010	0.010
Between variance	0.058	0.052	0.123	0.126
Theta	0.865	0.858	0.913	0.913
F Test	94.98***	198.63***	153.70***	306.95***
R^2	0.60	0.60	0.68	0.69
Akaike criterion	-1,367	-1,627	124,521	104,927

*, **, and *** denote 10%, 5%, and 1% significance levels, respectively.

Source: Research conducted by the authors based on Eurostat and FAOStat data (access: March 31st 2017).

Cluster II includes most of the "new" EU countries, where capital saturation is relatively lower, which results in a stronger reaction of incomes to an increase in the stock of capital. In the cost structure of agricultural holdings in cluster II, intermediate consumption, in particular feedstuffs, is of relatively higher importance. A smaller role is played by costs related with depreciation and external means of production (agricultural services, interest, rent). After 2004, most countries of Cluster II adopted the strategy of classic intensification, understood from the perspective of high importance of intermediate consumption in overall costs. A capital-intensive growth path of incomes brought about satisfactory results in those countries, at least in comparison with countries with higher level of capital to labour saturation and a cost structure shifted toward the use of external means of production. The growing share of expenditure on external means of production and fixed capital did not translate into higher elasticity of income.

Conclusions

On the basis of the information included in this article the following should be stated:

- Cluster analysis based on variation in cost structure led to the identification of two groups largely overlapping with the division into "old" and "new" member states;
- Cluster I is made up mostly of the countries of the "old" EU, where agriculture is better equipped with fixed capital, in particular buildings, and farmers are more likely to use external services. In the countries of Cluster II current agricultural expenses, in particular feedstuffs, were more important;
- In the Cluster I countries in the studied period observably higher payment to the factor of labour was noted. The relations between individual means of production were also observably more profitable. Both capital-labour ratio and land-labour ratio was higher in Cluster I, while the differences involved mostly the former relation;
- In the countries with the cost structure in which current expenses, that is intermediate consumption (Cluster II) played a more important role, payment to the factor of labour reacted more strongly to changes in capital-labour ratio. Most likely, those countries adopted the strategy of material-consuming intensification, which, due to a relatively low level of agricultural development in that area, lead to relatively large benefits. Because the changes in the relations in supply of land and available workforce in agriculture were too slow, land-labour ratio did not significantly influence payment to the factor of labour in either cluster.

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The Standard Model of Trade and the Marshall – Lerner Condition

Abstract. There are similarities between standard trade model and Marshall-Lerner condition. However, in order to see whether the condition can work both ways (with decrease and increase of the currency exchange rate), and the properties of this model could be thoroughly utilized, the revaluation case is being considered. The J-curve effect is also being examined. Looking at further research ideas, the Marshall–Lerner condition could be a complimentary tool in explaining the standard model.

Key words: standard trade model, Marshall-Lerner condition, revaluation, elasticities, balance of trade

JEL Classification: B27, F12

Introduction

When discussing contemporary trade theories, one should pay special attention to the standard model of trade (Paul Krugman – Maurice Obstfeld Model) presented in the famous book (Krugman, Obstfeld, 2015). The model that is more general than Ricardian, specific factors, and Heckscher-Ohlin proposals (Naotendur, 2017) implies the existence of the relative global supply curve resulting from the production possibilities and the relative global demand curve resulting from the different preferences for a certain good. The exchange rate - the relation between the export prices and the import prices is determined by the intersection between the two curves - the relative global supply curve and the relative global demand curve (cis01, 2017). If the other elements remain constant, the exchange rate improvement for a country implies a rise in the welfare of that country (buying more imports). Generally, knowing the supply and demand curves in the model, we can have an idea about the volume of import and export.

If one analyses the standard model of trade a certain analogy comes out, i.e. to the Marshall–Lerner condition (Lerner, 1944). The condition deals with long-term export and import demand elasticities, but it starts with a study on the impact of devaluation or depreciation of a given currency (shift in exchange rate) on the trade balance. However, the effects of revaluation of a given currency were not examined. That's why the aim of this little paper is to attend to it, draw further analogies to the standard model of trade, and to look for the prospects of further research. Comparative and intuitive methods were employed.

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The Standard Trade Model

Standard trade model is a general model that includes Ricardian, specific factors, and Heckscher-Ohlin models as special cases. It starts with the well-known concept of the production–possibility frontier (PPF) (Samuelson, 1967). The PPF curve shows the maximum possible production level of one commodity for any given production level of the other, given the existing state of technology. So, for example, production of guns would need to be sacrificed to produce more butter (Lipsey, 1995). If production is efficient, the economy can choose between combinations (points) on the PPF: B if guns are of interest, C if more butter is needed, D if an equal mix of butter and guns is required (Fig. 1). a point beneath the curve (such as A) indicates inefficiency, and a point beyond the curve (such as X) indicates impossibility.

A country's PPF determines its relative supply function. National relative supply functions specifies world relative supply function, which along with world relative demand determines the equilibrium under international trade. This equilibrium is again a relative price, ie. a ratio of export versus import prices, in other words – the "terms of trade" (Fig. 2).The latter decide upon the distribution of gains from trade.

A higher relative price for exports means that the country can afford to buy more imports. An increase in the terms of trade increases a country's welfare.

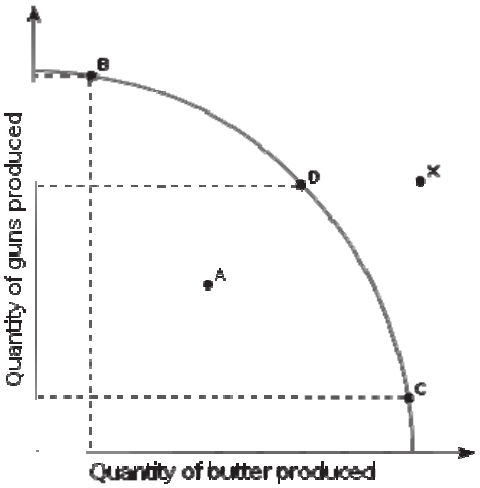

Fig. 1. Production–possibility frontier (PPF)

Source: Lipsey, 1995.

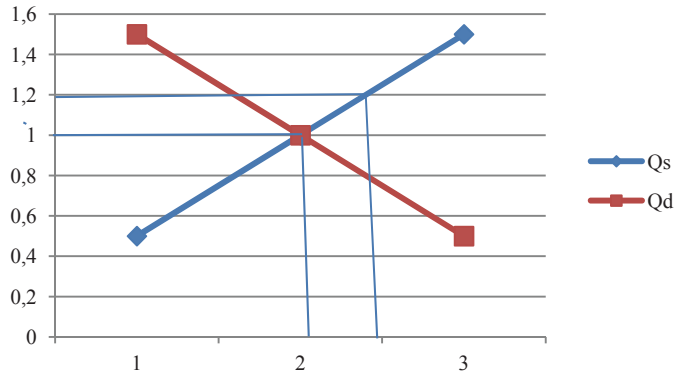

Fig. 2. The ratio of export versus import prices, the supply and demand curves

Source: based on Krugman, Obstfeld, 2015.

The vertical axis represents the price ratio, Qs is the relative global supply curve, and Qd is the relative global demand curve. For simplicity reasons, the supply and demand functions in Fig. 1 are linear, while in reality the relationship is curvilinear.

The Marshall – Lerner condition

The Marshall–Lerner condition refers to the situation that a currency devaluation or depreciation will only "cause a balance of trade improvement if the absolute sum of the long-term export and import demand elasticities is greater than unity" (Davidson, 2009).
In other words ExportsPED + ImportsPED > 1
where PED stands for the price elasticity of demand

After devaluation, imports become more costly and exports are cheaper because of a change in relative prices.

In a number of studies, it has been found that trade in goods tends to be inelastic in the short term, as it takes time to change consuming patterns and trade contracts (Bahmani, Ratha, 2007). Thus, the Marshall–Lerner condition is not met, and a devaluation is likely to worsen the trade balance initially. In the long term, consumers will adjust to the new prices, and trade balance will improve (the so called J-curve effect) (Feenstra, Taylor, 2014). However, Rose (1997) argues that there is little evidence that the exchange rate significantly affects the trade balance, while Pandey (2013) also referring to other empirical studies states that devaluation of the exchange rate causes an improvement in the trade balance. Some other studies (Ahmed, 1991) indicate that there are countries where there is no J-curve effect.

In economics, the 'J curve' refers to the trend of a country's trade balance following a devaluation or depreciation. A devalued currency means that imports become more costly (Feenstra, 2014). We also assume, that just after devaluation the volume of imports and exports change very little or does not change at all (as in the example in the table below). That is why the balance of trade (current account) is worsening. However, after some time,

the volume of exports may start to rise because it becomes more competitive, while imports is still more costly and falls. So the trade balance tends to improve (Fig. 3 – the PED in the graph is really the sum of export and import elasticities)[2].

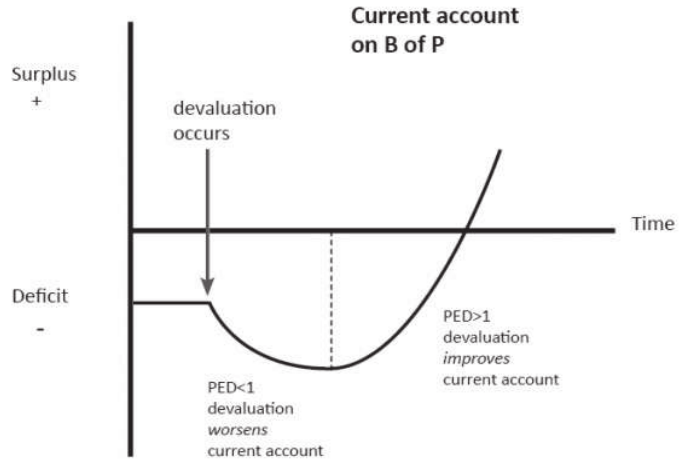

Fig. 3. The "J curve" and the devaluation process

Source: curve, 2017.

Let us illustrate this, by creating a simple "balance of trade" table, where:
a – elasticity coefficient (exports) price elasticity of the foreign demand for export (Exports PED);
b – elasticity coefficient (imports) price elasticity of the domestic demand for imports (Imports PED);
q – quantity of exports and imports;
p – domestic price;
pf – export and import price (in foreign currency).

Table 1. The Marshall-Lerner condition – devaluation

Export					Import					
A	q	p	pf	Value p x q	b	q	p	pf	Value p x q	balance
	100	10	10	1000		100	10	10	1000	0
	100	10	9	1000		100	11	10	1100	-100
0.2	102	10	9	1020	0.2	98	11	10	1078	-58
0.3	103	10	9	1030	0.3	97	11	10	1067	-37
0.5	105	10	9	1050	0.5	95	11	10	1045	5

Source: Sołdaczuk, 1987.

[2] For more in-depth explanation see: Feenstra, M., Taylor, A. 2014. International Macroeconomics. New York: Worth Publishers, 261–264.

At the initial stage the exchange rate is 1/1. The first row shows that the balance is 0. The government carried out a 10 percent devaluation. It means that when the domestic price is 10, the foreign price in exports is 9. If the foreign price of imported goods is 10, the domestic price is 11. So despite devaluation, the balance is negative, which is not, what we were hoping for (Krugman, Obstfeld, 2015). Once we introduce elasticities, starting from 0.2 up to 0.5, both the volume of exports and imports change (e.g. 2 percent rise in export corresponds to 10 percent fall in foreign prices). The negative balance diminishes. Finally with both a and b elasticities at 0.5 the balance is positive, which confirms the Marshall-Lerner condition.

The revaluation example

Let's return to our table, making some adjustments.

At the initial stage the exchange rate is 1/1. The first row shows that the balance is 0. Whatever the reason, the government may decide to rise the value of its currency. It carries out a 10 percent revaluation. It means that when the domestic price is 10, the foreign price in exports is 11. If the foreign price of imported goods is 10, the domestic price is 9. One may expect a negative balance of trade, but it's still positive. We again introduce elasticities, starting from 0.2 up, to 0.5. Of course both the volume of exports and imports change (e.g. 2 percent fall in export corresponds to 10 percent rise in foreign prices). The positive balance lowers. However, with both a and b elasticities at 0.5 the surplus of exports over imports is small, but it still exists. Only, with higher elasticities (if the sum exceeds unity, e.g. 1.2) the balance is decisively negative. Generally it proves the Marshall-Lerner condition also works in the reevaluation process.

Table 2. The Marshall-Lerner condition – revaluation

Eksport					Import					
A	q	p	Pf	value p x q	b	q	p	pf	value p x q	balance
	100	10	10	1000		100	10	10	1000	0
	100	10	11	1000		100	9	10	900	+100
0.2	98	10	11	980	0.2	102	9	10	918	72
0.3	97	10	11	970	0.3	103	9	10	927	43
0.5	95	10	11	950	0.5	105	9	10	945	5
0.6	94	10	11	940	0.6	106	9	10	954	- 14

Source: based on table 1.

Conclusions

There are certain analogies between the standard model of trade and the Marshall – Lerner condition, though they deal with different exchange rate. It would be interesting to try to combine two models. Marshall – Lerner theorem is called a condition but really it's also a simple model of trade. Marshall-Lerner condition usually describes what may happen

after devaluation. However the revaluation case is also worth examining. It also indicates that the sum of elasticities should be bigger than one for worsening of the balance, while for devaluation the condition to equal unity might be enough for balance improvement, as indicated in some older textbooks (Sołdaczuk, 1987). The core of the Marshall - Lerner condition is the concept of export and import elasticities. The magnitude and shifts in those parameters are crucial for the changes in the trade balance of a country i.e. for its welfare. That is why the concept of elasticities and its impact on the improvement of exports could add further aspects to the standard model.

Direction for further research

In the standard model of trade, the discussed ratio is really the terms of trade, which offers new research possibilities, i.e. creating some scenarios employing different term of trade categories. The other way of specifying the model could be an attempt to incorporate to it long term export and import elasticities.

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Poland's Competitive Position in Trade in Agri-Food Products with the United Kingdom – Selected Aspects

Abstract. Thirteen years have passed since Poland's accession to the European Union. This is a period long enough to make some generalisations over the accession results. This paper focuses on assessing the competitive position of Poland in trade in agri-food products with one of its most important trading partners – the United Kingdom. For this purpose, quantitative indexes of competitive positioning were used, in particular, the trade coverage ratio as well as the revealed comparative advantage indexes – RCAi and LFIi. The conducted analyses show that Poland's competitive position in agri-food trade with the United Kingdom improved markedly over the period considered. The dynamic growth in trade, especially in exports, a significant increase in the trade balance surplus, and generally favourable comparative advantage indexes for Poland show that the period of EU membership has been well utilised by Polish food producers. Polish food is increasingly eagerly bought by demanding British consumers.

Key words: competitive position, agri-food products, foreign trade

JEL Classification: Q17, F14

Introduction

Accession to the European Union meant for Poland the abolition of restrictions in trade exchange, including on the agri-food market. When opening its domestic market, Poland was granted the opportunity to sell its products on the developed European market. After thirteen years of Poland functioning in the EU structures, it can be stated that EU membership has proved to be very beneficial for the Polish food industry, and the results of Poland's foreign trade in agri-food products confirm this. Polish agri-food products are well known and eagerly acquired by European consumers. This is primarily due to the use of modern processing technologies, high quality raw materials, and price advantages (Szczepaniak, 2011).

The purpose of this paper is to analyse and evaluate the competitive position of Polish agri-food products, after Poland's accession to the European Union, in foreign trade exchange with one of the most important trading partners – the United Kingdom. The UK is an important trading partner for Poland in the European Union and is preparing to leave the Community. Its departure will undoubtedly influence the development of future economic relations with the remaining EU countries. It is, therefore, a very good time to analyse and summarize Poland's thirteen-year trade cooperation with the United Kingdom within the EU.

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Materials and methods

The subject literature broadly presents and discusses the results that Poland has achieved in agri-food trade. Authors of various analyses and reports (see, for example, Ambroziak, 2013, 2016; Pawlak, 2014; Szczepaniak, 2015) agree that membership in the EU has become a very strong incentive for Poland to develop trade with EU countries and that Polish food producers have significantly improved their competitive position in the enlarged European Union market. Poland's integration with the EU has initiated the modernization of Polish agri-food companies, also through the inflow of foreign direct investment and modern technologies (Firlej, 2010; Łapińska, 2014).

In general, the subject literature divides a country's measures and methods of assessing the competitive position into two categories. The first refers to the efficiency of a country's functioning in the international exchange of goods and services (measures and methods of assessing the ability to sell). The other includes measures and methods of assessing the attractiveness of a country's mobile production factors (the ability to attract) and of maintaining international technological competitiveness (Misala, 2007).

This paper focuses on evaluating the competitive position of Poland by means of selected measures belonging to the first group, which were applied to agri-food trade exchange with the United Kingdom. The assessment of the competitive position was preceded by a brief presentation of the results of foreign trade in this type of products with the United Kingdom.

The study covered the goods belonging to the SITC 0, SITC 1 and SITC 4[4] sections for the years 2004-2016. These three sections cover all agri-food products. The analyses conducted were based on statistical data published by Eurostat[5].

To assess the competitive position of countries participating in international trade, analysis of the level of revealed comparative advantages is often applied. The output of world science in the field of the methods of calculating comparative advantages is significant (see, for example, Balassa, 1965; Vollrath, 1991; Hoen, Oosterhaven, 2006). In this work, two mutually complementary indexes were used to evaluate the comparative advantages. The first of these is the RCA_i index, constructed in accordance with the Grupp-Legler formula (Gehrke Grupp, 1994):

$$\mathrm{RCA_i} = \ln\left(\frac{\mathrm{x_i}}{\mathrm{m_i}} : \frac{\mathrm{X}}{\mathrm{M}}\right), \tag{1}$$

where:
x_i – exports of product (group of products) i,
m_i – imports of product (group of products) i,
X – country's total exports,

[4] Standard International Trade Classification (SITC) – a classification, which is used to provide aggregated data. Aggregated data on trade are often presented in the one- or two- and three-digit categories of the SITC. An example of a one-digit category (section) is SITC 1 'food and live animals' and of a two-digit category (divisions) is 01 'meat and meat preparations' and three-digit category (groups) SITC 022 'milk and cream'.
SITC Rev. 4 was accepted by the United Nations Statistical Commission. It comprises 2 970 basing headings which are amalgamated into 262 groups, 67 divisions and 10 sections.
[5] Eurostat Database, http://ec.europa.eu/eurostat/data/database.

M – country's total imports.
The other index is LFI_i – Lafay's formula (1992) modified by Bugamelli (2001):

$$\mathrm{LFI_i} = 100 \times \left(\frac{\mathrm{X_i - M_i}}{\mathrm{X_i + M_i}} - \frac{\sum_{i=1}^{N}(\mathrm{X_i - M_i})}{\sum_{i=1}^{N}(\mathrm{X_i + M_i})}\right) \times \frac{\mathrm{X_i + M_i}}{\sum_{i=1}^{N}(\mathrm{X_i + M_i})}, \quad (2)$$

where:
X_i – exports of product (group of products) i,
M_i – imports of product (group of products) i.

Both indicators are interpreted in the same way. A value greater than zero means the occurrence of a revealed comparative advantage. It also indicates its intensity. A negative value of the indicator means no comparative advantage.

The revealed comparative advantages were designated for product groups according to the SITC nomenclature. The first of the indexes (RCA_i) was used to assess the competitiveness of agri-food products in total trade volume with the United Kingdom. The second indicator (LFI_i) was used to assess the competitiveness of individual products (SITC three-digit groups) by examining it only against trade in agri-food products (also with the United Kingdom only). In the second case, it was assumed that $\sum_{i=1}^{N}(X_i + M_i)$ and $\sum_{i=1}^{N}(X_i - M_i)$ will only represent the turnover and balance in trade in agri-food products, and not Poland's total trade with the United Kingdom.

Agri-food trade with the United Kingdom – selected aspects

The United Kingdom is one of Poland's most important trading partners. In terms of its volume of exports, it is the second largest trading partner for Poland, with a 6.7% participation, following Germany which has 27.1%. The United Kingdom is also one of the major sources of imports to the Polish market. Its share in Poland's imports is 2.7%[6], (Rocznik Statystyczny Handlu Zagranicznego, 2016).

In the years 2004-2016 there was a significant increase in the Polish-British trade turnover. The total value of Poland's exports to the British market almost quadrupled, from 3.3 billion EUR to 12.1 billion EUR, while the value of imports from the United Kingdom almost doubled – from EUR 2.5 billion to EUR 5.1 billion.

Bilateral trading developed particularly well in the section that included machines, equipment and transport equipment. The turnover of these types of products accounted for almost 6.8 billion EUR (exports – 5.1 billion EUR, imports – 1.7 billion EUR), which constituted over 40% of Poland's total trade with the United Kingdom in 2016. Agri-food products were also an important commodity group in the Polish-British trade. In 2016, Polish exports of food products to the United Kingdom accounted for nearly 2.1 billion EUR, while imports were 0.5 billion EUR.

The share of these types of products in trade exchange between Poland and the United Kingdom significantly increased throughout the period considered. On the import side, the share of agricultural and food products increased by 7.6 percentage points in the years 2004-2016, reaching the level of 10.6%. Regarding Poland's exports to the United

[6] The most important suppliers of goods to the Polish market include Germany with a 22.9% share, China – 11.6%, Russia – 7.3% (Rocznik Statystyczny Handlu Zagranicznego, 2016).

Kingdom, the share of agricultural and food products increased in the same time period by 8.4 percentage points to 17.6% (see Table 1.)

Between 2004 and 2016 the value of Polish-British trade in agri-food products increased over seven-fold – from 372.5 million EUR to 2,665.5 million EUR. The dynamics of import and export growth was similar (see Table 1). Imports increased from 73.8 million EUR to 542.8 million EUR, while exports from EUR 298.7 million to EUR 2,122.7 million.

Table 1. Foreign trade between Poland and the United Kingdom in agri-food products in the years 2004-2016

Specification	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Imports													
Value (in mln EUR)	73.8	100.3	131.0	185.9	269.8	312.4	328.5	395.9	376.3	414.8	452.3	500.6	542.8
Previous year=100	123.3	135.9	130.6	141.9	145.1	115.8	105.1	120.5	95.0	110.2	109.0	110.7	108.4
Year 2004=100	100.0	135.9	177.5	251.9	365.6	423.4	445.2	536.6	509.9	562.2	613.0	678.4	735.6
Share of agri-food products in total trade (in %)	3.0	3.9	4.3	5.1	6.8	9.3	8.2	9.5	9.5	9.6	9.9	9.7	10.6
Exports													
Value (in mln EUR)	298.7	397.8	540.8	742.9	813.9	790.3	935.5	1027.6	1322.9	1521.8	1676.7	2016.8	2122.7
Previous year=100	167.5	133.2	135.9	137.4	109.5	97.1	118.4	109.8	128.7	115.0	110.2	120.3	105.3
Year 2004=100	100.0	133.2	181.0	248.7	272.4	264.5	313.1	344.0	442.8	509.4	561.2	675.1	710.5
Share of agri-food products in total trade (in %)	9.2	9.9	10.7	12.2	12.2	12.6	12.4	11.8	13.6	15.2	15.9	16.7	17.6
Balance													
Value (in mln EUR)	225.0	297.5	409.8	557.1	544.1	477.9	607.0	631.7	946.6	1107.0	1224.4	1516.2	1580.0
The level of covering the import by export (%)	404.9	396.6	412.8	399.7	301.7	252.9	284.8	259.5	351.6	366.9	370.7	402.9	391.1

Source: Authors' own calculations based on Eurostat, http://ec.europa.eu/eurostat/data/database.

This bilateral trade turnover was growing markedly by the end of 2007. Poland's exports of food and beverage products to the United Kingdom increased by an annual average of 43.5%, while imports to Poland by 32.9%. From 2008, as a result of the economic slowdown triggered by the global financial crisis, the pace of growth of cross-border trade was decreasing. A significant drop in exports of Polish goods to the British

market occurred in 2009. The value of Polish exports of agri-food products to the United Kingdom decreased by 23.6 million EUR compared to 2008.

In the following years, despite the initially difficult economic situation in the world, there was a revival of Polish-British trade in agri-food products. In the years 2011-2016 the value of Poland's exports to the United Kingdom was increasing by 14.8% annually, while import of British goods to the Polish market was rising by 9% annually.

Evaluation of the competitive position of Poland's agri-food trade – analysis of selected indexes

The most frequently used and at the same time the easiest indexes used for assessing the competitive position of a country in foreign markets are the development of trade balance volume and export-import relations in trade in particular goods or groups of goods. Over the period under review, Poland had a surplus in bilateral trade in agri-food products with the United Kingdom. In 2004 the positive balance amounted to EUR 225 million. In subsequent years, this positive balance in trade in agri-food products increased significantly. In 2016 Poland achieved a trade surplus of 1,580 million EUR in trade with the United Kingdom. The degree of coverage of imports by exports in the agri-food products trade was extremely favourable for Poland over the whole period considered. In the last year of the studied period, export revenue exceeded more than four times the value of imports.

Table 2. The revealed comparative advantage indexes RCAi in trade in agri-food products between Poland and the United Kingdom in the years 2004-2016 according to the SITC classification

SITC	Specification	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
001	Live animals	-1.33	-1.56	-2.32	-1.93	0.51	0.08	-1.54	-5.36	-2.18	-2.07	-3.07	-6.02	-5.26
011	Meat of bovine animals, fresh, chilled or frozen	(.)	4.73	3.46	3.19	2.78	1.80	0.42	0.54	1.08	1.42	1.18	1.62	1.61
012	Meat and edible meat offal, fresh, chilled or frozen (except meat of bovine animals)	1.10	0.75	1.03	0.35	-0.40	-0.50	-0.40	-0.32	-0.39	-0.28	-0.09	0.17	0.27
016	Meat and edible meat offal salted, dried or smoked	-0.08	4.29	(.)	(.)	4.45	4.49	6.88	5.66	5.69	6.80	6.92	7.83	6.27
017	Meat and edible meat offal, n.e.s.	5.23	2.43	3.98	3.41	3.39	4.47	6.06	5.20	5.40	5.30	5.71	5.65	5.36
022	Milk and cream	3.72	4.45	2.61	2.51	2.25	2.07	1.98	1.93	1.45	2.47	2.03	2.16	1.67
023	Butter	4.83	(.)	-0.04	4.12	3.94	0.00	0.47	-0.98	-0.46	-0.20	0.01	0.30	0.00
024	Cheese and curd	2.35	2.33	1.58	2.37	2.83	2.29	2.43	1.27	1.14	0.89	1.30	0.75	0.90
025	Eggs fresh	1.27	0.71	2.57	8.61	0.56	8.54	2.59	3.03	1.41	3.22	3.95	3.88	2.92
034	Fish fresh, chilled or frozen	0.85	0.67	0.55	0.44	0.76	0.33	-0.77	-1.17	-1.15	-1.15	-1.29	-1.01	-1.10
035	Fish dried, salted, smoked	-1.91	-3.51	-1.18	4.87	2.40	2.92	4.00	3.11	3.71	4.09	3.91	3.29	1.73
036	Crustaceans and molluscs (also in shell)	(.)	(.)	-4.11	-5.66	-5.18	(.)	(.)	-9.43	-3.64	-8.14	-12.9	-8.30	-7.41
037	Fish, crustaceans and molluscs prepared or preserved	0.17	0.71	4.19	5.85	3.54	3.60	3.00	3.30	2.79	3.02	1.85	3.82	2.78

041	Wheat	(.)	-2.06	(.)	(.)	(.)	0.42	1.84	-5.96	2.96	4.57	4.25	5.44	8.26
042	Rice	-4.34	-3.94	-1.54	-0.68	0.23	-0.01	-0.33	-0.31	0.84	-0.25	0.16	-0.50	-0.26
043	Barley, unmilled	(.)	(.)	-9.18	-10.5	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	-6.49
044	Maize	(.)	(.)	(.)	(.)	(.)	(.)	(.)	8.61	(.)	8.25	-1.39	(.)	(.)
045	Cereals, unmilled	(.)	(.)	(.)	(.)	3.22	(.)	(.)	-0.82	2.74	5.80	-0.20	(.)	1.61
046	Meal and flour of wheat	-1.94	0.18	4.39	3.63	2.61	3.18	2.32	1.59	0.96	1.29	2.42	1.40	1.38
047	Cereal meals and flours	-3.06	-2.62	-1.58	0.08	1.01	2.96	3.51	3.98	1.46	2.00	3.10	2.60	2.53
048	Cereal preparations and preparations of flour	0.92	1.53	1.30	1.73	1.26	1.06	1.23	0.86	0.50	1.02	1.17	1.28	1.54
054	Vegetables fresh, chilled or frozen	3.48	3.26	2.80	3.05	3.31	3.28	2.29	1.43	2.51	2.49	1.80	2.03	2.09
056	Vegetables root and tubers, prepared	2.46	0.85	1.10	2.11	1.88	1.72	2.06	1.66	2.19	2.33	2.67	2.20	1.54
057	Fruit and nuts fresh or dried	2.77	2.79	2.72	1.72	0.41	0.58	0.25	-0.10	0.34	-0.02	-0.12	-0.22	-0.19
058	Fruit preserved and fruit preparations	2.64	1.68	2.11	2.33	1.69	1.19	1.49	1.32	1.27	1.37	1.18	1.12	1.19
059	Fruit juices and vegetable juices	3.92	2.74	5.04	3.64	4.99	3.20	1.23	1.31	2.98	2.66	2.34	1.79	2.05
061	Sugar, molasses and honey	3.12	2.21	1.53	1.63	0.03	-0.42	0.24	-1.07	-0.27	0.37	0.17	0.33	0.29
062	Sugar confectionery	0.54	0.83	1.06	1.15	1.49	1.62	1.55	1.01	1.01	0.85	0.73	1.13	0.65
071	Coffee and coffee substitutes	-2.43	-2.61	-1.74	-1.20	-1.18	-1.30	-1.45	-1.51	-1.66	-1.37	-0.79	-0.33	-0.40
072	Cocoa	-9.80	-6.43	-1.66	-5.30	-4.94	-4.32	-4.90	-5.12	-2.99	-1.22	-0.43	-3.25	-2.97
073	Chocolate and other food preparations containing cocoa	1.41	1.34	2.83	3.08	2.52	2.85	3.53	2.61	2.00	1.81	1.69	1.34	1.15
074	Tea	-1.74	-0.51	-0.59	-0.68	-1.01	-2.77	-2.25	-1.75	-0.39	0.72	1.19	0.13	1.12
075	Spices	-2.88	-0.21	-0.42	0.63	0.20	0.33	0.11	0.00	-0.87	-0.60	0.64	0.20	0.24
081	Feeding stuff for animals	0.82	0.72	-0.55	-0.54	-0.58	-1.88	0.26	-0.10	-0.41	-0.19	-0.47	-0.33	-0.63
091	Margarine and shortening	-7.43	-4.30	-2.16	0.58	-0.21	-1.21	-2.86	-2.26	-0.79	-0.81	-0.85	-0.09	0.76
098	Edible products and preparations, n.e.s.	0.65	0.68	0.24	0.24	0.48	0.66	0.61	0.56	0.54	0.64	0.49	0.25	-0.04
111	Non-alcoholic beverages	6.81	3.69	3.95	3.28	2.39	1.56	1.52	1.65	2.02	2.62	3.58	2.94	2.70
112	Alcoholic beverages	-0.43	-0.93	-0.40	-0.83	-1.21	-1.93	-2.43	-3.82	-3.41	-3.14	-2.44	-2.22	-2.12
121	Tobacco unmanufactured; tobacco refuse	-8.68	-2.52	0.69	0.17	-1.68	-3.59	-2.53	-3.11	-1.39	-4.04	-6.44	-5.39	-5.79
122	Tobacco manufactured	-5.36	-0.34	1.52	2.99	1.06	1.49	4.19	7.15	1.03	0.80	1.14	0.97	0.71
411	Animal oils and fats	-5.01	-3.53	-1.95	-0.33	-0.60	-1.57	-1.58	-1.37	-1.43	-0.66	-1.05	-0.67	-1.05
421	Fixed vegetable fats, and oils “soft”, crude, refined	-6.90	-4.90	-1.96	-1.84	-0.70	3.22	1.74	-1.95	-2.76	-1.90	-1.63	-1.68	-1.05
422	Fixed vegetable fats, and oils crude, refined other than “soft”	-7.55	-8.31	-5.61	-3.70	-2.68	-3.57	-3.20	-3.05	-2.89	-3.13	-4.09	-3.28	-3.36
431	Animal or vegetable fats and oils processed	-8.72	(.)	-6.71	-5.12	-4.74	-4.38	-3.87	-3.47	-3.94	-1.72	-3.76	-4.70	-4.29

(.) – data not available.

Source: Authors’ own calculations based on Eurostat, http://ec.europa.eu/eurostat/data/database.

Table 3. The revealed comparative advantage indexes LFIi in trade in agri-food products between Poland and the United Kingdom in the years 2004-2016 according to the SITC classification

SITC	Specification	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
001	Live animals	-0.24	-0.17	-0.12	-0.22	0.00	-0.01	-0.10	-0.40	-0.15	-0.23	-0.41	-0.45	-0.48
011	Meat of bovine animals, fresh, chilled or frozen	(.)	0.65	0.31	0.31	0.53	0.47	0.00	0.15	0.46	0.54	0.40	0.73	0.74
012	Meat and edible meat offal, fresh, chilled or frozen (except meat of bovine animals)	-0.10	-1.06	0.60	-4.01	-7.21	-5.93	-6.26	-3.76	-4.45	-4.02	-3.17	-1.96	-1.19
016	Meat and edible meat offal salted, dried or smoked	-0.01	0.01	(.)	(.)	2.86	3.40	3.04	2.87	2.03	2.15	2.14	1.62	1.45
017	Meat and edible meat offal, n.e.s.	3.13	0.93	1.46	2.05	2.42	2.92	3.22	3.82	2.94	3.19	3.40	3.40	3.57
022	Milk and cream	0.16	0.33	0.27	0.28	0.28	0.38	0.45	0.53	0.32	0.62	0.54	0.55	0.58
023	Butter	0.06	(.)	-0.07	0.10	0.07	-0.02	0.00	-0.23	-0.10	-0.10	-0.06	-0.02	-0.08
024	Cheese and curd	0.15	0.43	0.09	0.34	0.76	0.58	0.53	0.50	0.36	0.28	0.43	0.12	0.22
025	Eggs fresh	0.01	-0.01	0.07	0.13	0.00	0.11	0.08	0.11	0.20	0.12	0.14	0.13	0.13
034	Fish fresh, chilled or frozen	-1.03	-0.83	-1.31	-0.99	0.32	0.05	-2.27	-3.02	-2.87	-3.23	-4.06	-1.72	-2.28
035	Fish dried, salted, smoked	-0.01	-0.01	-0.01	0.10	0.05	0.31	0.31	0.19	0.19	0.19	0.24	0.22	0.09
036	Crustaceans and molluscs (also in shell)	(.)	(.)	0.00	-0.08	-0.08	(.)	(.)	-0.02	-0.04	-0.08	-0.12	-0.05	-0.12
037	Fish, crustaceans and molluscs prepared or preserved	-0.02	-0.01	0.79	1.37	1.39	1.66	1.49	1.29	1.03	0.86	0.74	0.76	0.75
041	Wheat	(.)	0.00	-0.10	(.)	(.)	0.00	0.02	-0.37	0.50	0.23	0.22	0.10	0.06
042	Rice	-0.01	-0.03	-0.01	-0.01	0.00	0.00	-0.01	0.00	0.00	-0.01	-0.01	-0.06	-0.02
043	Barley, unmilled	(.)	(.)	-0.35	-0.07	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	-0.02
044	Maize	(.)	(.)	(.)	(.)	(.)	(.)	(.)	0.05	(.)	0.25	-0.09	(.)	(.)
045	Cereals, unmilled	(.)	(.)	(.)	(.)	0.01	(.)	(.)	0.00	0.00	0.00	0.00	(.)	0.00
046	Meal and flour of wheat	-0.05	-0.01	0.01	0.04	0.10	0.16	0.16	0.12	0.05	0.07	0.13	0.07	0.06
047	Cereal meals and flours	-0.12	-0.14	-0.10	-0.04	0.02	0.03	0.05	0.06	0.02	0.05	0.04	0.05	0.05
048	Cereal preparations and preparations of flour	-0.22	0.61	0.57	1.18	1.15	1.48	1.43	1.19	0.21	0.82	1.12	1.19	1.81
054	Vegetables fresh, chilled or frozen	2.89	4.40	3.56	3.39	3.79	3.40	2.68	1.95	2.08	1.84	1.50	1.46	1.50
056	Vegetables root and tubers, prepared	0.21	-0.03	0.04	0.38	0.55	0.54	0.52	0.49	0.43	0.47	0.52	0.43	0.31
057	Fruit and nuts fresh or dried	0.42	0.57	0.68	0.44	-0.10	0.20	-0.11	-0.21	-0.01	-0.35	-0.51	-0.69	-0.49
058	Fruit preserved and fruit preparations	1.02	0.66	0.80	0.72	0.80	0.57	0.54	0.59	0.53	0.46	0.39	0.30	0.32
059	Fruit juices and vegetable juices	1.21	1.34	1.73	1.32	2.22	1.56	0.64	0.76	1.32	1.47	0.80	0.44	0.55
061	Sugar, molasses and honey	0.70	0.35	0.20	0.17	-0.14	-0.58	-0.08	-0.61	-0.36	-0.03	-0.09	-0.05	-0.05
062	Sugar confectionery	-0.26	-0.02	0.04	0.07	0.23	0.28	0.25	0.20	0.16	0.10	0.07	0.18	0.05
071	Coffee and coffee substitutes	-3.19	-3.50	-2.84	-2.57	-2.29	-1.91	-2.34	-2.40	-3.20	-2.73	-1.27	-0.64	-0.65
072	Cocoa	-1.39	-0.57	-0.13	-0.80	-0.83	-0.60	-0.66	-0.99	-0.21	-0.03	-0.01	-0.30	-0.18
073	Chocolate and other food preparations containing cocoa	0.58	0.95	2.57	1.79	2.67	3.92	5.98	6.86	4.97	4.11	3.37	2.60	2.04
074	Tea	-0.40	-0.18	-0.14	-0.19	-0.52	-2.82	-3.37	-2.76	-0.39	0.07	0.18	-0.09	0.14
075	Spices	-0.02	-0.01	-0.03	-0.01	-0.02	0.00	-0.01	-0.01	-0.11	-0.10	0.01	-0.02	-0.02
081	Feeding stuff for animals	-0.92	-0.47	-4.41	-1.98	-1.48	-6.77	-0.13	-0.20	-0.49	-0.61	-1.08	-0.86	-1.13
091	Margarine and shortening	-0.29	-0.06	-0.09	0.00	-0.05	-0.33	-0.89	-1.34	-0.37	-0.34	-0.39	-0.25	0.06

098	Edible products and preparations, n.e.s.	-1.47	-0.72	-1.66	-1.56	-0.30	0.86	0.46	0.88	0.39	0.38	0.04	-0.71	-1.27
111	Non-alcoholic beverages	1.26	1.16	1.19	0.68	0.87	0.65	0.46	0.48	0.45	0.56	0.62	0.57	0.57
112	Alcoholic beverages	-1.95	-3.49	-3.05	-4.21	-4.37	-3.98	-4.87	-5.68	-5.69	-6.48	-4.56	-4.69	-5.00
121	Tobacco unmanufactured; tobacco refuse	-0.14	-0.12	-0.01	-0.01	-1.34	-1.16	-1.46	-1.14	-0.05	-0.34	-0.62	-1.99	-1.87
122	Tobacco manufactured	-0.09	-0.03	0.20	0.69	0.27	0.83	0.70	0.82	0.31	0.21	0.42	0.48	0.34
411	Animal oils and fats	-0.44	-0.38	-0.25	-0.11	-0.12	-0.25	-0.17	-0.13	-0.19	-0.07	-0.09	-0.06	-0.10
421	Fixed vegetable fats, and oils "soft", crude, refined	-0.04	-0.08	-0.02	-0.01	-0.05	0.56	0.18	-0.44	-0.69	-0.12	-0.53	-0.55	-0.24
422	Fixed vegetable fats, and oils crude, refined other than "soft"	-0.26	-0.24	-0.16	-0.09	-0.12	-0.15	-0.18	-0.09	-0.10	-0.07	-0.25	-0.12	-0.16
431	Animal or vegetable fats and oils processed	-0.44	(.)	-0.40	-0.15	-0.14	-0.08	-0.12	-0.08	-0.12	-0.11	-0.13	-0.13	-0.12

(.) – data not available.
Source: Authors' own calculations based on Eurostat, http://ec.europa.eu/eurostat/data/database.

By analysing RCA_i values set for trade with the United Kingdom (see Table 2), it can be seen that in the period considered Poland had a relative advantage for most agri-food products. A particularly high surplus was observed in the case of trade in less processed goods, *e.g.*, meat and edible offal (RCA_{016} = 6.27, RCA_{017} = 5.36, in 2016) and wheat (RCA_{041} = 8.26).

Good results obtained in this area were a consequence of the price advantage of Polish meat and grain producers. These advantages were achievable mainly due to Poland's lower labour costs and prices of land, as compared with those in the UK. According to a study carried out by Judzińska (2014), the production of poultry meat was characterized by high price competitiveness, especially after 2013. At that time, the price of poultry meat on the UK market increased by 8%, which allowed Polish producers to gain a very competitive position in the market.

Poland also had significant advantages in non-alcoholic beverages (RCA_{111} = 2.70, in 2016) and fruit juices and vegetable juices (RCA_{059} = 2.05). In this segment, price advantages were of key importance. According to studies conducted by Kozień (2014), investments made in the non-alcoholic beverage and fruit and vegetable processing industries contributed significantly to the increase in productivity and the attractiveness of selections to customers, not only on the domestic market but also on foreign ones, including the UK market.

A relatively favourable situation also occurred in the field of dairy products, especially in the milk and cream commodity group (RCA_{022} = 1,67, in 2016) and the eggs group (RCA_{025} = 2,92, in 2016). Slight relative advantages (RCA_i < 1) were found for the following products: cheese and curd, sugar, molasses and honey, spices, margarine and shortening, manufactured tobacco.

Lack of comparative advantages occurred for all goods included in the SITC 4 section – animal or vegetable oils, fats and waxes, and alcoholic beverages. Also, Poland did not have any comparative advantage in live animals, crustaceans and molluscs prepared or preserved, coffee and cocoa.

Analysis of the LFI_i index that was used to examine the competitiveness of individual commodity groups in Polish-British trade, in the context of bilateral trade in merely agri-food products, in principle, confirms the earlier conclusions. Poland's comparative advantages in this bilateral trade emerged in almost the same product groups. In some cases, however, there were some differences with regard to their level. This is completely

justified due to the specific design of the LFI_i index. In Poland, the SITC 017 – meat and edible meat offal, n.e.s. (LFI_{017} = 3.57, in 2016) had a very high level of comparative advantages, when compared against the results of the agri-food sector. A slightly higher index level was also noted for trade in chocolate and other food preparations containing cocoa and cereal preparations and preparations of flour (see Table 3).

Analysis of the comparative advantages in agri-food products trade shows that in the years 2004-2016, trade in products from the SITC 4 section – animal or vegetable oils, fats and waxes exhibited the most advantageous situation among all agri-food products, and in particular SITC 431 – animal or vegetable fats and processed oils and SITC 422 – fixed vegetable fats and oils, refined other than 'soft'. Unfavourable LFI_i levels could be found in trade in tobacco, alcohols and live animals.

Conclusions

The presented results of the analysis showed that during its period of EU membership, Poland's competitive position in trade in agri-food products with the United Kingdom improved. This is evidenced by the dynamically growing trade volume as well as by the positive trade balance that continues to increase from year to year. An improvement in the competitive position is also confirmed by the analysis made with the use of the comparative advantage indexes.

Particularly high levels of indicators were achieved in the meat and cereal-grain products and non-alcoholic beverages categories.

As follows from a number of studies (see, for instance Ambroziak, 2013; Pietrzak, Łapińska, 2015; Szczepaniak, 2014) the increase in the competitiveness of Polish products on the EU market, including the UK market, was mainly due to the price advantage of Polish food producers. Also, qualitative advantages related to the use of high quality raw materials in production and modern manufacturing technologies contributed significantly.

The analyses conducted also show that in some product groups Poland did not have, or had lost, its previously possessed comparative advantages (see, for instance, SITC 034 – fish fresh, chilled or frozen, SITC 057 – fruit and nuts fresh or dried) in trade with the UK. However, it is worth emphasizing that the share of trade in products in which the comparative advantage ratios were negative was decreasing systematically. This, in turn, translated into an improvement in the balance of agricultural and food products in the Polish-British trade.

The increase in the competitiveness of Polish products on the British market was primarily due to the price advantage of Polish food producers. Noteworthy were the qualitative advantages associated with the use of high quality raw materials for production and modern manufacturing technologies.

The United Kingdom is a country, which, after EU enlargement, has become the most important migration destination for citizens of many countries. In this context, it is worth pointing out that the significant growth of Polish agri-food exports to the United Kingdom is also related to this fact. After Poland's accession to the European Union, Polish citizens were very willing to migrate to this country. Many of them set up their own companies to import Polish goods to the British market. Polish products through their presence on the British market gained new loyal buyers and these buyers were not only of Polish origin.

In 2016, in a referendum on the United Kingdom's membership in the European Union, the British voted in favour of leaving the Community. For the time being it is not clear when this will happen and how the whole procedure will be carried out.

Certainly, significant changes should be expected in terms of migration and social policies. They will also affect Polish citizens. In the most pessimistic scenario, people who have lived only a short time in the UK and do not have a permanent residence permit may be asked to leave the country. In truth, this will likely depend on how much they will be needed on the UK labour market. In this context, it is worth pointing out that Polish citizens make up an important group of buyers on the British market that buy Polish food products. Thus, they contribute significantly to the achievement of favourable results in food products trade with the UK.

Difficulties may also be encountered by people who have established their businesses in the UK. Poles were eager to set up businesses in the UK because of a friendly tax system. Such benefits may also be lost. In the context of foreign trade, it is worth remembering that Polish companies provide services on the British market, selling Polish products, including agricultural and food products. At the same time, they promote brands that are highly respected and trusted by customers in Poland.

Leaving the EU also means a change in the rules that will apply to trade between the UK and the EU. It is difficult to assess now the possible effects of the return of restrictions on the flow of goods and capital. Great Britain will most likely seek to sign a new economic cooperation agreement with the EU. However, it cannot be ruled out that a possible consensus will not be reached.

The economic relations between the United Kingdom and EU countries, including Poland, are quite strong. As a result, both sides have a lot to lose. However, it seems that the situation of Poland is more difficult. The huge surplus in foreign trade makes Poland more dependent on exports to the United Kingdom than on imports from that country. By the asymmetry of export indexes, Poland's bargaining position in negotiations with the United Kingdom is going to be much weaker.

Agri-food products comprise an important group of exported products. If the United Kingdom leaves the common market and the customs union, then its trade with the EU will follow the WTO rules. The agri-food sector is likely to lose a lot (Rosati, 2016). It cannot be ruled out that the current extremely favourable situation for Poland in the foreign trade in agri-food products with the United Kingdom may change.

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Perspectives of Agritourism Development in Poland, Belarus and Ukraine

Abstract. Agritourism is a form of leisure, which is increasingly popular. The aim of the article is to present perspectives on the development of agritourism in three countries: Poland, Belarus and Ukraine. The analysis was based on statistical data and the author's own observations. The article also includes a SWOT analysis. The analysis, own observations and observations indicate that in all three countries agritourism has a chance for development. The analysed countries differ in their tourist potential, infrastructure, landscape values, monuments, but one thing they do - tourists want to visit them.

Key words: agritourism, Poland, Belarus, Ukraine, perspective, SWOT analysis

JEL Classification: Z32

Introduction

Agritourism is a form of leisure that is inextricably linked with countryside and agriculture. The offer is predominantly aimed at people living in cities, who have to cope with noise, haste, polluted environment on a daily basis, and need peace and quiet, appropriate conditions to relax in the great outdoors. People are drawn from cities to rural areas by the nature of this form of leisure and the possibility of interacting with nature, and by the possibility to consume Earth's produce and to learn about regional cuisine or tradition. Agritourism constitutes an additional source of income for agricultural societies; it allows them to use the surplus workforce, improves the rural infrastructure, reinvigorates rural areas. It is conducive to improving the quality of life of people living in rural areas, helps them make investment decision and enrich life in a village. It enables a very important cultural exchange of thoughts, views, ways of life.

In agritourism, special attention should be paid to the accommodation providers' potential, which cannot be explicitly defined, presented in a list and evaluated. It is the way in which hosts (accommodation providers) wish to welcome their guests; how they want to make each stay special, to satisfy the guests and make them return to a given agritouristic farm—it is the strength of such enterprises.

Agritourism is a subject of study of many authors, very popular in the world of science. It also constitutes an important research issue of a cognitive, as well as applicational nature.

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Data and methods

This article attempts to, on the one hand, show the current agritourism development status and, on the other hand, determine perspectives of its development in the future. The objective of the article was to present the perspectives of agritourism development in three countries: Poland, Belarus and Ukraine. The considerations were based on data processing methods, i.e. analysis and synthesis. A SWOT analysis of agritourism development in Poland, Belarus and Ukraine has been prepared for the article. The analysis used data from:
– Central Statistical Office (Poland),
– Statistical Office in Ukraine,
– Statistical Office in Belarus,
– available papers and analyses,
– the Author's own observations conducted in Poland and in Ukraine[2].

Agritourism: its nature and definition methods

Agritourism began its large-scale development in mid-1990s. Back then, it constituted an alternative or primary source of income for agricultural families. To date, it can provide a possibility of making money by hosts whose agricultural income is insufficient to provide for their families (Roman, Niedziółka, 2017, p. 19).

There are many definitions of agritourism; Drzewiecki's definition appeared first. According to him, agritourism is a form of leisure in rural areas of an agricultural nature, based on accommodation services, and often also on catering. It constitutes a form of recreational activity related to agricultural farms and their environments: natural, production and services (Drzewiecki, 1995, p. 27).

Agritourism is a part of rural tourism. Its offer consists of a stay at a farm (lodging), which can be connected (depending on conditions) with meals throughout the day, or a possibility of buying fresh products from the farm to prepare meals on one's own. Agritourism also involves borrowing a horse, carriage, sports equipment, organizing sleigh rides, selling handicrafts, etc. It also covers enabling tourists to fish, hunt, collect and dry herbs, fruit and mushrooms, ride on horseback, etc. Provided that it's related to agricultural farms (Wiatrak, 1996, p.35).

J. Sikora's definition is different: Agritourism is a specific type of rural (alternative) tourism, organized by agricultural families using housing and vacation resources of an agricultural farm, and environmental, cultural and infrastructural resources of the village and its region (Sikora, 2012, p. 65).

Agritourism is a sector of the tourism industry, focusing on using natural, sociocultural, cultural, historical, and other resources in a village, and taking advantage of its nature to create a comprehensive touristic product (Belova, Komova, 2011, p. 13-16). A complex touristic product is understood as a set of tangible and intangible assets (goods and services) that constitute a particular objective for its guests.

Czerwiński proposes an interesting take; he states that agritourism is a bridge connecting cities and villages, facilitating establishing closer ties with the rural community,

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allowing to explore (guest) and cultivate (host) folk traditions and rural lifestyle, while, for the farms, it is an additional source of income from renting accommodations, feeding tourists, and selling agricultural products (Czerwiński, 2015, p. 193).

Agritourism differs from other forms of tourism by (Mikuta, Żelazna, 2004, p. 48):

- space – a village provides tourists with: freedom, unpolluted environment, clean water, close contact with nature, first-hand exposure to cultural and historical heritage;
- existence of agricultural farms and the rhythm of life and work therein – a farm offers a possibility of accommodation and living together with the family that runs it. It allows contact with animals, participating in farm activities, gives the possibility to eat healthy food;
- characteristic rural life – each region has a unique nature (monuments, folk artists, specific festivities);
- stay costs – tourists can be offered various discounts (helping at the farm in exchange for discounts, unassisted preparation of meals, buying cheaper food).

Another method of defining agritourism splits the meaning of the term agritourism into an objective one, which treats agritourism as a form of entrepreneurship of farmers providing services for tourists, and a subjective one, which describes agritourism from the point of view of its participants, i.e. customers of agritouristic farms (Czerwińska-Jaśkiewicz, 2013, p.14). Another approach that also splits the definition of agritourism is presented by Balińska, involving the perspective of supply and demand (Balińska, 2016, p. 102). Thus, from the point of view of tourism supply, agritourism is a form of extra-agricultural activity of owners of agricultural or sustainable farms, which consists of equivalent performance of agricultural (production) and touristic functions, and providing tourists and guests with a wide variety of services based on the potential of the farm and its environment. From the point of view of tourism demand, agritourism is spending time at agritouristic farms, enabling us to learn the nature of living and working in a village, experience nature and culture, and perform various forms of leisure.

Agritourism in Poland, Belarus and Ukraine

By analysing the phenomenon of agritourism as exemplified by the three chosen countries, we can unequivocally state that this activity is growing in each country. We will begin analysing this issue with Poland. Table 1. shows agritouristic accommodations by province in 2015, according to the List of Tourism Facilities kept by commune offices. The number of accommodations and their placement indicate that this form of activity is being particularly developed in certain places in the country. These include the provinces: małopolskie (1273), warmińsko-mazurskie (764), pomorskie (687), dolnośląskie (597). There are also provinces with small numbers of agritouristic accommodations. These include: opolskie (107), lubuskie (123), łódzkie (152), kujawsko-pomorskie (211).

Variation in the amount of accommodations depends on various factors. They primarily include: landscape, cultural and historical qualities, motivation of owners of agricultural farms to undertake entrepreneurial activities.

In Poland, it is difficult to specify a precise number of agritouristic farms. This stems from the fact that their definitions are varied and, at the same time, no statistical studies are

conducted in this regard. According to the Central Statistical Office, there were 802 agritouristic farms in 2016 (CSO, 2016).

Table 1. Agritouristic accommodations in Poland by province in 2015, according to the List of Tourism Facilities kept by commune offices.

List	Agritouristic accommodations		Guest rooms	
	Facilities	Beds	Facilities	Beds
Total	7726	78808	16449	236609
Dolnośląskie	597	6463	1073	12772
Kujawsko-pomorskie	211	2297	89	1442
Lubelskie	447	3770	383	5813
Lubuskie	123	1265	109	1637
Łódzkie	152	1475	145	2423
Małopolskie	1273	15012	2961	42808
Mazowieckie	346	3363	456	5291
Opolskie	107	1093	82	1290
Podkarpackie	943	8037	312	3968
Podlaskie	592	5513	159	2392
Pomorskie	687	7500	5512	80477
Śląskie	387	4657	610	10553
Świętokrzyskie	289	2754	115	1484
Warmińsko-mazurskie	764	7092	369	4105
Wielkopolskie	427	4536	317	4474
Zachodniopomorskie	381	3981	3757	55680

Source: Agriculture and Food Economy, Anthology edited by the Institute of Agricultural and Food Economics, Warsaw, 2016, p. 128

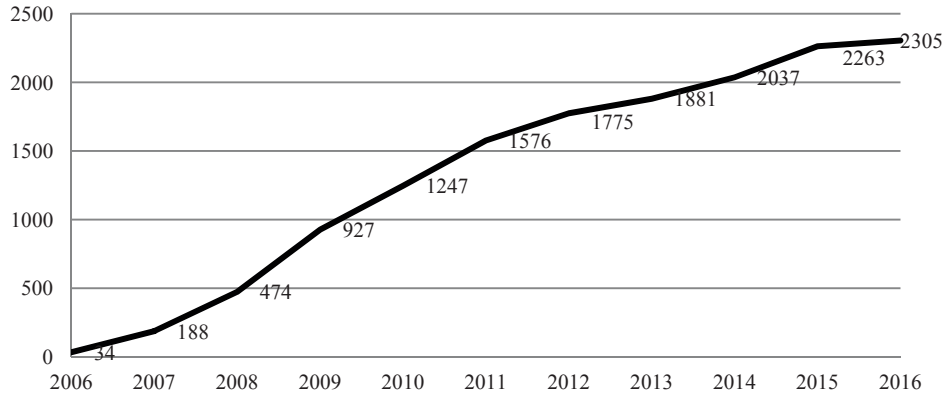

Fig. 1. Number of agritouristic farms in Belarus

Source: own work based on data from belsat.gov.by. Accessed on: 17 November 2017.

In Belarus, agritourism is being revived. Since 2006, the number of agritouristic farms increased significantly, which is clearly shown on graph 1. It's clear that in the last 10 years their number has increased significantly, from 34 farms in 2006 to 2305 in 2016.

Table 2 presents the number of agritouristic farms by region. It can be clearly seen that this number has increased by several hundred percent. The largest growth is in the Minsk region: from 7 agritouristic farms in 2006 to 613 in 2016, and in the Vitebsk region, correspondingly, from 5 to 612.

In Belarus agritourism, as a relatively new business, will rise from a promising level to a developed level, assuming a normally functioning legislation. Especially since the interest in rural tourism does not fade on the side of both owners of agritouristic farms and the country's guests and eager Belarusians. (Klicunova, 2014, p. 41).

Table 2. Number of agritouristic farms in Belarus by region

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Brest	4	32	75	146	151	178	199	253	296	346	353
Vitebsk	5	50	157	273	322	359	401	449	502	605	612
Gomel	5	11	31	60	131	332	358	289	228	196	189
Grodno	11	33	70	156	180	185	229	246	281	303	315
Minsk	7	48	125	214	255	304	412	482	541	597	613
Mogilev	2	14	16	78	208	218	176	162	189	216	223
Total	34	188	474	927	1247	1576	1775	1881	2037	2263	2305

Source: own work based on data from belsat.gov.by. Accessed on: 17 November 2017.

Agritourism is also being developed in Ukraine (Zaburanna, 2012, p. 409-413). According to the sources (Lytvyn, Nek, 2013, p. 81-88), main regions with concentration of agritourism are in the Carpathians, Crimea, and in Kyiv and Poltava regions. In 2012, their number equalled 1187 and is still rising. A big role is played by regional and local leisure centres in rural areas. Their tasks focus on providing information about the possibilities of leisure in rural areas, creating a positive image of the region, controlling the quality of touristic services in the region (Marina, 2015, s. 119-122). A significant part of them have been categorized The total categorization in Ukraine included 193 farms from 18 areas, including, with the basic certificate (the lowest): 83 farms, the first certificate: 19 farms, the second certificate: 37, the third (highest) certificate: 54 (www.greentour.com.ua).

Comparison of agritourism development capabilities in Poland, Belarus and Ukraine

In order to fully present the development capabilities of agritourism in the selected countries, a SWOT analysis was prepared, specifying strengths, weaknesses, opportunities and threats for the development of agritourism in Poland, Belarus and Ukraine.

Table 3. SWOT analysis for the development of agritourism in Poland, Belarus and Ukraine

STRENGTHS

Belarus	Poland	Ukraine
Farms situated in touristically attractive regions, large environment and landscape diversity		
Interesting monuments of culture and pieces of folk art		
Help in expanding the farm	Constantly developing transport, social and economic infrastructure	Favourable geopolitical location
Clean natural environment		Ukrainian cuisine
Relatively simple visa rules	Increased interest in regional culture	
Development of rural areas and renovation of villages		
Growing entrepreneurship among people living in rural areas	Dynamically growing accommodation services	Possibilities of development of many forms of tourism
Possibility of taking advantage of forest and water resources (country-wide)	Quality of accommodation services in line with global standards	Historical and cognitive value of the area
Possibility of obtaining a low-interest loan	State policy fostering the growth of small enterprises and EU help	Significant resources of the workforce
	Openness to change among people living in rural areas	Resources of investment areas
Rich cultural heritage (numerous monuments, archaeological sites, cultivating folk traditions)	Appropriate education of people living in rural areas	
	Possibility of joining agritouristic associations	Good soil conditions
Very good soil and water conditions and climate for the development of agriculture	Increasingly better awareness of the necessity to categorize rural accommodation services	Rich cultural heritage
	Simple procedure for establishing an agritouristic farm	

WEAKNESSES

Belarus	Poland	Ukraine
Focus on agritouristic product only on the country level	Insufficient level of tourism infrastructure in rural areas	
No agritouristic associations	Increasingly large number of people outside agriculture decide to run a tourism business	Slow investment speed
Partial depopulation of villages	Slightly detrimental demographic situation in the country	Tourism is not financed by the state
Complex visa system	Insufficient experience of accommodation providers	Low development level of IT
Weak promotion and marketing, both domestic and international		Unfavourable impact of political and economic conditions
	Poor acquisition of EU funds	
Low development level of IT	Not all farms belong to associations	Large disproportion between the price and the quality of service
Uneven development of rural areas on the national level		
Poor knowledge of foreign languages among accommodation providers		
Still insufficient desire to care about service quality (categorization)		
Insufficient use of accommodations outside the season		
High level of unemployment in rural areas		
No openness to disabled tourists		
Insufficient qualifications to run such business		

OPPORTUNITIES

Belarus	Poland	Ukraine
Rapid development of technical, social, economic and tourism infrastructure		
Ability to receive additional income from selling farm produce		
Preserving rural heritage (traditions, culture, craftsmanship)		
Ability to expand the offer		
Ability to improve the offer (benchmarking)		
Increased interest of city dwellers in the offer of agritourism farms		
Ability to develop many forms of tourism		
Investments in expanding tourism business	Creation of many complex rural tourism products (thematic villages)	Increased number of tourist trails
Reduction in unemployment		Using the Internet as a source of sales, promotion and distribution of the offer
The possibility of obtaining external funds for the development of tourism	New trends in rural and agri-tourism (e.g. herbalism, health tourism)	

THREATS

Belarus	Poland	Ukraine
Low demand for agritouristic products	Lack of faith in abilities to run an agritourism farm, despite the existing potential	Unfavourable economic and political situation
Reluctance of residents towards innovative ideas	Competition from the tourist side regional centers	Increased price for services that is inadequate to the quality decreases demand
Marazm of the local community	Young emigrating and educated residents	Insufficient number of leisure offers for low-income people
Low quality of touristic products	Increase in the popularity of forms of tourist activities interfering with the environment	Low quality of touristic products
Poor creativity and innovativeness in action		
Increase in competitiveness through the availability of better offers		
Relatively high costs related to maintaining appropriate standards		
Difficult financial and political situation		
Threat to the natural environment by tourist interference		

Source: Own work.

Summary

The article presents the current status and agritourism development capabilities in Poland, Belarus and Ukraine. The paper uses statistical data, as well as a SWOT analysis, which enables us to easily formulate conclusions.

In Poland, agritourism has great development chances, because it constitutes an additional source of income, gives the possibility of using already owned resources, reinvigorates rural areas, "opens" native citizens through tourists to new cultures, teaches them acceptance of tourists on their territory and, through new relationships, opens to the world.

In the future this form of activity will develop if:

1. Activities will be focused on building partnerships, large-scale cooperation;
2. Care for the quality of the services provided will be a priority which will contribute to greater opportunity for foreign guests to be interested in the offer;
3. The councilors will pay more attention to the use of programs and assistance that is offered in the country (PROW, Funds);
4. Accommodation providers will meet the market's expectations and start specializing, for example, in the development of health tourism - currently very popular - through the production of healthy, organic food, preparations, cosmetics, aromatherapy, hippotherapy and others;
5. The councilors will pay attention to an important group of recipients, such as older people, for whom the offer should be tailored to their needs.

In Belarus, agritourism has begun to revive in recent years. Everything is possible thanks to beneficial loan conditions, possibility of taking advantage of already owned potential, obtaining additional sources of income, which reduces unemployment. For further dynamic development, farmers need to:

1. Pay attention to the basic recipient which is the domestic customer;
2. Ensure continuous education for people doing agritourism activities, which will strengthen their potential and contribute to greater openness to tourists;
3. To create information centers in the field of agritourism;
4. Take care to improve the quality of services offered that will contribute to interest from foreign tourists.

In Ukraine, agritourism is also capable of being developed. Despite difficulties resulting from political conditions, it allows farmers to generate income, provides jobs, develops people living in rural areas. For this growth to continue, farmers need to:

5. Pay attention to the basic group of consumers: residents of industrial centers, indigenous inhabitants of cities, lovers of Ukrainian folk traditions, people of medium and low wealth;
6. Include local authorities in supporting this form of activity;
7. Promote this form of tourism;
8. Ensure the quality and categorization of the services provided;
9. Encourage cooperation in the development of agritourism.

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A Comparative Study of Profitability of Agricultural Cooperatives in Poland and Around the World

Abstract. The differences in perception and functioning of agricultural cooperatives in different parts of the world are visible to the naked eye. Moreover, the literature brings different findings in respect to comparisons between cooperatives and non-cooperatives in terms of profitability. The purpose of this article was to identify the differences in profitability between agricultural cooperatives in selected parts of the world as well as between cooperatives and other enterprises in Polish agriculture. The description of results of the world report on cooperatives and analysis of variance on 300 agricultural enterprises in Poland were used in order to accomplish the above purpose. The main findings prove that American agricultural cooperatives achieved the best profitability results and that cooperatives have lower profitability than other enterprises in agriculture.

Key words: agricultural cooperatives, profitability, analysis of variance, Kruskal-Wallis test, Poland

JEL Classification: M21, Q12, Q13

Introduction

For many years cooperatives have been an interesting alternative of doing business and simultaneously an important element of socio-economic life all over the world. In the agricultural sector they play a prominent role, both in developed and developing countries (Tortia et al., 2013). The world's largest agricultural cooperatives, with annual turnover of more than 40 billion USD, are located in Asia and North America (World…, 2016). In Canada cooperatives have large market shares in grain, dairy products, poultry, honey and maple (Hudson, 2009). Many agricultural cooperatives operate in India and China where the small size of land holdings fosters working together to gain economies of scale and scope (Measuring…, 2014). In Africa cooperatives are significantly contributing to poverty reduction, especially in rural areas (Wanayama et al., 2008).

In Western Europe cooperatives hold a strong position on agricultural markets and continue to develop their expanded structures (Suchoń, 2012). They have evolved into modern forms of economic activity, strengthening the bargaining power of their members (Mierzwa, 2009). In countries such as Finland, the Netherlands, Denmark, Sweden, Ireland, France and Austria, the share of cooperatives in the agricultural market counts to 50-70% (Bijman et al., 2012). Firms such as Arla Foods, Danish Crown and DMK Deutsches Milchkontor GmbH, with their annual revenues of 5-10 billion EUR, stand among the largest and best-known agricultural cooperatives in Europe (Development…, 2015). This brief description of the strength of agricultural cooperatives demonstrates that, globally, agricultural cooperatives use their potential and continue to develop.

However, there are some countries where cooperatives, instead of developing, successively cease their activity. This refers particularly to post-communist countries, like

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Poland, where cooperatives are regarded as a relic of the previous regime with all the economic, political, legal and social consequences (Dzun, 2009). The lack of a comprehensive theoretical framework and an in-depth analysis in this subject even worsens the situation (INT.RE.COOP Report Summary, 2016).

Because the differences in perception and functioning of agricultural cooperatives in different parts of the world are visible to the naked eye, from the scientific point of view it is justified to make the comparisons of different aspects of cooperative life. One of the most important issues that has to be taken into account while comparing economic entities, is financial performance and one of its measures: profitability (Fitzsimmons et al., 2005). Moreover, it turns out that under the same economic conditions, some cooperatives show great development dynamics, some of them are characterized by stagnation and others are in recession (Mierzwa, 2013). Therefore, the comparisons between cooperatives and other enterprises are also scientifically interesting. In this light, the purpose of this article is to identify the differences in profitability between agricultural cooperatives in selected parts of the world as well as between cooperatives and other enterprises in Polish agriculture.

A Literature Overview

Regarding profitability, there are studies which consider it to be an indicator of a company's growth, success and control (Majed et al., 2012). Some authors use it as a measure of competitiveness in agriculture (Korom & Sagi, 2005) or even of a firm's overall efficiency (Bumbescu, 2015). The well-known ratios of profitability are return on assets – ROA, return on equity – ROE and return on sales – ROS (Machek, 2014). They help to evaluate a business's ability to generate earnings compared to its expenses incurred over a period of time. Profitability is the synthetic determinant of financial standing, which fundamentally influences the assessment of competitive ability, and thus the ability to continue agricultural activity and development prospects (Gołaś, 2009).

Nevertheless, while analyzing the profitability of agricultural cooperatives one has to be aware of the specificity of such entities. Sexton and Iskow (1988) demonstrated how financial analyses of cooperatives, although popular, were not based on economic theory. This results from the objective of cooperatives: to maximize the benefits and welfare of their members and the local community. According to the literature, cooperatives do not only seek to maximize profits, but they also seek to satisfy the interests of their members by increasing the prices of their products as much as possible (Guzmán and Arcas, 2008; Soboh et al., 2009, 2012; Hernández et al., 2013). As a consequence, cooperatives are expected to have a low profitability level (Martínez-Victoria et al., 2015).

Some studies confirm the above statement (Notta and Vlachvei, 2007; Soboh et al., 2011). The authors conclude that cooperatives have lower profitability values than non-cooperatives because they increase the cost of the purchased products to their members-suppliers by paying out parts of their profit in the price. On the other hand, there are also studies which prove that profitability of agricultural cooperatives and other enterprises is similar (Lermand and Parliament, 1990; Gentzoglanis, 1997; Boyle, 2004; Hardesty and Salgia, 2007). Boyle (2004) claims that this is because the cooperatives did not establish their prices at the maximum value as non-cooperatives companies do. Hardesty and Salgia (2004) explain it with the characteristics of each industry (dairy, fruit and vegetables, grain, farm supply), where cooperatives and non-cooperatives operate. In the view of such diverse

research results, there is the need for further investigation of the differences in profitability of agricultural cooperatives.

Data and Methods

According to the objective of the present study, two approaches were used: the regional and subjective. The first one referred to searching for differences in profitability of cooperatives in different regions of world agriculture. The second approach included comparisons of profitability between agricultural cooperatives and other enterprises. Special attention was paid to Polish agricultural production cooperatives (APC) as the representatives of agricultural cooperatives in Poland.

The statistical data sources in the article were the following:

- For the regional, and partially subjective approach – the "World Co-operative Monitor" – a robust and comprehensive report published annually by the International Co-operative Alliance and the European Research Institute on Cooperative and Social Enterprises (World…, 2016);
- For the subjective approach – the "List of the 300 Best Agricultural Enterprises" prepared annually by the Institute of Agricultural and Food Economics – the National Research Institute in Poland (Lista…, 2010, 2011, 2012, 2013, 2014, 2015).

The above list includes agricultural enterprises established from the property of the Treasury (former state farms) and agricultural production cooperatives. The source data are collected using a specially designed questionnaire, which is aligned with the official items of financial statements.

In the subjective approach, the study utilizes a sampling frame consisting of the following types of agricultural enterprises: agricultural production cooperatives – APC, companies of state agency (Agricultural Property Agency) – CSA, private companies – PC, the rest of the entities – RE. The profitability in the subject approach of this study consists of five ratios:

- Return on Sales (ROS) – the ratio of profit on sales to the sum of revenues from sales of products, goods and materials. The operating costs, calculated in the profit on sales, include also the labor costs of member-workers of APC;
- Return on usiness (ROB) – the ratio of financial profit from business activity, adjusted for profit (-) or losses (+) from the sale of non-financial assets, to the sum of revenues from sales, other operating income (decreased by profit from disposal of non-financial assets) and financial income;
- Return on Assets (ROA) – the ratio of net financial profit, adjusted for profit (-) or losses (+) from the disposal of non-financial assets, to the value of general assets;
- Return on Equity (ROE) – the ratio of net financial profit, adjusted for profit (-) or losses (+) from the disposal of non-financial assets, to capital equity;
- Value Index (VI) – the ratio of return on equity and the cost of capital equity containing, among others, average interest rates on bank deposits. Only index higher than one means that the value of the enterprise was increased for its owners.

The data analysis was done in STATISTICA software. In order to accomplish the objectives of the research, the analysis of variance was used. Because almost all of the variables were not normally distributed there was a need to use the non-parametric methods

of analysis of variance, which was the Kruskal-Wallis test. This type of analysis is used to determine the influence of one classification factor (controlled on multiple levels) on the results of the study as a result of the comparison between the groups of analyzed units. The following formula of statistical hypotheses was adopted (Stanisz, 2006):

- null hypothesis H0: the averages in the groups are the same;
- alternative hypothesis H1: at least two averages differ between each other.

The process of verifying hypotheses consisted of rejecting the null hypothesis in favor of the adoption of its alternative, taking into account the significance level $\alpha = 0,05$. The rejection of the null hypothesis indicated the existence of statistically significant differences between the compared groups. The results of the test were supplemented with graphical interpretation using a box and whisker plots.

Research results

When it comes to the analysis of the financial indexes of the agricultural cooperatives around the world, it turns out that they are doing quite well (Table 1).

Table 1. Financial indexes for agricultural cooperatives around the world (%)

Index	Definition	No. of coops in the sample	In total	Americas region	Asia and the Pacific	European region
ROE	net income/total equity	71	10,3	19,1	6,2	8,4
ROA	net income/total assets	71	3,4	4,9	2,5	3,2
Liquidity	total current assets/total current liabilities	66	1,66	1,64	2,57	1,51
Account%	accounts payable/current liabilities	59	62,2	44,9	66,6	66,1
Leverage	long term debt/total equity	63	84	90	101	80
Margin1	(total equity - net property, plant and equipment)/total equity	68	-0,7	10,2	-3,9	-3,2
Margin2	(total equity - net property, plant and equipment + long term debt)/total equity	62	17,1	28,2	12,9	15,2
Net property%	net property, plant and equipment/total equity	68	36,9	26,1	41,3	39,1

Source: Author's own study on the basis of (World…, 2016).

The average ROE value is 10,3%. The highest ROE (19,1%) shows cooperatives from the region of the Americas (precisely from the USA, Canada and Brazil). This can be the result of a higher net income or a lower level of the total equity. By looking at the ROA, the agricultural cooperatives show also positive results, but not as high as ROE (3,4% on average). In this case, the Americas also achieve the best results (4,9%), however the differences between regions are slighter. The data shows a sector in moderate equilibrium with respect to liquidity, with the best situation in Asia and the Pacific. The cooperative

regions differ in terms of the accounts payable – the European and Asian co-operatives in the data set perform better compared with those in the Americas region. The financial leverage data does not differ greatly between regions. The cooperatives prefer rather safe strategies of financing. Two additional indexes – Margin1 and Margin2 – are used to determine the ability to cover the fixed assets by long-term liabilities. The higher the Margin2 value – with a not too pronounced negative value of the Margin1 index, the better the financial equilibrium of the co-operative is. The data shows a solid sector, in financial equilibrium with a significant difference between the Americas and European/Asian regions in favor of the former ones. Comparing this with the net property percentage, one can conclude that the greater values of margins indexes achieved by cooperatives in the Americas might be the consequence of a lower level of investments because of a greater use of outsourcing. However, this is only an assumption that requires further verification.

Summing up, the data show the advantage of agricultural cooperatives in the Americas over the rest in terms of profitability and financial solidity. The reasons for this situation can be many, including natural conditions, markets specificities, or even governance abilities. While such considerations are not the subject of this study, the next step is to compare the financial performance of agricultural cooperatives with other sectorial enterprises. Within this scope, the data are shown in Table 2. They are limited only to the European region.

Table 2. Financial indexes for agricultural enterprises in Europe (%)

Index	No. of coops in the sample	Values for cooperatives	No. of other enterprises in the sample	Values for other enterprises
liquidity	45	1,5	81	1,7
account%	40	66,1	77	13,3
leverage	46	80,0	84	67,0
margin1	47	-3,2	84	-15,6
margin2	45	15,2	84	1,8
net property%	46	39,1	84	59,7

Source: Author's own study on the basis of (World…, 2016).

The differences between the compared groups are not so significant regarding liquidity and leverage. However, they appear when looking at other indexes. Firstly, the account percentage shows that the cooperatives tend to use suppliers' debt more than other enterprises. Secondly, relatively huge differences refer to margins and net property indicators. Their values confirm that cooperatives are more solid than other firms in the European agriculture.

Switching to the Polish conditions, as it was mentioned before, the profitability of agricultural cooperatives was also measured in comparison to other types of entities. The detailed data on cardinality of the sample are presented in Table 3. In every studied year, the 300 of enterprises were examined. Almost half of them were public companies (PC), approximately one third were agricultural production cooperatives (APC), about 10% accounted for companies of state agency (CSA), the rest (also 10%) consisted of other entities (RE), including individual farms. Plant production was the main activity for the

vast majority of APC and PC. A relatively large share of livestock production was regarded for CSA. The most diverse group in terms of direction of production was RE.

Table 3. The number and percentage of enterprises in the research sample in every analyzed year

Type of entity	Direction of production*	Year						Average no. in 6-year period	Percentage in each type of entity
		2010	2011	2012	2013	2014	2015		
APC	Plant	46	52	58	58	56	50	53	59%
	Livestock	14	11	8	12	13	15	12	13%
	Mixed	22	26	21	27	23	26	24	27%
	Other	0	1	0	1	2	4	1	1%
	In total	**82**	**90**	**87**	**98**	**94**	**95**	**91**	**100%**
CSA	Plant	12	10	11	9	12	11	11	27%
	Livestock	16	15	12	12	13	13	14	34%
	Mixed	12	16	15	15	16	17	15	38%
	Other	0	0	0	0	0	0	0	0%
	In total	**40**	**41**	**38**	**36**	**41**	**41**	**40**	**100%**
PC	Plant	98	90	96	88	94	94	93	68%
	Livestock	8	8	10	13	10	8	10	7%
	Mixed	39	36	32	26	26	26	31	22%
	Other	5	6	3	4	2	4	4	3%
	In total	**150**	**140**	**141**	**131**	**132**	**132**	**138**	**100%**
RE	Plant	12	12	13	11	10	12	12	37%
	Livestock	4	7	7	10	9	9	8	24%
	Mixed	8	7	8	7	6	6	7	22%
	Other	4	3	6	7	8	5	6	17%
	In total	**28**	**29**	**34**	**35**	**33**	**32**	**32**	**100%**
All of the entities		300	300	300	300	300	300	~300	

* Direction of production was declared by the respondents on the basis of predominant share of sales. "Mixed" means that there is an equilibrium of plant and livestock production. "Other" means that the agricultural production is just an addition to the other economic activity.

Source: Author's own study on the basis of (Lista…, 2010, 2011, 2012, 2013, 2014, 2015).

As a result of data analysis done by using the Kruskal-Wallis test, it was found that statistically significant differences exist between the profitability of agricultural cooperatives and other Polish agricultural enterprises. This refers mainly to public companies, which showed higher values of medians for each of the indexes in each year. Similar conclusions can be drawn while comparing APC to the RE – the cooperatives had lower profitability of all indexes in 2010 and 2013-2015 (with a little exception of VI in 2015). However, the APC do not differ from CSA in terms of profitability as the identified differences within this scope were sporadic and irregular. The detailed findings are presented in Table 4, enriched with Figure 1.

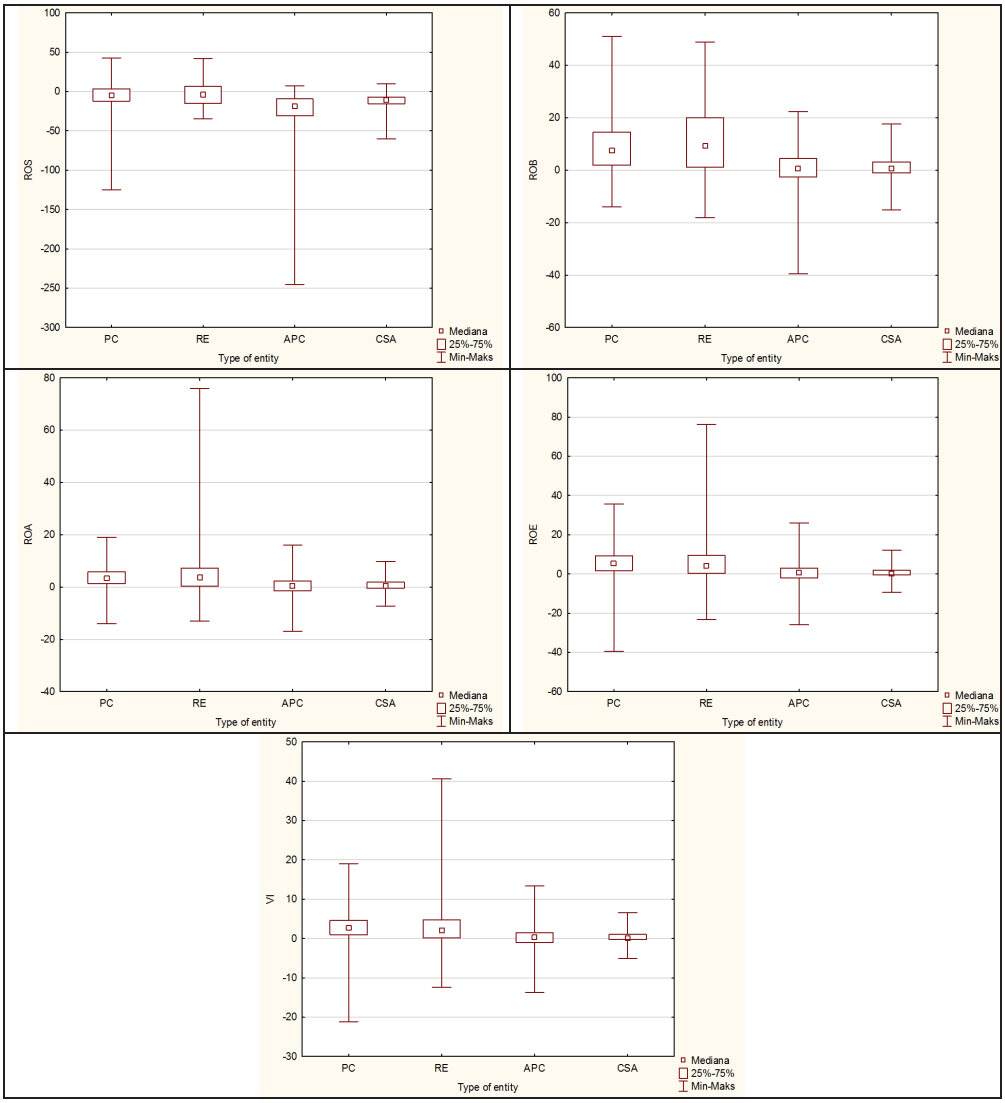

Fig. 1. Box and whisker plots for each of profitability indexes of analyzed typed of entities

Source: Author's own study on the basis of the research results.

Table 4. The results of the Kruskal-Wallis test with the p-values and the medians of APC in comparison to other entities

Index	Type of entity	2010		2011		2012		2013		2014		2015	
		p	m	p	m	p	m	p	m	p	m	p	m
ROS	CSA	1,000000	na	0,584968	na	0,036636	hig	1,000000	na	0,148435	na	0,017018	lo
	PC	0,000000	lo	0,254789	na	0,001128	lo	0,000004	lo	0,000000	lo	0,000000	lo
	RE	0,000064	lo	1,000000	na	1,000000	na	0,002014	lo	0,000043	lo	0,000003	lo
ROB	CSA	0,210482	na	0,063348	na	0,001147	hi	1,000000	na	1,000000	na	1,000000	na
	PC	0,000000	lo	0,000461	lo	0,000680	lo	0,000003	lo	0,000000	lo	0,000000	lo
	RE	0,000461	lo	0,191538	na	1,000000	na	0,000025	lo	0,000053	lo	0,000065	lo
ROA	CSA	0,118257	na	0,084978	na	0,000391	hi	1,000000	na	1,000000	na	1,000000	na
	PC	0,000000	lo	0,000003	lo	0,000007	lo	0,000017	lo	0,000000	lo	0,000000	lo
	RE	0,010697	lo	0,962825	na	1,000000	na	0,001615	lo	0,003052	lo	0,000581	lo
ROE	CSA	0,044220	hi	0,014353	hi	0,000172	hi	0,722342	na	1,000000	na	1,000000	na
	PC	0,000000	lo	0,000000	lo	0,000000	lo	0,000005	lo	0,000000	lo	0,000000	lo
	RE	0,019090	lo	1,000000	na	1,000000	na	0,020671	lo	0,011161	lo	0,005113	lo
VI	CSA	0,042690	hi	0,012934	hi	0,000085	hi	0,935407	na	1,000000	na	0,003605	na
	PC	0,000000	lo	0,000004	lo	0,000001	lo	0,000014	lo	0,000000	lo	0,000000	lo
	RE	0,026615	lo	1,000000	na	1,000000	na	0,011556	lo	0,013553	lo	1,000000	lo

p – p-values,
m – median,
na – not applicable,
lo – lower,
hi – higher.

Source: Author's own study on the basis of the research results.

Conclusion

While considering profitability of agricultural cooperatives, what has to be taken into account is that these types of enterprises are not profit-oriented. They exist in order to maximize the benefits for their members. Thus, in the model of cooperating with farmer-members, dominating worldwide, agricultural cooperatives give farmers higher, satisfying prices for supplied products, thereby decreasing the general profits. In return, in the model of worker cooperatives, such as Polish agricultural production cooperatives, the profit is decreased by the labor costs of member-workers, the level of which should also be satisfying. Therefore, as was stated in the article, agricultural cooperatives are expected to have a low profitability.

The analysis of profitability and financial solidity in the regional approach revealed that the best results are achieved by agricultural cooperatives in the Americas. European cooperatives perform better than other sectorial enterprises regarding margins and net property. However, the evidence of comparison between cooperatives and non-cooperatives

from Poland showed that there are statistically significant differences regarding the profitability. Entities like private companies or even individual farms reach higher levels of profitability indicators (ROS, ROB, ROA, ROE, VI). Thus, the obtained results confirm the findings of Notta and Vlachvei (2007) and Soboh et al. (2011). They also fall into the expectations about cooperatives' lower profitability suggested by Martínez-Victoria et al. (2015). Nevertheless, the analysis should be enriched with comparisons of purchase prices of agricultural products and wages in agriculture to properly verify this statement. Otherwise, the low profitability could be the result only of inefficient management of the cooperative.

Finally, it has to be noticed that the profitability in agriculture can be connected with the direction of production. The vast majority of studied enterprises in Poland were oriented to plant production. A quick look at the results of the analysis enables to say that enterprises like CSA, with a relatively big share of livestock production, in general achieved lower profitability indexes. Therefore, this side of analysis needs also to be examined more thoroughly.

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The Crop Insurance Systems in Poland Towards the EU

Abstract. The increasing number of unfavorable conditions of agricultural production causes the farmers to suffer severe losses in their activity. At the same time, the increase in the profitability of agricultural production, the support of numerous European Union funds, led to increased interest in insurance as an instrument supporting agricultural risk management. Hence, both the agricultural industry and the insurance industry see the need to create an effective agricultural and livestock insurance system.
The paper examines the changes and scope of crop insurance in Poland towards the European Countries. There were presented issues connecting to policies, regulation and state aid rules, crop insurance level in EU countries and characteristic of the crop insurance market – case study Poland. There was used descriptive and comparative methods, as well as the selected statistical method. The analysis was performed in the years 2005-2016.

Keywords: crop insurance, subsidies, risk

JEL Classification: G0, G2, Q1

Introduction

Agricultural production is threatened by a number of risk factors affecting both the asset and the farm income. These include risks primarily related to production such as weather conditions, pests and plant diseases, market conditions, etc. As a consequence of these factors, the stability of agricultural incomes may be shaken. In recent years, the European Union has considered the possible integration of agricultural risk management systems within the Common Agricultural Policy, and also analyzes crisis management systems to better prepare for emergencies in the agricultural sector (Risk Management Tools for EU Agriculture, 2011; Iturrioz, 2009; Józefecka, 2009).

Most European Union countries have a classic insurance system, mainly one and several types of risk insurance and also crop-yield insurance. These are generally private insurance. The exception to this is Greece and Cyprus where insurance is public and mandatory. In many countries, the crop insurance market represents 2 or 3 insurance companies. The level of development of the agricultural insurance system in a given country depends mainly on the level of risk that varies from country to country and from the public financial support for the insurance system (CEA, 2005; Clipici, Frant, 2013).

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The role of government is different in different countries. Some offer or subsidize insurance, while others can count on help only if risk is realized. Help is provided through a compensation system, targeted funds or so-called. Future markets, which may be partially funded by the rural community in an optional or mandatory manner. The following analysis will present the various existing risk management tools. This will allow us to better understand the evolution of insurance systems in Europe, as the development of insurance systems depends very precisely on the presence of other risk management tools, the role of the public sector and, in particular, the existence of ad hoc relief measures (Agricultural insurance schemes, 2008b).

Material and methods

The aim of this paper is to examine the changes and scope of crop insurance among the European Countries (EU). The following problems are examined: policies, regulation and state aid rules, crop insurance level in EU countries and characteristic of the crop insurance market – case study Poland.

The analyses, carried out in the paper, cover the period of 2006- 2015. The information and data about analyzed issues are taken from the applicable legislation, the Ministry of Agriculture and Rural Development (MARD) and the Central Statistical Office (GUS). The data used illustrates the examined problems, shows the scale of changes, their tendency and differences.

The descriptive and comparative methods were used in the research paper, as well as the selected statistical method in order to analyze the problem from the economic point of view.

Policies, regulations and state aid rules

Crisis definitions and catastrophes eligible for state aid in the Member States of the European Union have been verified and compared in the "Community Guidelines for State Aid in the Agriculture Sector" (EC 2000). Further Commission Directives (EC 2006b) and Regulation (EC 2006a) on the application of Articles 87 and 88 of the Treaty were adopted in December 2006. The definitions were largely formulated on the basis of World Trade Organization (WTO) agreements. Member States' experts have defined the terms of the disaster and the emergency situation eligible for state aid and the definition of insured risk, if any. Some states refuse public assistance where the risk has been realized can be insured. Such countries include Spain, Austria, Portugal, Greece, Sweden, Turkey and Italy for insurance subsidized by the state budget and in France if the insurance has reached the assumed level of diffusion. Since 2010, the regulation partially makes the conditions for state aid subject to the purchase of a specific agricultural insurance (CEA, 2005; Clipici, Frant, 2013).

Most EU Member States follow certain Community Guidelines on State Aid (EC, 2000) when deciding whether or not a state can assist. Member States can be classified in four groups according to the degree of compliance with EU guidelines. For the first group of countries in their legislation strictly followed the above mentioned guidelines, the second group has adopted certain assumptions without mentioning the guidelines in its legislation.

The third group adopted stricter assumptions than those provided for in the Community Rules. On the other hand, the fourth group of countries defined their assumptions less restrictively than was assumed in the EU guidelines (EC, 2001; Agricultural insurance schemes, 2008b).

Crop insurance statistics in EU countries

In 2006, about 23% of the crop value of 27 EU Member States was insured. Insurance amounted to € 1 583 million, i.e. 4% of the declared value. Spain, considered the most developed country in the area of insurance systems, in the world, accounts for € 564 million, with only 5.86 million hectares being insured, indicating a relatively low market penetration (26% of the area), compared to Germany, where market penetration is much higher (7.26 million hectares, i.e. 43% of crop area), while the average amount of premiums is 129 million euros. This fact can be explained by the fact that in Germany insurance usually only covers one risk (hail). On the other hand, high value in Spain can be explained by the greater number of dangers covered and potentially higher risk in this country (Clipici, Frant, 2013).

The total amount of the grant was 497 million euros, representing 32% of the sum insured. In each country, the amount of subsidies varies greatly. The highest subsidy amounts in Europe were registered in Italy and Portugal, for example in Italy 80% of crop insurance guarantees. In other countries such as UK, the subsidy is not applied at all. Average amount of damage, i.e. the total sum of compensation paid by insurance companies for a specified number of years a year divided by the total amount of contributions from the same period - is in the range of 60 to 70% (Agricultural insurance schemes, 2008a).

Characteristic of the crop insurance market – case study Poland

The increasing number of unfavorable conditions of agricultural production causes the farmers to suffer severe losses in their activity. At the same time, the increase in the profitability of agricultural production, the support of numerous European Union funds, led to increased interest in insurance as an instrument supporting agricultural risk management. Hence, both the agricultural industry and the insurance industry see the need to create an effective agricultural and livestock insurance system. However, it is necessary to combine the actions of the state and insurance companies (Parlińska, 2011; Józefecka, 2009).

The answer to the market demand was the agricultural insurance law introduced by the Act of 7 July 2005 on agricultural and livestock insurance. However, the experience of 2006 and subsequent years prompted the legislator to make changes in the scope of the insurance subjects and range of risks (Table 1). At the moment the crop insurance contract covers: cereals, maize, rape, colza, hops, tobacco, ground vegetables, fruit trees and shrubs, strawberries, potatoes, sugar beet or legumes, sown or harvested for harvest, grown in the main crop, The law allows to insure from all the risks specified by the law (package insurance) or selected by the agricultural producer.

Also, the upper limits of the sum of the compulsory insurance of crops constitute the sum insured, however they should not exceed the limits designated by the Minister for Agriculture. The sum of the crop insurance is influenced by the following factors (Parlińska, 2011; Wicka, 2009):

- the surface of all the fields (parcels), on which the agricultural cultivation has been reported to the insurance,
- the amount of the yield obtained in the holding in question,
- the market price per unit yield of the main, the gross price specified in the cultivation contract (if yield is subject to contract),
- documented the value of planting trees, shrubs, strawberries, or the average value recorded in the area at the time of the conclusion of the insurance contract.

Table 1. The changes in the scope of the insurance subject and range of the risks in Poland

	Changes in the Act of Law of agricultural crop and livestock insurance			
	From 7.07.2005	From 27.04.2006	From 7.03.2007	From 25.07.2008 till now
Scope of the insurance subject	cereals, maize, rape, colza, potatoes, sugar beet	added: hops, vegetables, fruit trees and shrubs	added: tobacco, strawberry, legumes, changes in the names: instead vegetables - ground vegetables,	
Range of risks	From sowing or planting to harvest: fire, hurricane, flood, wet, hail, lightning, explosion, landslide, avalanche, drought, negative effects of wintering, spring frosts	excluded: fire, explosion	changes in definitions of: hurricane, lightning, drought, negative effects of wintering, spring frosts	changes in definitions of: spring frosts; liability for partial damage caused by frosts from 15 April

Source: Regulations the Minister of agriculture and rural development on the maximum sum for each of the insurance of crops and livestock from 2008-2015.

Table 2. Changes in maximum of insurance's sum in crop insurance contracts in Poland in the years 2008-2016

Description	The maximum total coverage								
	2008	2009	2010	2011	2012	2013	2014	2015	2016
for cereals	6 000				8 000	8 100	8 400	14 000	
for maize	6 000	11 000	13 000	10 000	10 000	9 000	8 800	10 300	
for rape and turnip rape	6 000				10 000	12 300	9 200	10 550	
for hops	25 000	30 000	40 000		26 000	36 700	37 300	45 500	
for tobacco	30 000	35 000			21 000	26 500	24 100	26 100	
for vegetables	162 000		129 000			83 000	144000	182 400	
for trees and shrubs	84 000		61 000			55 600	59 200	101 500	
for strawberries	25 000		50 000				43 200	52 000	
for potatoes	16 000	17 500	25 000	30 000		32 200	35 700	31 200	
for sugar beet	8 000		9 000			12 200	10 400	11 430	
for legumes	15 000					15 600	16 700	20 130	

Source: see table 1.

According to the Act of Law the sum of the insurance shall be determined in agreement with the agriculture producer at a level which cannot be higher than this which are established by regulation. The changes of insurance's sum and level of the aid for contribution in crop insurance contracts in the years 2008-2016 are presented in Table 2 and Table 3.

Table 3. Changes in the level of the aid for contribution of the insurance contracts in Poland in the years 2006-2016

<table>
<tr><th rowspan="2">Description</th><th colspan="4">The value of the aid</th></tr>
<tr><th>2006</th><th>till 06.2007</th><th>From 06.2007 till 23.04.2015</th><th>From 24.04.2015</th></tr>
<tr><td>for cereals</td><td rowspan="3">40%</td><td rowspan="3">40%</td><td rowspan="12">50%</td><td rowspan="12">Till 65%,
but insurance premium should be:
- 3.5% of the insured sum for cereals, maize, spring rape, colza, potatoes or sugar beet -5% of insured sum for winter rape, vegetables g round, hop, tobacco, trees and bushes fruit, strawberries or legumes</td></tr>
<tr><td>for maize</td></tr>
<tr><td>for rape and turnip rape</td></tr>
<tr><td>for hops</td><td rowspan="6">-</td><td>35%</td></tr>
<tr><td>for tobacco</td><td>-</td></tr>
<tr><td>for vegetables</td><td rowspan="2">35%</td></tr>
<tr><td>for trees and shrubs</td></tr>
<tr><td>for strawberries</td><td>-</td></tr>
<tr><td>for potatoes</td><td rowspan="2">35%</td><td rowspan="3">35%</td></tr>
<tr><td>for sugar beet</td></tr>
<tr><td>for legumes</td><td>-</td></tr>
</table>

Source: Regulations the Minister of Agriculture and Rural Development on the maximum sum for each of the insurance of crops and livestock from 2008-2015.

The potential of crop insurance can be assessed by looking into the agricultural area and sown. In 2009, agricultural area in Poland was more than 15.5 million ha, of which about 74% is the sown area. In the following years, can be observed decline in the agricultural area and drilling, which in the year 2015 were 14.6 million hectares and the total sown area was 10.7 million ha. Also, during the research time could noticed that about 30% of the sown area was a subject to of obligatory insurance (Fig. 1).

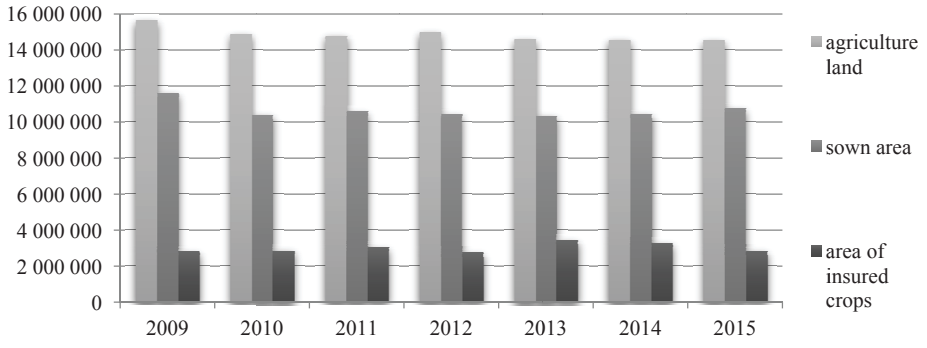

Fig. 1. The total area of agricultural land in Poland in years 2009-2015 (in hectares)

Source: own calculation on the base of data of the Central Statistical Office.

Over the years, can be noted a general decline in agricultural area in Poland. The biggest decreases in the area over the years 2009-2015 can be observed in crops of potatoes- 50%, hops – 30% and vegetable – 25%. The increases were observed for maize for grain -144%. This trend has to do with the general downward trend of the utilized agricultural area, and in the case of potatoes from the droughts that are extremely unfavourable for crops of potatoes and make farmers abandon their crops to other plants (Table 4).

Table 4. The area insured crops

Specification	2010	2011	2013	2014	2015
			in thous. ha		
Area of insured crops	2 845.78	3 032.63	3 398.81	3 269.87	2 823.61
cereals	1 697.97	1 691.06	1 922.49	1 741.33	1 568.26
rape	829.05	995.99	1 056.44	997.19	787.81
maize	200.53	174.08	276.23	363.92	299.85
potatoes	15.76	15.93	14.43	25.23	17.14
sugar beets	41.47	48.84	46.60	60.34	48.95
pulse crops	30.86	20.06	21.65	34.27	62.79
fruit from berry plantations and fruit trees	7.88	53.15	8.09	9.93	13.04
field vegetables	10.99	26.64	12.28	18.55	16.05

Source: own calculation on the base of data of the Central Statistical Office.

The development of the agricultural insurance market with state subsidies to premiums in Poland was launched in 2006 when the legal provisions of the Act of 7 July 2005 on farm and livestock insurance came into force. The average area for one policy is about 20 hectares and it did not change significantly in 2009-2015. Thus, the large and very large farms are insured. The higher average premium results not only from the coverage of larger areas, but also (as shown by research carried out by Poznan University of Economics) from the tendency of large farms to insure against a greater number of risks. Therefore it can be seen that not all farmers are insured despite the obligation to insure at least 50% of the crop area and at the same time do not use the full potential of the funds that could be mobilized to finance these insurance. Farmers usually insure themselves from the hail, and risks such as drought and floods are very low. It was also found that finding reinsurance coverage especially at drought risk was limited or impossible. In addition, there was a significant problem associated with a vague interpretation of the drought risk definition. Hence, after receiving signals from both insurance companies and agricultural circles, targeted subsidies were introduced to cover some of the compensation paid to agricultural producers for damage caused by drought. In the years of this change, insurers received a payment of 88.2 million zloty after the drought in 2008. In recent years the most common risks in the crop insurance policy include: negative effects of wintering, hail and spring frosts. The disaster was 2012, when insurance companies suffered a great deal of damage as a result of unfavorable weather conditions compared to previous years.

A farmer wishing to use agricultural subsidies is obliged to conclude an insurance contract with the selected insurance company who has signed an agreement with the Ministry of Agriculture of insurance or any other insurance business. Among the insurers who have the right to offer agricultural insurance with state subsidies, the largest share in

the sale, both in the amount and value of these policies, holds the largest Polish property company PZU S.A.. However, since 2006, the share of PZU S.A. in favor of Concordia Polska Towarzystwo Ubezpieczeń.

Table 5. Characteristic of the implementation of subsidized crop insurance in Poland in 2009-2015

Specification	2009	2010	2011	2012	2013	2014	2015
Number of insurance policies	144080	149751	139772	137863	151101	142292	139108
The insurance sum (billion PLN)	6.49	7.84	10.24	12.09	14.23	13.33	13.69
Area of insured crops (ha)	2808104.3	2845777.5	3032633.7	2751438.6	3398 811.8	3269870.9	2823606.3
The average sum of insurance per ha	2311.3	2756.3	3376.1	4393.0	4187.4	4075.7	4850.2
The average sum of insurance per policy (PLN)	45047.1	52379.0	73252.1	87674.7	94190.3	93659.2	98449.2
The average area per policy	19.5	19.0	21.7	20.0	22.5	23.0	20.3
Value of the aid (mln PLN)	79.1	97.0	126.6	162.5	164.3	161.5	173.4
The average aid per policy (PLN)	549.2	648.0	905.5	1178.8	1087.7	1134.7	1246.3

Source: own calculation on the base of data of the Central Statistical Office on data from the Ministry of Agriculture and Reginal Development Department of Finance.

According to the data of the Ministry of Agriculture and Rural Development, the scope of insurance covered by the subsidy covers mainly crops (their share in the structure of contracts concluded and the value of subsidies is about 95%). In 2013 over 151 thousand. The policy of crops with subsidies from the state budget, which means almost 14 times their growth against 11 thousand. policy in 2006.

In 2006, under 10 738 agricultural insurance contracts were covered little more than 300 thousand hectares of crops. In 2015 more than 2.8 million of hectares of crops are insured within 139 108 insurance contracts. However, the biggest increase in the market could be observed in 2008 when it was obliged to insure at least 50% of the crop area. In 2010, the Ministry of Agriculture and Rural Development subsidized 300 million PLN, 131 million PLN in 2009 and 150 million PLN two years earlier. According to the MARD data, in 2015 insurance premiums amounted to PLN 173.4 million, which represents more than 17 times increased against PLN 9.85 million in 2006 (Table 4).

Conclusion

Crop insurance systems in European countries differ in terms of both the available insurance products and the state's share in shaping agricultural insurance policies. This is dependent on many factors such as the level of economic development, the frequency of natural disasters and the structure of the agricultural sector in a given country. The high level of variation in the nature of agricultural production and the crop insurance market in these countries demonstrates how difficult it would be to have a common crop insurance

policy across the European Union. At the same time, existing loss-making insurance schemes in countries such as Canada and the United States are waiting for their momentum in Europe, where none of the countries so far have offered farmers such a form of hedging.

The agricultural insurance market with state subsidies has been operating in Poland since 2006. After the first years of existing the legal norms of the Act on agricultural and farm livestock insurance were subject to changes in the subject matter, construction of contributions, maximum sums of insurance or subsidies from the state budget. Significant changes took place in 2008, when the obligation to insure at least 50% of the crop area was introduced. The number, value and area of crops covered by the agricultural insurance contracts with subsidies are visible from year to year. However, in spite of the above changes, farmers do not use the resources allocated by the resort for this purpose. At the same time, the insurer reports that the insurance cover is taken up by large and medium-sized households, for whom weather risks can cause financial distress. Small farms, despite the state subsidy system, still have little need to secure their crops.

A number of risks threatening agricultural management force agricultural entrepreneurs to take preventive actions in case of realization of risks. Changes introduced in the crop insurance system have so far indicated that the focus was mainly on increasing the prevalence of agricultural producers' participation. This is evidenced by the introduction of an insurance obligation in 2008 or continued pressure to increase the level of subsidized insurance.

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Importance and Comparative Advantages of the EU and US Agri-food Sector in World Trade in 1995-2015 [2]

Abstract. The aim of the paper was to examine the evolution of the importance and comparative advantages of the EU and US agri-food sector in world trade in 1995-2015. The research is based on data from UNCTAD (United Nations Conference on Trade and Development) resources. The following indicators were used in the comparative advantage analysis: Balassa's Revealed Comparative Advantage (RCA), Vollrath's Revealed Competitiveness (RC), the Revealed Symmetric Comparative Advantage (RSCA), and the Lafay's Trade Balance Index (TBI). In 1995-2015, the EU countries and the US were the largest players of world trade in agri-food products. The EU countries held comparative advantages in the global market as regards exports of products of animal origin whereas the exports of cereals, preparations of cereals, oilseeds and oleaginous fruits and meat products were the source of revealed comparative advantages for the US. Both the EU countries and the US reached high comparative advantages in trade in those assortment groups which corresponded to their highest shares in global exports and generated a high, consistently increasing positive trade balance. Therefore, their comparative advantages were the source of their favourable export specialisation profile, which is consistent with the classical comparative costs principle.

Key words: international competitiveness, comparative advantages, export specialisation, agri-food products, world trade, the EU, the US

JEL Classification: F10, F14, Q17

Introduction

Today's world economy experiences two contradictory trends. On one hand, as a consequence of progressing globalisation and regional economic integration processes, trade is well on its way to comply with the free trade concept advanced by classical economists. On the other hand, however, there are protectionist trends emerging gradually as a counter-reaction to the international trade liberalisation processes and to the increasing competitive capacity of new industrialized countries (Rynarzewski and Zielińska-Głębocka, 2006). The free market and free trade mechanisms contribute to the openness of national economies, make them more focused on international trade and contribute to the increased importance of international competitiveness[3].

By referring to the line of research on international competitiveness which is rooted in international exchange theories and emphasizes the importance of free trade (Kim and

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[2] The paper is funded by National Science Centre within the OPUS research project No. 2015/17/B/HS4/00262, titled „Polish agri-food sector under the implementation of the Transatlantic Trade and Investment Partnership agreement (TTIP)".
[3] This is particularly true for economies affected by insufficient effective demand (referred to as "demand-restricted economies").

Marion, 1997), international competitiveness may be defined as the *"ability to maintain or increase the market shares"* (Agriculture Canada, 1991; van Duren, Martin and Westgren, 1991; Kennedy et al., 1997; Pitts and Lagnevik, 1998). The simplest, but not flawless, indicators of international competitiveness levels include the trade balance and shares in world trade[4]. Assuming that in the era of internationalisation and globalisation of many industries, competitiveness may only be assessed in the context of international markets (*Stanowisko Rady Strategii…,* 1997; Wziątek-Kubiak, 2003), the *"domestic companies' ability to effectively and profitably establish their operations in international markets and develop effective exports"* (Woś, 2001) became one of the priorities of economic policies adopted by many countries and is determined through those policies.

In 1990-2015, affected by the changing macroeconomic and institutional conditions, the shares of specific countries and continents in world trade developed dynamically, reflecting their changing economic standing. In this period, the European and North American countries were among those experiencing a decline in their economic activity. In 2016, their share in global exports (compared to 1990) decreased by 14 and 3 percentage points, respectively, reaching 37% and 14% (WTO, 2017). One reason for this was the 2007-2009 worldwide economic crisis manifested by a decline in the trade volume in 2008-2009, disproportionately high compared to the reduction of demand[5]. Under these circumstances, the importance of competition theory and policy was recognized once again. A discussion was initiated on the sources of advantage of one economy over another. Also, attempts were made to quantify the competitive advantages of specific countries or sectors of their national economies.

The EU and the US are the largest players of world trade in agri-food products. Today, agricultural goods are traded increasingly often between countries at similar levels of economic development with similar access to production factors, mostly on an intra-industry basis. Also, agricultural raw materials and foodstuffs are considered to be heterogeneous rather than homogenous goods. With the above in mind, modern trade theories play an increasingly important role in explaining the sources of benefits from trade and competitive advantages over partners. According to these theories, trade flows are determined by such factors as changes in access to production factors; changes in manufacturing efficiency in and between specific countries; increase of disposable incomes *per capita*; transport costs; national economic policies; ability to achieve economies of scale of production and sale; differentiation in levels of technological progress between countries, affecting product diversification and lifecycle[6]. Despite the increasing importance of the above factors, the proper development of agricultural trade flows and structure and the international competitiveness of the agri-food sector may also be

[4] According to Casson (1991), a positive trade balance means an advantageous commodity structure and favourable trade conditions. The generated surplus usually results from the increased efficiency of trade which largely depends on the competitiveness of domestic products (Hybel, 2002). Therefore, despite some methodological doubts (Krugman, 1994), the trade balance is a reliable indicator of competitiveness which becomes increasingly important as the period under consideration grows longer (Bieńkowski, 1995).

[5] According to JaeBin, Amiti and Weinstein (2011), during the last economic downturn, international trade flows were three times more sensitive to the reduction of global demand than GDP. Also, in their analysis of the US economy, Levchenko, Lewis and Tesar (2010) demonstrate that the decrease of the trade to GDP ratio was the highest in 60 years. For a broader discussion on reasons behind the strengthened erosion of trade during the 2007-2009 economic crisis, see Czarny and Śledziewska (2012).

[6] For a broader discussion on sources of competitive advantages in modern international trade theories, see Pawlak (2013).

considered as the effect of comparative advantages, in line with the foreign trade models by Ricardo and Heckscher, Ohlin and Samuelson. This is because according to a study by Pawlak (2013), the higher technical potential of the EU-15 farms provides these countries with a comparative advantage primarily as regards capital-intensive production profiles dependent upon technical progress. In turn, the Central and Eastern European agriculture has an advantage in labour-intensive production profiles. Note also that countries with a temperate climate usually generate a higher comparative advantage in the trading of products of animal origin whereas Mediterranean countries tend to run the specialisation and earn their profits from exports of plant products.

The development of new trade theories is without detriment to the classical concept of comparative advantages. However, in view of dynamic changes taking place in national economies and in the world economy, it was realized that while no country has a guaranteed, sustainable competitive advantage, the ability to compete in the long run is important from the perspective of setting policy priorities[7]. In that context, the objective of this study was formulated which is to examine the evolution of the importance and comparative advantages of the EU and US agri-food sector in world trade in 1995-2015.

Data and methods

This study relies on data from UNCTAD (United Nations Conference on Trade and Development) resources. To identify the evolution of the importance of the EU[8] and US in world agri-food trade, the analysis covered the value, balance and growth rate of trade and the shares of the countries considered in global exports and imports.

The following indicators were used in the comparative advantage analysis: Balassa's Revealed Comparative Advantage (RCA), Vollrath's Revealed Competitiveness (RC), the Revealed Symmetric Comparative Advantage (RSCA) as per the formula proposed by Laursen and Dalum et al., and the Lafay's Trade Balance Index (TBI).

The Balassa's Revealed Comparative Advantage (RCA) is the ratio between the share of exports of a product in world trade and the share of exports of the entire sector in world trade (Balassa, 1965):

$$RCA_{ij} = RXA_{ij} = (X_{ij} / X_{ik}) / (X_{nj} / X_{nk}) \quad (1)$$

with: X – exports, i – country under consideration, j – product (product group) under consideration, k – all goods, n – reference country (countries).

If above one, RCA means a favorable competitive situation. Lower values demonstrate the absence of comparative advantages (Balassa, 1965; Peterson, 1988). In this form, RCA was used to assess the competitive position of the agri-food sector by many researchers, including Anderson (1990), Leishman, Menkhaus and Whipple (1999) and Banterle (2005). The weakness of the Balassa's index is that the comparative advantages are estimated based solely on the value of exports. A more comprehensive approach to the analysis of

[7] The dynamic nature of competitiveness was already noted by Porter (1990) and Landau (1992), and the dynamics of comparative advantages were analysed by Vollrath (1985).

[8] In order to ensure an objective (undistorted by subsequent enlargements of the EU) assessment of changes over time, the EU was treated as a group of 28 member states during the entire period under consideration.

comparative advantages, taking both the import and export performance of a country into consideration, was proposed by Vollrath (1989) who developed the Revealed Competitiveness (RC) index which is the difference between natural logarithms of the revealed comparative advantage in exports (RCA=RXA) and of the revealed comparative advantage in imports (RMA, calculated similarly):

$$RC_{ij} = \ln (RXA_{ij}) - \ln (RMA_{ij}) \quad (2)$$

Positive RC values indicate the existence of a competitive advantage whereas negative values mean an unfavourable competitive situation. The competitive position of agri-food products was estimated with the use of the Vollrath's modified indexes of revealed comparative advantage by many researchers, including Bojnec (2001), Rytko (2003), Banterle and Carraresi (2007), as well as Pawlak and Poczta (2011).

Because of the asymmetric distribution and the absence of a finite upper limit of RCA, several modified formulas were developed with a symmetric distribution (Posłuszny, 2011). Laursen (1998) and Dalum et al. (1998) adjusted the RCA, enabling the definition of Revealed Symmetric Comparative Advantages (RSCA), calculated as follows:

$$RSCA_{ij} = (RCA_{ij} - 1) / (RCA_{ij} + 1) \quad (3)$$

RSCA falls into the interval [–1,1] with negative and positive values indicating, respectively, the absence and existence of a comparative advantage. De Benedictis and Tamberi (2002) claim that the above transformation of the Balassa's index does not provide any benefits in terms of interpretation. However, when combined with the Lafay's Trade Balance Index (TBI), it may enable the creation of a matrix to synthetically assess the competitive position of specific countries trading in specific products or product groups in selected reference markets (Widodo, 2009). TBI falls into the interval [-1, 1] and may be determined as follows (Lafay, 1992):

$$TBI_{ij} = (X_{ij} - M_{ij}) / (X_{ij} + M_{ij}) \quad (4)$$

Positive values indicate a specialized country and usually mean a trade surplus, whereas negative values are characteristic of countries with no export specialisation which are net importers of the product or product group concerned. Considering the RSCA and TBI values, Widodo (2009) developed a matrix enabling the identification of four competitive position scenarios for a country, depending on the level of its comparative advantages and on the level of its export specialisation (Fig. 1)[9].

In this study, the product mapping schemes were developed for two research periods: 1995-1997 and 2013-2015. The applied methodological approach allowed to assess the long-run ability of the EU and US agri-food sector to compete in global trade and to answer the following questions: Did changes in the trade commodity structure in these countries appear in accordance with the principle of comparative costs? Is it possible to consider them as rational from this point of view? Such an analysis gives grounds for making some

[9] This product mapping scheme was used by many researchers, including Ervani (2013), Ishchukova and Smutka (2014) and Benesova et al. (2017), in their studies on the international competitiveness of the agri-food sector.

recommendations regarding the potential reorientation of the trade commodity structure due to their comparative advantages being the source of their favourable export specialisation.

RSCA>0	**Group B:** Comparative advantage Net-importer (RSCA>0 and TBI<0)	**Group A:** Comparative advantage Net-exporter (RSCA>0 and TBI>0)
RSCA<0	**Group D:** Comparative disadvantage Net-importer (RSCA<0 and TBI<0)	**Group C:** Comparative disadvantage Net-exporter (RSCA<0 and TBI>0)
	TBI<0	TBI>0

Fig. 1. Product mapping scheme based on the level of comparative advantage and export specialisation by Widodo
Source: Widodo (2009).

Comparative advantages were analyzed at the level of product groups identified in line with the Standard International Trade Classification (SITC). The timeframes of this study were determined by the availability of complete essential data comparable on an international basis.

Value of trade and the EU and US share in world trade in agri-food products

In 1995-2015, as the globalisation of the world economy and regional economical integration processes were progressing, there was a boost in the global agri-food trade. The world's largest agri-food exporter were the EU countries which accounted for approximately 39% of the global exports in mid-2010s, generating an annual revenue of around USD 553 billion (in 2013-2015). Note however that the trade with non-EU countries (at an average annual level of USD 146 billion in 2013-2015) represented slightly more than ¼ of the total agri-food exports in this group of countries. This means a share of only slightly more than 10 percent in the world exports, a result comparable to that of the US (Table 1). The high share of intra-EU flows in the EU's agricultural exports is determined by similar consumption patterns and food marketing systems (Reed, 2001), in addition to geographic proximity and absence of mutual trade barriers. In 2013-2015, with an average annual value of exports of USD 141 billion, the US were the world's second largest exporter of agri-food products. Notably, in 1995-2015, the growth rate of agri-food exports from the EU and US was below the world average, resulting in a decrease of their shares in the global exports by 6 percentage points and around 3 percentage points, respectively.

Similar trends were observed for all key assortment groups in the structure of the EU and US agri-food exports. In mid-2010s, the EU countries were the origin of approximately 60% of the world's exports of dairy products and livestock; 45% of exported meat and meat preparations; over ⅓ of the global export of cereals and preparations of cereals, as well as

fruit and vegetables; nearly 30% of the world's exports of sugar and sugar confectionery, oils and fats. Note that despite the dynamic growth of the absolute value of exports, during the last two decades, the importance of the EU countries as providers of the above assortment groups to the global market has consistently reduced, especially when it comes to more processed animal products, horticultural products, sugar and sugar confectionery (Table 1). In third countries, the position of the EU countries as exporters of the latter group and of dairy products has considerably weakened. In 2013-2015, following a decline by nearly 13 percentage points and over 10 percentage points, respectively, the international sales of these two product groups in non-EU markets represented less than 6% and slightly above 15% of the world's exports. Note also that when considering only the trade flows with third countries, the EU's share in the world's exports of the aforesaid product groups was no more than 11%. Meanwhile, the US have reduced their share in the global sales of cereals and oilseeds. In 2013-2015, the exports of these assortment groups from the US represented, respectively, around 14% and 30% of the global exports, compared to 26% and 47% in 1995-1997. Even though their importance in world trade has declined, the US export more cereals, oilseeds, fruits, vegetables, meat and meat preparations than the EU to third countries.

Conversely, in 1995-2015, the US increased their importance as an importer of agri-food products (Table 1). Eventually, in mid-2010s, compared to EU and its trade relationships with third countries, the US imported more animal products, cereals, preparations of cereals, sugar and sugar confectionery, while having a smaller share in the global imports of oils and fats, oilseeds and oleaginous fruits, fruit and vegetables, which are produced in surplus quantities in the US and are traditionally exported because of the cost and price advantages. Due to high level of food self-sufficiency, only small volumes of animal products and cereals were imported to the EU from third countries. These goods were mainly traded inside the EU and, considering the entire trade volume, allowed the EU countries to reach a share of more than 25 percent in the global imports of cereals and preparations of cereals, and a share of around 45 percent in the imports of animal products. The EU countries' share in the global imports of fruit and vegetables was at a similar level. Also, they had a share of around 30% in the global imports of sugar, sugar confectionery, oils and fats, and a share of 20% in the global imports of oilseeds and oleaginous fruits.

In 2013-2015, the average total value of agri-food imports to the EU, both from the Single European Market and from third countries, following a two-and-a-half times increase in the 1995-2015 period, was nearly USD 540 billion per year and represented almost 38% of the world's import volume (Table 1). During that period, the value of agri-food imports to the US more than tripled. In 2013-2015, food imports to the American market absorbed more than USD 130 billion per year, representing approximately 9% of global imports. What should be noted is that even though the imports grew faster than the exports, the US remained a net exporter of all key products in the exports structure except for fruit and vegetables while experiencing a significant improvement in the trade balance for meat, meat preparations, dairy products, oilseeds and oleaginous fruits. The EU countries, due to the need to import products from other climate zones, have become an increasingly important net importer of oilseeds, oils, fats, fruit and vegetables in the global market while reporting a growing surplus of trade in animal origin products and cereals.

Table 1. Value of trade and the EU and US share in world trade in agri-food products in 1995-1997 and 2013-2015

Product group	Exports			Share in the world exports		Imports			Share in the world imports		Trade balance	
	1995-1997	2013-2015		1995-1997	2013-2015	1995-1997	2013-2015		1995-1997	2013-2015	1995-1997	2013-2015
	Million USD		1995=100	%		Million USD		1995=100	%		Million USD	
EU in total												
Live animals	5 737	13 025	227.0	55.9	59.3	4 739	9 766	206.1	46.7	44.0	998	3 259
Meat and meat preparations	27 538	65 487	237.8	56.2	45.8	23 534	56 802	241.4	49.0	41.6	4 004	8 685
Dairy products	25 346	59 025	232.9	78.0	63.6	19 356	44 121	228.0	61.0	48.4	5 990	14 903
Cereals and preparations of cereals	22 122	59 809	270.4	36.8	34.5	17 515	47 573	271.6	27.7	26.8	4 606	12 235
Oilseeds and oleaginous fruits	1 762	8 567	486.2	11.3	10.6	7 849	18 920	241.0	46.5	22.0	-6 087	-10 353
Fruit and vegetables	33 608	85 696	255.0	45.8	36.9	43 814	102 840	234.7	55.3	43.4	-10 207	-17 144
Sugar and sugar confectionery	7 670	13 539	176.5	37.6	27.7	6 730	15 292	227.2	32.2	30.5	940	-1 753
Oils and fats	9 045	25 784	285.1	34.0	27.0	9 969	30 780	308.8	37.1	31.6	-924	-4 996
Total	212 076	552 945	260.7	44.6	38.6	218 689	539 656	246.8	44.9	37.6	-6 613	13 288
EU – third countries												
Live animals	1 298	2 440	188.0	12.6	11.1	725	340	46.9	7.2	1.5	573	2 099
Meat and meat preparations	6 205	11 244	181.2	12.7	7.9	5 739	7 634	133.0	11.9	5.6	466	3 610
Dairy products	8 279	14 069	169.9	25.5	15.2	2 697	1 041	38.6	8.5	1.1	5 582	13 027
Cereals and preparations of cereals	8 345	19 084	228.7	13.9	11.0	3 943	7 892	200.1	6.2	4.5	4 401	11 192
Oilseeds and oleaginous fruits	430	1 020	237.0	2.8	1.3	6 511	11 815	181.5	38.6	13.8	-6 081	-10 795
Fruit and vegetables	6 460	14 560	225.4	8.8	6.3	18 569	39 096	210.5	23.4	16.5	-12 109	-24 536
Sugar and sugar confectionery	3 782	2 766	73.1	18.5	5.7	2 692	4 021	149.4	12.9	8.0	1 090	-1 255
Oils and fats	3 244	6 108	188.3	12.2	6.4	4 397	12 412	282.3	16.4	12.7	-1 153	-6 304
Total	68 270	145 793	213.6	14.3	10.2	84 414	164 042	194.3	17.3	11.4	-16 144	-18 249
The US												
Live animals	591	907	153.5	5.8	4.1	1 700	3 190	187.6	16.8	14.4	-1 109	-2 283
Meat and meat preparations	6 809	17 809	261.6	13.9	12.4	2 592	8 686	335.1	5.4	6.4	4 217	9 123
Dairy products	781	5 642	722.0	2.4	6.1	723	2 051	283.7	2.3	2.3	58	3 591
Cereals and preparations of cereals	15 618	24 725	158.3	26.0	14.3	2 241	9 729	434.2	3.5	5.5	13 377	14 996
Oilseeds and oleaginous fruits	7 253	23 755	327.5	46.6	29.4	362	1 798	496.2	2.1	2.1	6 891	21 957
Fruit and vegetables	7 917	24 483	309.3	10.8	10.5	8 351	30 702	367.6	10.5	12.9	-435	-6 219
Sugar and sugar confectionery	635	2 276	358.5	3.1	4.7	1 844	4 712	255.6	8.8	9.4	-1 209	-2 436
Oils and fats	2 225	3 254	146.2	8.4	3.4	1 625	6 212	382.3	6.1	6.4	600	-2 958
Total	60 615	141 470	233.4	12.7	9.9	40 624	130 234	320.6	8.3	9.1	19 991	11 236

Source: (UNCTAD, 2017), own calculations.

Comparative advantages of the EU and US in the world agri-food trade

Based on the calculated RCA values, it may be concluded that in 1995-2015, the EU countries demonstrated revealed comparative advantages in the exports of products of animal origin (RCA>1; Table 2). It is noticeable that during the period under consideration, the EU has strengthened its competitive position as an exporter of less processed goods (livestock) while experiencing a decline in exports of products with a higher value added (meat, meat preparations, dairy products). However, an important observation is that after excluding the intra-EU trade from the total flows, declining comparative advantages were reported in the EU only with respect to exports of dairy products (RCA=1.78 in 1995-1997 and RCA=1.49 in 2013-2015). In 1995-1997, the EU countries held a relatively small comparative advantage in the exports of sugar and sugar confectionery to third-country markets (RCA=1.29). In 2013-2015, they had a comparative advantage in the exports of livestock, cereals and preparations of cereals to non-EU countries (RCA=1.09 and RCA=1.08, respectively).

Similar conclusions may be drawn from the analysis of Revealed Competitiveness indexes (RC) which take into consideration both the export and import performance of a country. According to this approach, a favourable competitive situation was recorded for cereals and preparations of cereals not only in relationships with non-EU countries but also with respect to total trade volumes (Table 2). Note also that as regards cereals and products of animal origin, the EU's competitive position, measured with the Vollrath's index, was deteriorating in the global market while getting stronger in third-country relationships. In the period under consideration, the US demonstrated high (though declining) comparative advantages in exports of cereals and preparations of cereals, oilseeds and oleaginous fruits (RCA>1 and RC>0) while reporting an improvement of their competitive position in trade in meat products and dairy products.

Note that in 1995-2015, both the EU countries and the US reached high comparative advantages in trade in those assortment groups which corresponded to their highest shares in global exports and generated a high, consistently increasing positive trade balance. Similar conclusions may be formulated based on product mapping by comparative advantage level and by export specialisation degree made with the Widodo method (2009).

In 1995-2015, the EU countries reached comparative advantages and run export specialisation (RSCA>0 and TBI>0) in world trade in livestock, meat, meat preparations and dairy products (Fig. 2). In 1995-1997 and 2013-2015, the exports of the above commodity groups provided the EU countries with a 64% and a 55% share, respectively, in global exports. The trade surplus of USD 26.8 billion reached in 2013-2015 was twice as high as the positive trade balance of the total agri-food sector (Table 1). In third-country markets, EU countries held the highest comparative advantages with respect to (and were a net exporter of) livestock, dairy products and cereal products (Fig. 3). An important erosion of their competitive position in third-country markets was observed for sugar and sugar confectionery which, in 1995-1997, were among products providing a high comparative advantage, a nearly 20% share in world's exports and a trade surplus of USD 1 billion, approximately. Meanwhile, in 2013-2015, together with horticultural products, oilseeds, oils and fats, they formed a group with no comparative advantages which contribute to the widening trade deficit (RSCA<0 and TBI<0). Together, these four assortment groups absorbed over 40% of expenditure on foods imported from outside the EU, while generating barely around 17% of revenue from agri-food exports to third-country markets.

The reason for the increasingly negative balance of the EU trade in oilseeds and oils of plant origin was the need to import them because many EU countries are not self-sufficient in these products. In turn, the status of net importer of fruit and vegetables was determined by highly intensive intra-industry flows resulting from the complementarity between imported goods and intra-EU production.

Table 2. An evaluation of the EU and US comparative advantages in world trade in agri-food products in 1995-1997 and 2013-2015

Product group	SITC code	1995-1997				2013-2015			
		RCA	RC	RSCA	TBI	RCA	RC	RSCA	TBI
EU in total									
Live animals	00	1.25	0.19	0.11	0.10	1.54	0.27	0.21	0.14
Meat and meat preparations	01	1.26	0.14	0.12	0.08	1.19	0.07	0.08	0.07
Dairy products	02	1.75	0.25	0.27	0.13	1.65	0.25	0.24	0.14
Cereals and preparations of cereals	04	0.83	0.29	-0.10	0.12	0.89	0.22	-0.06	0.11
Oilseeds and oleaginous fruits	22	0.25	-1.41	-0.59	-0.63	0.28	-0.76	-0.57	-0.38
Fruit and vegetables	05	1.03	-0.18	0.01	-0.13	0.96	-0.19	-0.02	-0.09
Sugar and sugar confectionery	06	0.84	0.16	-0.08	0.07	0.72	-0.12	-0.16	-0.06
Oils and fats	4	0.76	-0.08	-0.13	-0.05	0.70	-0.18	-0.18	-0.09
EU - third countries									
Live animals	00	0.88	0.76	-0.06	0.28	1.09	2.10	0.04	0.76
Meat and meat preparations	01	0.88	0.25	-0.06	0.04	0.77	0.46	-0.13	0.19
Dairy products	02	1.78	1.29	0.28	0.51	1.49	2.70	0.20	0.86
Cereals and preparations of cereals	04	0.97	0.99	-0.02	0.36	1.08	1.02	0.04	0.41
Oilseeds and oleaginous fruits	22	0.19	-2.45	-0.68	-0.88	0.12	-2.27	-0.78	-0.84
Fruit and vegetables	05	0.61	-0.79	-0.24	-0.48	0.62	-0.85	-0.24	-0.46
Sugar and sugar confectionery	06	1.29	0.55	0.13	0.17	0.56	-0.23	-0.28	-0.18
Oils and fats	4	0.85	-0.11	-0.08	-0.15	0.63	-0.57	-0.23	-0.34
The US									
Live animals	00	0.45	-1.49	-0.38	-0.48	0.42	-1.33	-0.41	-0.56
Meat and meat preparations	01	1.09	0.52	0.04	0.45	1.26	0.59	0.12	0.34
Dairy products	02	0.19	-0.37	-0.68	0.04	0.62	0.91	-0.24	0.47
Cereals and preparations of cereals	04	2.04	1.57	0.34	0.75	1.44	0.87	0.18	0.44
Oilseeds and oleaginous fruits	22	3.66	2.65	0.57	0.90	2.98	2.56	0.50	0.86
Fruit and vegetables	05	0.85	-0.40	-0.08	-0.03	1.07	-0.29	0.03	-0.11
Sugar and sugar confectionery	06	0.24	-1.46	-0.61	-0.49	0.47	-0.79	-0.36	-0.35
Oils and fats	4	0.66	-0.10	-0.21	0.16	0.35	-0.71	-0.49	-0.31

Source: (UNCTAD, 2017), own calculations.

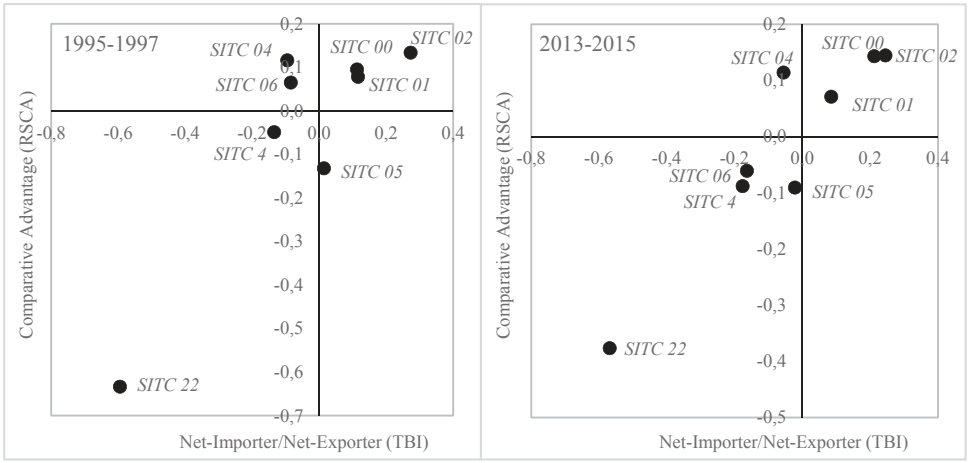

Fig. 2. Product mapping scheme for selected agri-food product groups exported from the EU by the level of comparative advantage and export specialisation in 1995-1997 and 2013-2015 (total trade, Widodo's method)

Source: (UNCTAD, 2017), own calculations.

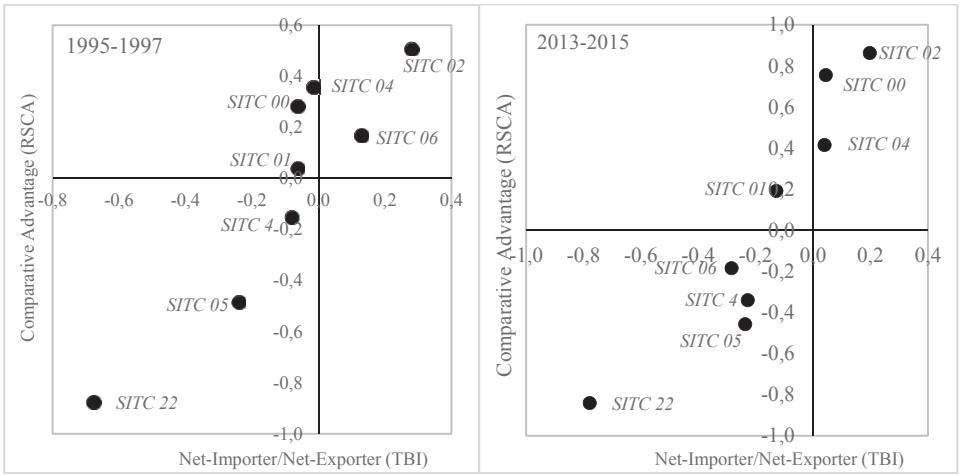

Fig. 3. Product mapping scheme for selected agri-food product groups exported from the EU by the level of comparative advantage and export specialisation in 1995-1997 and 2013-2015 (trade with third countries, Widodo's method)

Source: (UNCTAD, 2017), own calculations.

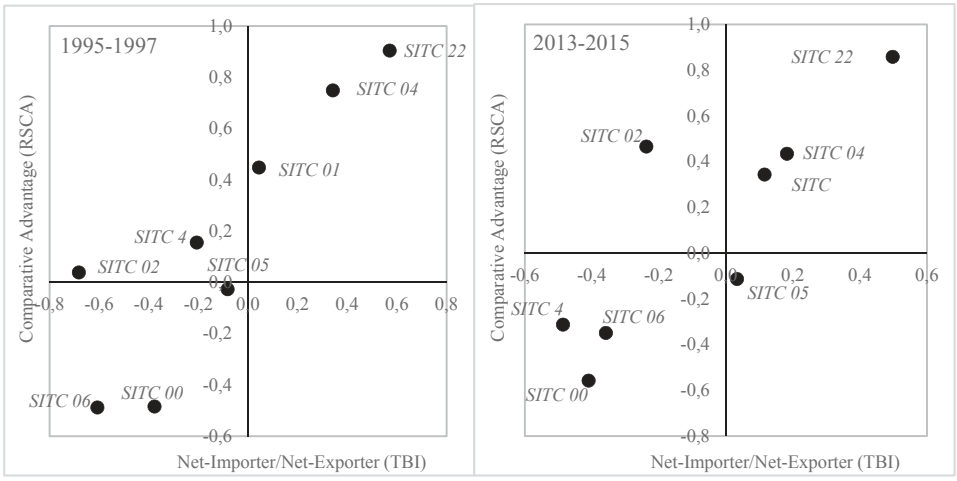

Fig. 4. Product mapping scheme for selected agri-food product groups exported from the US by the level of comparative advantage and export specialisation in 1995-1997 and 2013-2015 (Widodo's method)

Source: (UNCTAD, 2017), own calculations.

In the US, the highest comparative advantages (RSCA>0) and the highest trade benefits reflected by the growing trade surplus in 1995-2015 (TBI>0) were observed for oilseeds, oleaginous fruits, cereals, cereal preparations and meat products (Fig. 4) which, in 2013-2015, accounted for nearly 47% of total revenue from agri-food exports and generated a positive trade balance of around USD 46 billion (Tab. 1), i.e. four times more than the total agri-food trade balance. Throughout the period under consideration, no comparative advantages (RSCA<0) were reported for livestock, horticultural products and sugar confectionery exported from the US. In 2013-2015, this was also true for oils and fats. These circumstances (except for fruit and vegetables in 2013-2015) were not encouraging to engage into export specialisation in this field (TBI<0). However, importantly, in the last period under consideration, the exports of product groups with no comparative advantages (which strengthened the US role as a net importer) represented barely 5% of total agri-food exports.

Concluding remarks

The EU countries and the US are the largest players of world trade in agri-food products. Together, they accounted for approximately 48% of global food trade in mid-2010s. In the last twenty years, their involvement in international exports and imports of agricultural products has reduced by approximately 9 percentage points and 7 percentage points, respectively. In 1995-2015, the EU countries held revealed comparative advantages in the global market as regards exports of products of animal origin whereas the exports of cereals, preparations of cereals, oilseeds, oleaginous fruits and meat products were the source of revealed comparative advantages for the US. It is noticeable that during the period under consideration, the EU has strengthened its competitive position as an exporter of less processed animal products (livestock) while experiencing a decline in exports of

products with a higher value added, such as meat, meat preparations and dairy products which, in turn, were the source of increasingly higher comparative advantages for the US. In view of the above, it may be concluded that in the coming years these two sectors may prove to be the most sensitive ones to the increase of competitive pressure in the EU-US bilateral trade and in global trade flows, especially in light of the potential trade liberalisation.

It should be noted that both the EU countries and the US reached high comparative advantages in trade in those assortment groups which corresponded to their highest shares in global exports and generated a high, consistently increasing positive trade balance. Therefore, it may be concluded that their comparative advantages were the source of their favourable export specialisation profile, and the trade commodity structure in these countries has changed in accordance with the classical comparative costs principle.

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Linear and Non-linear Relationships Between Shares of the Agri-food Industries of the Warsaw Stock Exchange. Risk Aspect

Abstract. Despite a wide range of research on the agricultural market conducted so far, relatively little attention has been devoted to a comprehensive analysis of linear and non-linear causality in relation to the entire agri-food sector in Poland, in the context of risk. The objective of this study is therefore to analyze the linear and non-linear relationships between shares of WSE's agri-food industry sectors in terms of risk. The study covered three sectors of agri-food sector currently existing on the WSE (29 listed companies): Foods (21 listed companies), Agricultural Production and Fisheries (5 listed companies) and Food and Foodstuffs and fast-trafficking foodstuffs (3 listed companies). The existence of linear relationships was verified using the test procedure proposed by Hong, Liu, Wang and Łęt, while non-linear relationships were verified using the Diks-Panchenko, Orzeszko and Osińska tests's. The study was carried out on the basis of data from companies of the agri-food industry listed on the Warsaw Stock Exchange in the period from 1 May 2010 to 1 May 2017. The chosen research methodology was dictated by the correlation with investment risk on the WSE. The strongest and most enduring dependencies have been found in the agricultural and fisheries sectors. In the foodstuff sector and the fast-marketable sector, the risk of investment in the listed companies was temporary.

Key words: shares, risk, causal linear relationship, non- causal linear relationship, agri-food industry

JEL Classification: E220, C510, L160, Q100, Q180,

Introduction

Globalisation - and as a result, the dynamics in the development of modern financial markets has been reflected also in the classic commodity market, where (similarly to the financial market) the goal of every investor is to achieve the highest possible profit while maintaining an optimal, acceptable level of risk. Skilful risk forecasting is therefore an important element of the investment strategy. As a result, in recent years commodity markets have become increasingly similar to financial markets due to the motives and strategies of their participants, many tools and methods of econometrics and financial engineering are used in commodity markets.

For a few years now, the contemporary Polish literature of the subject has been using financial econometrics methods to analyze the commodity market, including the agricultural market. An important area, whose research has become popular in recent years, is the analysis of causation in agricultural markets. He dealt with this issue, among others, with the following issues Figiel (2002), which examined causality in the sense of Granger in the sense of intervention prices of buying wheat and rye and their market purchase prices, causality in the sense of Granger in relation to domestic rye and wheat prices in particular regions of Poland and causality in the sense of Granger in relation to domestic

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and selected world monthly wheat prices. Dudek (2008) addressed the analysis of causal links between feed cereal and pig livestock prices. Rembeza (2009), investigating the relationship between prices of agricultural products in Poland and European Union countries, conducted causality tests of wheat prices for the Polish, French and American markets as well as prices of pork livestock from the Polish, Danish and Dutch markets.

Gędek (2009) studied the relationship between pork prices on the Polish market and selected European Union markets and used the Granger test to investigate causality for prices of pork half-carcasses in Poland, Germany and France. Rembeza and Chotkowski (2010) investigated the price links between the small markets on the potato market. Rembeza (2010) also presented the results of Granger's causality test for cereal prices in Poland and Germany, France and the USA for prices of pigs in Poland, Denmark and the Netherlands, for wheat and pig and poultry, as well as rye and pigs. In the same work, he used the causality analysis of Granger in order to determine the direction of price impulses flow for prices of raw materials and preparations such as: meat and pork and ham, wheat and wheat flour, wheat bran, rye and rye flour and rye bran and rye bran. Gędek (2010) studied causality in the sense of Granger as regards prices of wheat, piglets and pork livestock on the local market of the Ryk area. Tłuczak (2011) investigated the impact of purchase prices of livestock on retail prices of meat and used the Granger test to identify causal links between purchase prices and retail prices of bone-in and boned beef and veal, gutted chickens and cattle, pigs and poultry. Hamulczuk and Klimkowski (2011) studied the relationship between oil prices and wheat prices in Poland. The research using the Granger's test to identify causal links between cereal market prices in Poland was also conducted by Krawiec (2013) and Łęt (2014) as regards the risk of selected WSE sectors in Warsaw. The trade in agricultural and food products on the stock exchange (the conception of the essence of the commodity exchange) was examined by Dykiel, Liszka (2015).

Despite such a wide range of research on the agricultural market conducted so far, relatively little attention was devoted to a comprehensive analysis of linear and non-linear causality in relation to the entire agri-food sector in Poland, in the context of risk. The objective of this study is therefore to analyze the linear and non-linear relationships between shares of the WSE's agri-food industry sectors in terms of risk. The study covered three sectors of agri-food sector currently existing on the WSE (29 listed companies): Food (21 listed companies), Agricultural Production and Fisheries (5 listed companies) and Foodstuffs and fast-trafficking foodstuffs (3 listed companies).

The existence of linear relationships was verified using the test procedure proposed by Hong, Liu, Wang (2009) and Łęt (2014), while non-linear relationships were verified using the Diks-Panchenko test's (Diks, Panchenko, 2006) and Orzeszko and Osińska (Orzeszko, Osińska, 2007).

The survey was conducted based on data from listed companies of the agri-food industry listed on the Warsaw Stock Exchange in the period from 1 May 2010 to 1 May 2017.

The author hopes that the conducted research will contribute to a methodical and comprehensive approach in the analysis of causality of linear and non-linear relationships.

Linear and non-linear causes of risk. Literature review

The causes behind the risk in the sense of Granger is related to the flow of information on the financial markets. For this reason, it is referred to as information causality (Osińska, 2011). Investors, in response to the incoming information, make decisions that result in financial capital movements between the markets (Osińska, 2008). Thus, the risk of one financial instrument may precede that of another.

The concept of causality in economics is widely discussed from the point of view of methods of axiomatic description and methods of analysis. Pearl (2000) applies methods of graph theory based on probabilistic bases in Bayesian terms; Hoover (2001) stresses the need for a causal structure analysis and uses tools of multi-equation econometric models; Cartwright (2010) refers to philosophical fundamentals and criticizes Pearl and Hoover's approach; the paper (Syczewska, Struzik, 2014) contains an overview of selected methods of causality testing; Barnett, Barret, Seth, (2009) and Hlaváčkova-Schindler et al. (2011) demonstrated the equivalence of the linear Granger test for the normal distribution variables.

A linear version of the Granger test is used to detect causality in average. Krawiec (2012) analyses quotations of selected Polish commodity funds and world prices of the most important goods, for the period from 01.2009 to 12.2011. It also tests the linear causality of Granger's rate of return in logarithmic terms., $r_t = \ln P_t - \ln P_{t-1}$, and states that there are causal links from the S&P500 index to some but not all raw material funds. Misiuk, Zajkowska (2010) based on daily data from 01.2004 to 03.2010 showed that WIG20 influences DAX, BUX, ATX and S&P500, and is influenced by CAC, PX (index for the Czech Republic), BUX (Hungarian index), ATX (Austrian index), FTSE, FTSE MIB (Italian indexes). Applications in financial econometrics often concern causality in variance (Cheung, Ng 1996) and risk. Fałdziński, Osińska, Zdanowicz (2012) recall that the original idea of Granger's causality in risk assumes the use of Value at Risk as a measure of risk, and expands the use of the test with Expected Shortfall and spectral measurements. The risk factors are tested for the period before the crisis (1.02.2006-31.07.2008) and during and after the crisis (1.08.2008-18.02.2011).

The concept of causality in the sense of Granger in the sense of risk of Hong, Liu and Wang has been developed along the lines of causality in variance. As Hong, Liu and Wang (2009) say, variance alone is not in a good position to capture risk figures in the event of extreme financial market movements. Variation reflects both expected values of above-average losses and profits. Risks, on the other hand, reflect uncertainty as to the potential losses that an investment in a financial instrument could incur. In addition, the occurrence of risk causal relationships between the two instruments may occur despite the rejection of similar hypotheses in relation to mean and conditional variance (Hong, Liu, Wang, 2009), because risk causality may occur, among other things, in situations where there are common changes in the obliquity.

The non-linear aspects of causation have already been addressed by Granger (Granger, Teräsvirta, 1993; Granger, Maassoumi, Racine, 2004). Bruzda (2007) discusses the conditions that must be fulfilled by an ideal measure of functional dependency of two stochastic processes: it is to be well defined for both continuous and discrete variables; equal to zero for independent variables; normalized to $\langle 0,1 \rangle$ or $\langle -1,1 \rangle$; shall meet the distance conditions, and for variables of normal distribution shall be equal to the correlation

coefficient or one of its simple functions. Diks and Panchenko as one of the arguments justifying the need to modify the Hiemstra-Jones test, quoted the fact that the test more often rejected the hypothesis of no causality than the Granger's linear test, which in their opinion weakened the conclusion based on the HJ test in the published practical applications. Diks and Panchenko (2005) concluded that the Hiemstra-Jones test (1994) could reject the hypothesis of no causality even if the Granger's linear test definitely points to it. So they proposed an adjusted version of this test. The test T_n (Diks, Panchenko, 2006) can be used to detect non-linear causations.

Data and methods

The aim of the survey is to analyze linear and non-linear relationships between shares of WSE's agri-food industry sectors in terms of risk. Three currently operating agri-food sectors of the WSE (29 listed companies) were analysed: Foods - F (21 listed companies), Agricultural Production and Fisheries - APF (5 listed companies) and Foodstuffs and fast-trafficking foodstuffs - FFF- (3 listed companies) – Table 1. The research was conducted on the basis of companies data for the period from 1 May 2010 to 1 May 2017.

Table 1. List of companies in the Warsaw Stock Exchange agri-food sector (data on 10.2017)

Nazwa spółki	Foods	Agricultural production and fishing	Foodstuffs and fast-trafficking foodstuffs
ADM Czernin [ADM]	YES	NO	NO
Atlanta Poland SA [ATP]	YES	NO	NO
Bakalland SA [BAK]	YES	NO	NO
Colian Holding SA [COH]	YES	NO	NO
Gobarto SA [GOB]	YES	NO	NO
Graal SA [GRA]	YES	NO	NO
Helio SA [HEL]	YES	NO	NO
Indykpol SA [IND]	YES	NO	NO
Kernel Holding SA [KEH]	YES	NO	NO
Kruszwica SA [KRU]	YES	NO	NO
Makarony Polskie SA [MAP]	YES	NO	NO
Mieszko SA [MIE]	YES	NO	NO
Milkiland NV [MIL]	YES	NO	NO
Mispol SA [MIS]	YES	NO	NO
Ovostar Union NV[OVU]	YES	NO	NO
Pamapol SA [PAM]	YES	NO	NO
Tarczyński SA [TAR]	YES	NO	NO
Wawel SA [WAW]	YES	NO	NO
Wilbo SA [WIL]	YES	NO	NO
ZM Henryk Kania SA [ZHK]	YES	NO	NO
ZPC Otmuchów SA [ZPC]	YES	NO	NO
Agroton Plc [AGR]	NO	YES	NO
Astarta Holding NV [ASH]	NO	YES	NO
AUGA Group AB [AUG]	NO	YES	NO
IMC SA [IMC]	NO	YES	NO
KSG Agro SA [KSG]	NO	YES	NO
Delko SA [DEL]	NO	NO	YES
FH Jago SA [FHJ]	NO	NO	YES
North Coast SA [NOC]	NO	NO	YES

Source: The author's own development.

The choice of sectors was dictated by the place of publication of the article. The survey covered all companies in a given sector, regardless of the level of capitalisation of the listed company and the liquidity of shares on the stock exchange.

The existence of linear relationships was verified using the test procedure proposed by Hong, Liu, Wang and Łęt, while the Diks-Panchenko, Orzeszko and Osińska tests's were used to verify non-linear relationships.

The test procedure proposed by Hong, Liu and Wang is based on the examination of correlation coefficients between time series containing information on the VaR value-at-risk values being exceeded by the return of a given listed company.

According to Tody's, Yamamoto, Bauer and Maynard (Toda, Yamamamoto, 1995; Bauer, Maynard, 2012), for non-stationary variables, it is advisable to select the optimal number of 2 delays for the VAR model, and then increase it by a number equal to the number of rows of integration of variables *d*.

The linear causality test of Granger variable pairs shall be carried out as follows: the equations of the VAR model with the same number of delays for both variables, k, are estimated and the total significance of delays for a given variable is tested in the equation explaining the second variable:

$$y_t = \alpha_{10} + \sum_{j=1}^{k} \alpha_{1j}\ y_{t-j} + \sum_{j=1\,1j}^{k}\ x_{t-j} + \in_{1t} \tag{1}$$

$$y_t = \alpha_{20} + \sum_{j=1}^{k} \alpha_{2j}\ y_{t-j} + \sum_{j=1\,2j}^{k}\ x_{t-j} + \in_{2t} \tag{2}$$

In the equation (1) H_0: $\beta_{11} = \beta_{12} = \ldots = \beta_{1k} = 0$ means that there is no causal link in the sense of Granger between the variable *X* do *Y*. In the equation (2) H_0: $\beta_{21} = \beta_{22} = \ldots = \beta_{2k} = 0$ means no linear causality from *Y* to *X*.

Diks and Panchenko concluded that the Hiemstra-Jones test's (1994) could reject the hypothesis of no causality even if the Granger's linear test definitely points to it. So they proposed an adjusted version of this test. The run of the Diks-Panchenko test's is as follows: the *X* variable is the cause in the sense of Granger for *Y* if current and delayed values $X = x_t,\ x_{t-1},\ \ldots,\ x_{t-n}$ contain additional information about future values $Y = Y_{t+1},\ Y_{t+2},\ \ldots,\ Y_{t+n}$, not included in the current and delayed values of this variable. Authors focus on the case when *X*'s impact on $Y_{t+1}$is investigated. Diks and Panchenko tested the conditional independence and the finite number of delays.: $Y_{t+1} \mid (X_t,\ X_{t-1},\ \ldots,\ X_{t-lx+1},\ Y_t,\ Y_{t-1},\ \ldots,\ Y_{t-ly+1}) \sim Y_{t+1} \mid (X_t,\ X_{t-1},\ \ldots,\ X_{t-lx+1})$, where: l_x, l_y means the number of delays taken into account for a given variable. The test is an improved version of the Hiemster-Jones test, comparing the differences between conditional distributions. Diks and Panchenko applied one delay for both variables and the forecast for one period. If: $(X_t,\ Y_t,\ Y_{t+1}) = (X,\ Y,\ Z)$ *X* and *Y* will be strictly stationary variables. A null hypothesis with no causality means that a conditional distribution *D* relative *X* and *Y* is as follows *D* relative *Y*. The combined boundary distribution and spacing is as follows:

$$f_{X,Y,Z}\ (x, y, z) / f_{X,Y}\ (x, y) = f_{X,Z}\ (x, z) / f_Y\ (y) \tag{3}$$

Diks and Panchenko show flaws in approximating the difference between the two sides of this formula with the correlative integral used in Hiemstry-Jones's work, and derive their own version of the formula:

$$g_g \equiv E\,[(f_{X,Y,Z}\,(X,Y,Z)\,f_Y\,(Y) - f_{X,Y}\,(X,Y)\,f_{Y,Z}\,(Y,Z)] \tag{4}$$

where: $g\,(X, Y, Z)$ is a positive weight function; for $g\,(X, Y, Z) = f_Y^2\,(Y)$.

On the assumption of zero hypothesis truthfulness, the expression in round brackets shall be zeroed. The zero hypothesis is rejected if the calculated value of test statistics is high.

Based on the above relationships – the study used an estimator based on the indicator function.:

$$T_n\,(\square) = \frac{(2)^{-dx-dy-dz}}{n(n-1)\,(n-2)} \sum i\,[\sum k, k \neq i \sum j, j \neq i\,(l_{ik}^{X,Y,Z} l_{ij}^{Y} - l_{ik}^{X,Y} l_{ij}^{Y,Z})] \tag{5}$$

Where: n – number of observations, d_x – vector dimension X, indicator function $l_{ij}^{W} = l\,(\square$ $W_i - W_j \square \leq \square)$ equal to 1 if $\square$ $W_i - W_j \square \leq \square$ - 0 in the opposite direction.

Results

The article presents an analysis of linear and non-linear relationships between shares of WSE's agri-food industry sectors in terms of risk in the period from 1 May 2010 to 1 May 2017. The subject of the empirical illustration were three currently existing on the WSE agri-food sector in the number of 29 listed companies. Verification of the existence of linear relationships was performed using the test procedure proposed by Hong, Liu, Wang and Łęt. For the verification of non-linear relationships, the Diks-Panchenko, Orzeszko and Osińska tests's were used. The tests were performed for the long position.

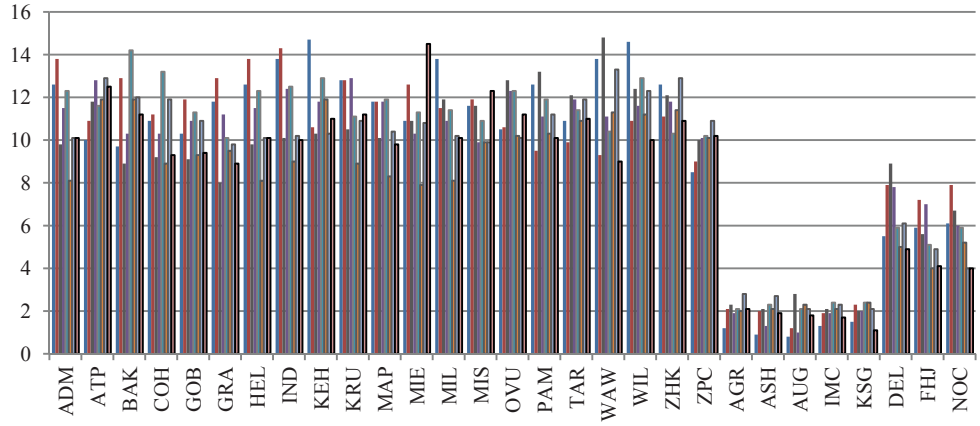

Fig. 1. Percentage logarithmic returns in the period 01.05.2010 - 01.05.2017

Source: The author's own development based on Warsaw Stocks Exchanges.

As far as the linear part is concerned, Figure 1 represents the logarithmic percentages of the surveyed listed companies in the period considered. The most likely are the F and FFF sector returns. The least likely are the returns of the APS sector. Quotations of all shares have been subject to relatively high volatility since 2014.

Table 2. Descriptive statistics for time series and standard deviation for the period 01.05.2010 -01.05.2017

Segment	Companies	Minimal	Average	Maximum	Standard deviation
F	ADM	-2.232	+0.231	+18.878	14.989
	ATP	-1.231	+0.324	+10.854	7.658
	BAK	-3.342	+0.874	+11.232	7.659
	COH	-8.989	+0.542	+10.999	6.341
	GOB	-5.231	+0.762	+9.232	8.767
	GRA	-4.322	+0.162	+7.898	9.651
	HEL	-5.431	+0.167	+10.767	9.342
	IND	-7.342	+0.421	+11.231	9.125
	KEH	-8.342	+0.323	+10.342	9.132
	KRU	-6.232	+0.521	+10.111	8.321
	MAP	-5.231	+0.555	+9.342	9.435
	MIE	-6.781	+0.765	+9.444	9.671
	MIL	-8.909	+0.898	+9.232	9.324
	MIS	-8.676	+0.343	+10.111	9.312
	OVU	-4.454	+0.212	+10.233	9.333
	PAM	-6.788	+0.432	+11.111	9.767
	TAR	-4.989	+0.123	+9.909	9.344
	WAW	-5.999	+0.231	+9.999	9.222
	WIL	-8.909	+0.222	+10.001	9.011
	ZHK	-7.771	+0.454	+11.212	8.320
	ZPC	-4.456	+0.542	+10.221	8.999
APF	AGR	-14.232	-0.012	+5.232	1,232
	ASH	-10.221	-0.023	+3.231	1.111
	AUG	-13.234	-0.001	+1.323	1.325
	IMC	-12.453	-0.011	+2.323	1.453
	KSG	-13.893	-0.021	+1.111	1.621
FFF	DEL	-8.999	+0.015	+7.899	5.342
	FHJ	-9.898	+0.001	+7.342	4.239
	NOC	-9.763	+0.003	+7.221	4.554

Source: The author's own development.

Table 2 presents the most important descriptive statistics of the series considered. All listed companies with the exception of APF showed a positive or close to zero average rate of return. The series corresponding to the F sector shares had the highest standard deviation and the highest mean deviation. The FFF sector is the lowest average.

Table 3 contains the results of risk causality tests between the aforementioned pairs of listed companies in the analysed sectors. In addition, it illustrates the number of delays in the VAR model for the whole trial, based on the Akaike, AIC, Bayesian Schwarz, BIC, and Hannan Quinna, HQC criteria.

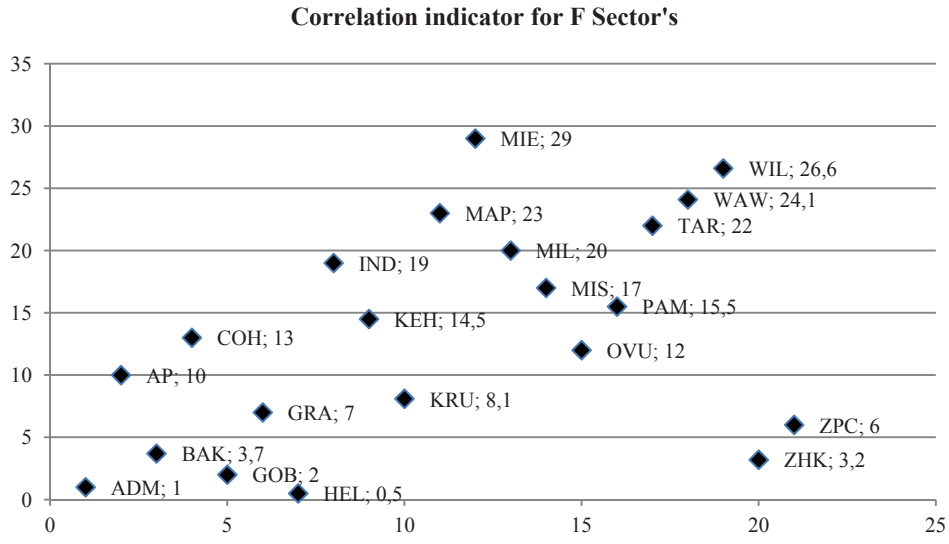

Fig. 2. Correlation of F sector companies in the period 01.05.2010 - 01.05.2017

Source: The author's own development.

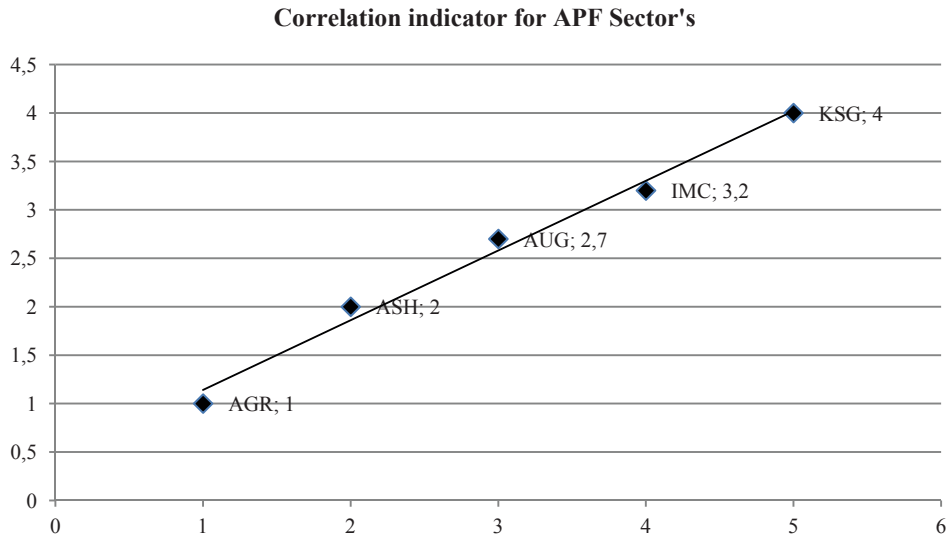

Fig. 3. Correlation of APF sector companies in the period 01.05.2010 - 01.05.2017

Source: The author's own development.

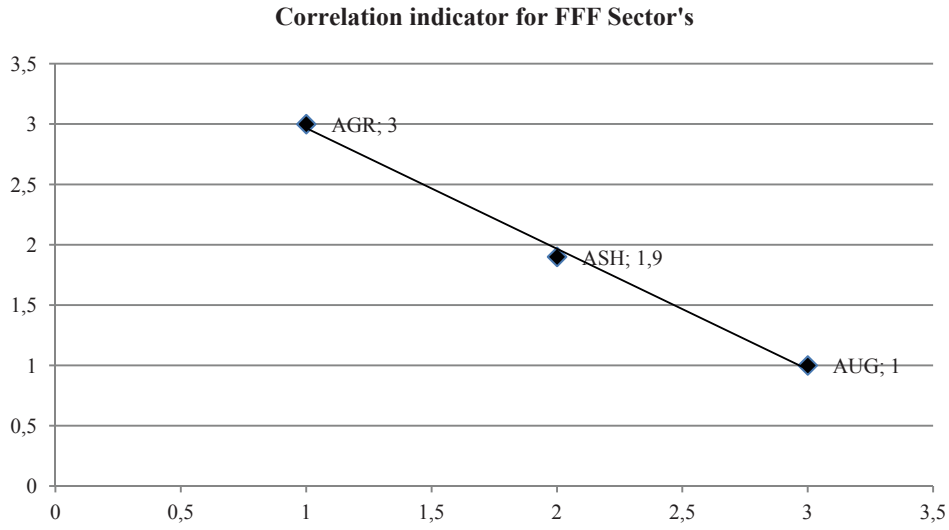

Fig. 4. Correlation of FFF sector companies in the period 01.05.2010 - 01.05.2017

Source: The author's own development.

In the APF sector, strong and lasting causal relationships in the sense of Granger in risk have been detected (Figure 3). In the sector, extreme falls of all APF companies were preceded by the risk of an above-average loss on the shares of these listed companies. Particularly strong and long-lasting relationships exist here between AGR-KSG, AUG-IMC and ASH-KSG. In the case of FFF listed companies (Figure 4), there was a situation in which the direction of dependency coincided with the relationship between the capitalisation of the listed company concerned. The sector is characterised by a moderate significance of risk dependence. In the last analysed sector F (Figure 2), it should be stated that the risk was negligible among the surveyed companies in this sector of causal relationships in the sense of Granger. This situation is likely to be influenced by the general nature of the sector and the profile of the listed companies that make up the sector.

Correlation of all 29 variables clearly confirms the results of the research obtained so far. There is a strong positive linear correlation in the APF sector. This means that the companies in this sector are generating the risk arising from the loss on the shares of these companies. The reason for this is the profile of the sector, which includes these companies. Recent years have seen progressive losses in the agricultural production and fisheries sector. The sector needs a lot of funding. Currently it is a development sector, but not very profitable. Existing EU regulations also limit the development of this sector. For the sector: Fishing is still limited and strictly limited time to catch fish. In practice, this means periodicity in profits. The attractiveness of this sector is also significantly affected by the lack of foreign capital. All this influences the profitability of this sector, which has remained unchanged for almost a few years. Therefore, there is little interest of stock exchange investors in shares of APF companies. In practice, this means that the value of APF companies listed on the Warsaw Stock Exchange is decreasing.

Table 3. Causality test results by sector for the period 01.05.2010 - 01.05.2017

Segment	Companies	M*1	M5	M10	M20	M50	M100	Cause of Ganger's H_0
F	ADM	1.234	0.432	2.343	3.451	6.878	7.999	NO
	ATP	1.001	2.323	2.441	3.999	6.999	7.345	NO
	BAK	1.898	0.232	3.879	4.878	6.001	7.989	NO
	COH	1.671	1.221	4.676	4.793	6.565	7.545	NO
	GOB	1.990	2.223	4.233	5.343	6.111	7.222	NO
	GRA	1.232	2.998	4.231	5.555	6.435	7.342	NO
	HEL	1.232	2.222	4.887	5.212	6.231	7.432	NO
	IND	1.008	2.111	4.665	6.321	6.343	7.123	NO
	KEH	1.121	2.241	4.221	5.453	6.777	7.398	NO
	KRU	1.565	2.222	4.888	4.567	6.989	7.767	NO
	MAP	1.111	3.878	4.777	5.786	6.454	7.897	NO
	MIE	1.889	4.767	4.222	5.989	6.767	7.455	NO
	MIL	1.900	3.232	3.878	5.343	6.888	7.344	NO
	MIS	1.112	2.898	5.342	5.343	6.323	7.234	NO
	OVU	1.111	2.898	2.333	5.232	6.777	7.867	NO
	PAM	1.567	2.333	2.999	6.323	6.344	7.777	NO
	TAR	1.232	1.232	2.899	5.764	6.233	7.985	NO
	WAW	1.878	2.344	2.677	5.989	6.899	7.090	NO
	WIL	1.223	2.232	2.888	5.878	6.900	7.459	NO
	ZHK	1.111	2.345	2.777	5.888	6.553	7.754	NO
	ZPC	1.001	2.245	2.990	5.998	6.232	7.762	NO
APF	AGR	10.098	11.656	13.898	15.768	16.123	18.898	YES
	ASH	10.768	11.888	13.343	15.435	16.899	17.199	YES
	AUG	10.777	11.453	13.456	15.879	16.234	17.348	YES
	IMC	10.989	11.899	13.243	15.677	16.989	18.009	YES
	KSG	10.676	11.009	13.789	15.345	16.776	17.565	YES
FFF	DEL	4.878	5.787	6.554	6.878	7.676	10.767	YES/NO
	FHJ	4.878	5.888	6.435	6.989	7.990	10.671	YES/NO
	NOC	4.999	5.666	6.897	6.453	7.876	10.129	YES/NO

M*- Number of days of delay.

Source: The author's own development.

The situation is better for the FFF sector: Food and fast-moving products. There is a strong negative linear correlation. In practice, this means that there is a decreasing risk of equity investments in this sector. The profile of this sector and the interest in foreign capital play an important role here. The fast-moving articles that make up this sector generate a high rate of growth in profits and investment. This in turn has led to a growing interest of stock market investors in investments in this sector. The high level of competitiveness in this sector means that further profitability forecasts for equity investments in companies in this sector are positive. Therefore, further low investment risk in shares of this sector may be forecast.

The lack of linear correlation and therefore neutral risk is observed in the last analysed sector: F. This sector includes 21 companies from the food sector. The sector's profile, prospects of its further development, dynamics, growing interest in foreign capital and dispersion of investments mean that in the case of this sector we can only speak of a lack of

any correlation. The dispersion of the sector causes great variability and variety of offered goods. In practice, this means high dynamics on the profit and loss side. This dynamics therefore indicates that there is no correlation in the sector concerned.

The Diks- Panchenko (Table 4) test's was calculated with a default value of 0.5 and the T_n test statistics were calculated for delays from 1 to 5. The results of the test calculations indicate that the statistics can have different values with different number of delays of *X* and *Y* variables.

Table 4. Results of Diks-Panchenko test's for returns of shares in agri-food companies in the period 01.05.2010 - 01.05.2017 (average)

Y	ADM	ATP	BAK	COH	GOB	GRA	HEL	IND	KEH	KRU	MAP
1	+1.239	+4.873	+3.878	+7.990	+5.898	+9.871	+7.676	+10.564	+8.345	+9.001	+10.001
2	+1.349	+5.231	+2.989	+7.342	+5.342	+8.545	+8.889	+11.231	+8.129	+9.132	+12.012
3	+1.901	+1.287	+9.777	+7.888	+5.878	+6.342	+9.888	+9.063	+9.389	+8.990	+13.564
4	+1.122	+10.987	+8.567	+7.234	+8.567	+7.878	+6.234	+10.123	+8.101	+8.778	+14.564
5	+1.909	+6.909	+7.342	+8.991	+9.573	+5.342	+7.777	+11.234	+7.576	+7.888	+10.198
6	+1.111	+8.767	+6.776	+9.912	+6.989	+4.342	+8.345	+12.456	+6.897	+9.787	+11.129
7	+1.887	+7.887	+3.342	+8.567	+7.898	+6.787	+9.767	+10.345	+8.432	+9.787	+10.564
8	+1.567	+8.223	+9.777	+6.778	+9.651	+8.787	+8.349	+11.989	+9.678	+9.001	+9.081
	MIE	MIL	MIS	OVU	PAM	TAR	WAW	WIL	ZHK	ZPC	
1	+4.567	+7.899	+8.897	+9.345	+7.989	+8.991	+9.989	+8.998	+10.767	+9.991	
2	+7.897	+9.999	+9.998	+9.678	+9.323	+9.002	+9.888	+9.456	+10.999	+9.101	
3	+3.456	+7.234	+10.187	+9.001	+8.786	+8.453	+9.000	+9.434	+10.889	+10.101	
4	+9.879	+8.345	+11.675	+9.101	+9.457	+10.001	+8.564	+8.456	+10.999	+11.123	
5	+8.199	+9.129	+10.655	+9.878	+9.577	+10.222	+9.111	+9.788	+10.000	+9.990	
6	+9.234	+8.342	+11.234	+9.888	+8.888	+10.009	+9.221	+9.999	+11.129	+9.012	
7	+8.145	+9.432	+9.123	+9.001	+9.378	+9.901	+8.565	+9.878	+10.789	+9.238	
8	+8.345	+8.323	+8.128	+9.888	+9.991	+12.897	+7.999	+9.999	+12.789	+8.998	
	AGR	ASH	AUG	IMC	KSG	DEL	FHJ	NOC			
1	-0.767	-0.567	-0.545	-0.453	-0.567	+0.239	+0.186	+0.355			
2	-0.234	-0.789	-0.567	***+2.989***	-0.761	+0.678	+0.129	+0.115			
3	-0.567	-0.323	-0.675	-0.129	-0.562	+0.111	+0.131	+0.189			
4	-0.897	-0.332	***+1.786***	-0.763	-0.431	+0.132	+0.142	+0.121			
5	-0.678	-0.123	-0.189	-0.221	-0.330	+0.189	+0.122	+0.155			
6	-0.677	-0.675	-0.121	-0.777	-0.141	+0.168	+0.155	+0.187			
7	-0.889	-0.898	-0.156	-0.232	-0.871	+0.134	+0.199	+0.198			
8	-0.765	-0.198	-0.909	-0.111	***+4.999***	+0.122	+0.112	+0.110			

Source: The author's own development.

The null hypothesis of no causality was in most cases rejected and the causal relationships were weak in two sectors: F and FFF. In three cases of the listed companies AUG, IMC and KSG, the T_n test rejected the hypothesis of no causality.

The presented results of causality testing refer to earlier studies on the use of stock market indices. The study carried out in this work complements these findings with conclusions on risk causation. So far, causality studies in the sense of Granger have been conducted by: B Łęt, M. Krawiec, E.M. Syczewska i W. Orzeszko, M. Osińska. Obtained research results clearly indicate the validity of the adopted research method. The results revealed linearity and non-linearity of the analysed data (similarly to this analysis). B. Łęt stressed that the results of the tests showed in most cases a risk causality between the examined instruments in the banking, fuel and raw material sectors. In the case of M. Krawiec, the results obtained, unequivocally, will reveal the occurrence of causal relationships in the sense of Granger on the cereals market in Poland in the years 2007-2011. E.M. Syczewska showed causal relationships between the USDPLN price and the corresponding stock exchange indices, which are represented by S&P500 for the United States and WIG20 for the Warsaw Stock Exchange. W. Orzeszko and M. Osińska showed causal relationships between price changes and the Warsaw Stock Exchange turnover changes; price changes were determined by changes in turnover. All the conducted research also indicates a need for further analysis of the causality of linear and non-linear events.

Conclusions

The aim of this study was to analyze the linear and non-linear relationships between shares of Warsaw Stock Exchange agri-food industry sectors in terms of risk. Calculations made with the help of tests - the Granger linear test and the Diks-Panchenko test's - showed such or no such dependence.

Diks and Panchenko tests's T_n gave the same result as the Granger test. The null hypothesis of non-causality was in most cases rejected and the causal relationships were weak for two sectors: F and FFF.

In three cases of the listed companies: AUG, IMC and KSG, the test T_n rejected the hypothesis of non-causality. It did not happen that the test T_n rejected zero hypothesis if the Granger linear test did not reject it – in this respect, Diks and Panchenko's modification seems to fulfil its role.

The presented test results in most cases indicate that there is no occurrence of causation of risk between the analyzed instruments. The strongest and most enduring dependencies have been found in the sector APF. For the FFF sector, the temporary consequence of the risk of investing in the listed companies under investigation was short term.

The studies carried out allow us to formulate the following practical conclusions:

1. Price increases of particular shares of the companies may be better predicted, if appropriately delayed price increases of other analysed indices are taken into account.
2. The division of the WSE-listed agro-food sector into a linear sector with significant investment risk and a non-linear sector with insignificant investment risk.
3. Skillful size forecasting risks is helping investors to make investment decisions on shares in the agri-food sector.
4. The results obtained suggest a need for detailed research in this area.

5. Consideration of using non-linear specifications for the models used in capital markets.

The presented causality testing results refer to earlier studies concerning the use of stock exchange indices as additional variables improving the quality of models and daily quotation forecasts for equities prices. The results of the queries are not entirely exhaustive. A similar analysis would be worth analysing other sectors of the Warsaw Stock Exchange, which would provide a comprehensive picture of the risk causal relationships on the domestic capital market. In addition, the analysis could also be carried out for short positions for different levels of value-at-risk tolerance. Further testing is also indicated by detailing the conditions under which the number of variable delays depends. This should be especially true for the Diks - Panchenko test's, where the results depend on this number. The impact of delays for variables should therefore be examined more closely and the results obtained compared to other methods of detecting causal relationships. The calculations made in this article should provide a basis for further examination.

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Comparison of Poland's Agrarian Structure with other EU Countries Using Cluster Analysis

Abstract. The analysis of agrarian structure of agricultural holdings in Poland was carried out in comparison with other EU countries. The study was conducted on the 2005 and 2013 data derived from Eurostat databases by means of cluster analysis. The results of the analysis confirmed the hypothesis of improvement of the agrarian structure of agricultural holdings in Poland vis-a-vis other EU countries. An increase in the average farm size was observed with a decrease in the number of entities.

Keywords: agricultural holdings problems, farm fragmentation, agrarian structure, cluster analysis

JEL Classification: Q15, C10, C38

Introduction

Farms which are primarily located in rural areas are of great economic, social and environmental importance. They form an agricultural sector which plays a significant role in Poland's national economy as well as in other European Union countries. This sector provides jobs for many people who produce food and other materials used in industry. The transformation and development of a sector as strategic as agriculture, requires cooperation and balance between social and economic factors. Disturbance of any of these factors can cause problems for agricultural producers. Correct diagnosis and adaptation to programs supporting agricultural development can mitigate the effects of these disturbances. It should be noted that the economic environment and changing reality in which farms operate require adaptation to new conditions, which agriculture a more evolutionary character.

One of the main problems of agricultural holdings in Poland is their fragmentation which results in an unfavourable agrarian structure. This means that a significant number of these holdings have little chance of development and the agricultural sector cannot fully compete with other EU countries. This situation is closely linked to the number of people employed in the agricultural sector and to the level of education of the rural population. These aspects were widely discussed and put forward in the work of Piotr Prus "Contemporary Problems of Agriculture and Rural Areas". His study focused on the problem of Poland's agrarian structure in relation to other EU countries. In order to analyze the problem of the paper, the following hypotheses were made:

– the average size of agricultural holdings in Poland increased and their number decreased,

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– the improvement of Poland's agrarian structure against other EU countries was observed.

In order to verify the questions posed, a literature review was done and the study was conducted. The appropriate conclusions were drawn.

Literature review

Agriculture is one of the most important economic sectors influencing the standard of living and the economic and social development in rural areas. Although the share of this sector in GDP is constantly decreasing, it still creates jobs for more than half of the rural population[2], which accounts for 10.5%[3] of total employment (Q2 2017). The farm is the basic economic unit of the agricultural sector and creates a socio-economic system. Its primary function is to meet the needs of the farm's owner and his family members who depend on the income generated by whatever is produced. The factors influencing the amount of income earned from running a farm can be endogenous and exogenous. The first group includes factors which are influenced by the farmers themselves, e.g. the size and the way of using the factors of production (capital, land, labor). The second group includes factors on which the farmers have no impact (they are linked to external conditions) e.g. prices of agricultural products and goods or weather conditions (Gardner, 1990; Rembisz, 2006). Therefore one of the determinants of production is the agricultural holding size. The literature includes a number of papers devoted to the problem of fragmentation of Polish farms. This phenomenon is the subject of a lively debate because of its negative impact on the efficiency of farming which ultimately affects the competitiveness of the agricultural sector against other EU countries. Reduction of this phenomenon should significantly contribute to the improvement of agrarian structure which, in turn, may result in more efficient use of production resources (Gozs, Kozera, 2002; Jackson-Smith, 1999).

In the paper "Contemporary Problems of Agriculture and Rural Areas" (Prus 2008), the author identified the problems occurring in agriculture and made a thorough analysis. He pointed out that the income situation, the level of education and the stock of labor in the agricultural sector could significantly contribute to the current situation in this sector. When describing the income situation of farms, he underlined the past significant disparities between agricultural income per capita and the average net income for farms up to 50 ha. He emphasized a significant increase of income from non-agricultural sources such as pensions or paid work in total household income. The decline in agricultural income and the increase in differentiation of earnings levels, led to a rise of pessimistic assessment of agricultural holdings economic development. According to Gutkowska (2002), for this reason the majority of farmers considered their farms to be non-expandable which contributed to a lack of investments or their enlargements. Another interesting problem described by Prus was the issue of low education among the farm owners. The author pointed out that the human factor and its quality significantly contributed to achievement of competitive advantage on the market, and its low quality among the owners of Polish farms constituted a barrier for farm development.

[2] According to the "National Strategic Plan for Rural Development" from 2005, 66% of the rural population was employed in the agricultural sector.

[3] The data come from the website http://rynekpracy.org/x/989321.

As a consequence, the low level of education among farmers contributed to their reduced socio-occupational activity which in turn led to bigger difficulties in finding an alternative, better paying jobs. In addition, the author emphasized that knowledge could determine the existence of entrepreneurial attitudes which may, in turn, affect the efficiency and productivity of agricultural production. Additionally, low education contributed to the increase of agriculture labor resources leading to so-called agrarian unemployment. The author rightly noted that the high level of employment in agriculture was inextricably linked to the fragmentation of farms that in the future may result in the poor agrarian structures. For comparison purposes, the author used the average farm size which in Poland according to the "Rural Development Program 2007-2013", was 10 hectares, while in the EU-15 it was about 23.11 hectares[4]. Such fragmentation prevented accumulation of capital and other production resources what would enable increased investment and improved management effectiveness. As a consequence, this would contribute to the increase of the agricultural sector competitiveness in comparison with other EU countries and to the increase of the net agricultural income per person employed in agriculture.

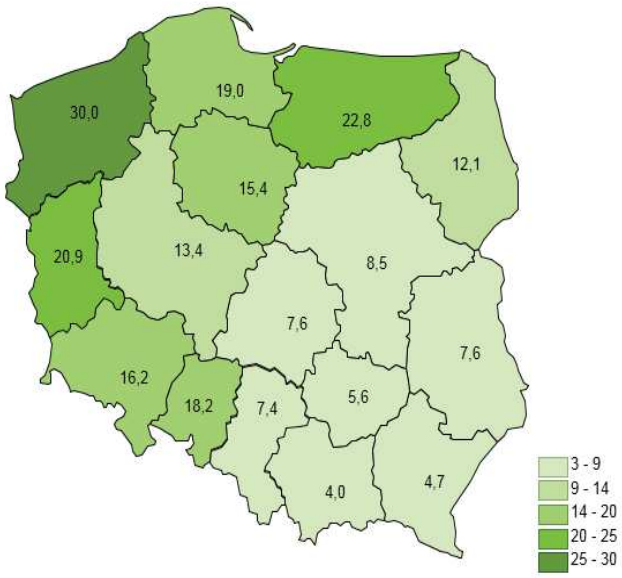

Fig. 1. Average size of agricultural land in the farm by voivodeships, 2015 (hectares)

Source: ARMA (the Agency for Restructuring and Modernisation of Agriculture).

The author considers that the present situation of the agricultural sector is largely the result of a systemic transformation at the turn of the 1980s - 1990s. It covered the entire economy and affected the behavior of all economic entities. In addition, the crisis and

[4] The author also noted the considerable diversity within the country, where the largest average farm area (20 ha) is in the north-western regions, while the smallest (3.3 ha) in the south. For the EU countries, the largest is UK at 70 ha and smallest is Italy with 8 ha.

downturn in the whole economy, as well as in agriculture, and the lack of support from the state contributed to the weakening of modernization processes in agricultural holdings. All this led to an increase in disproportions to other sectors of the economy and deepened the problem remaining after the centrally planned economy: improper structure and spatial development. Particularly, along with the changes, state intervention in the market and the instruments of agricultural policy used up to that time, were reduced to a minimum. Such a policy allowed control of prices by controlling the demand and supply or setting prices for agricultural products and means of production at a relatively low level. The deterioration of the general situation in the country (as a result of liquidation of state enterprises), the emergence of unemployment and the rise in prices of agricultural products reduced the demand for domestic food and caused the difficulties in selling it. Therefore, it had a great impact on the economic situation of many farms. The highly profitable agricultural production guaranteed by the state collapsed.

A detailed analysis of changes in the number of farms in Poland was conducted by Jan Falkowski and outlined in his article "Change in the Number of Agricultural Holdings in Poland during the Period of Transformation" (Falkowski, 2010). In this work he raised the issue of the unfavourable impact of the fragmentation of agricultural holdings on the efficiency and productivity of the agricultural sector. In addition, he claimed that owning a farm was a kind of social security for the inhabitants of the rural areas and that the change in the number of farms should be connected with the problem of rural depopulation. In his work, he created an econometric model based on the data on the change in the number of farms in the counties (explanatory variable) in the years 1996-2002, whose purpose was to examine the influence of various factors on the explanatory variable. According to his analysis, the number of farms in the counties was bigger mainly where the small farms dominated. This argument was supported by the fact that it was easier for the larger farms to survive in the free market economy. In turn, the slow fall in the number of farms, according to the results obtained by the author, depended on the *agricultural* labor force. According to the literature, higher employment in agriculture indicates that there is no alternative employment in other sectors of the economy in the region, so abandoning a farm is associated with an increased risk of unemployment. The results of the model indicated that, contrary to popular beliefs, a larger decrease in the number of farms was observed for *poviats* where development prospects were positively assessed by the farm owners. The author explains this result as a consequence of extremely high competition and over-optimistic development forecasts. Similarly, in *poviats* where the population inflows to rural areas increased, the rate of decline in the number of holdings increased. According to the author's analysis, as a result of systemic transformation in years 1996-2002, about 1.2 million entities resigned from agricultural production. Falkowski's study is full of interesting information which can help in explaining the causes of area structure differences between Poland and other countries.

The agrarian structure of agricultural holdings in the European Union is very diverse. Jerzy Babiak in his article "Changes in Agricultural Structure in Countries of the European Union" (Babiak, 2010), writes that this is caused by natural factors and structural transformations and the tendencies of these changes are heading towards decrease in farm numbers and the area extension of the existing ones. According to the author, this is due to well-designed institutional tools for controlling and directing agricultural land turnover. An analysis of the structure of agricultural holdings between 1979 and 2007 indicated that in most European countries (EU-15) the number of farms increased in the area of over 50 ha.

Among the countries which entered the European Union after 2004, the largest number of farms are in Romania and Poland[5]. This is because of the predominance of small farms covering up to 5 hectares. Over time their number decreased and therefore the average area of the farm increased. The author mentioned that the process of transformation in the agrarian structure took place in two stages. The first began after World War II and the main drivers of the changes were the mechanisms of market competition and economic factors. The second stage was launched in the early 1960s and can be still observed today, where both the changes and their pace were stimulated by governments and EU policies under the CAP[6].

Later in this paper the area of agricultural holdings in Poland in comparison with other EU countries will be analyzed.

Data and research methodology

Based on the above literature review, the data provided by Eurostat were used to compare the agrarian structure of agricultural holdings in Poland against other EU countries. The data collected from the website included the number of farms and the total agricultural land size for each EU country. The number of agricultural holdings, described in the statistics included farms recognized both as individual and legal entities. Available data considered years 2005, 2007, 2010 and 2013, while only 2005 and 2013 data were used for comparative analysis. In addition, a new variable representing the average farm size in a given region was created which was obtained by dividing the amount of utilised agricultural land by the number of farms.

The method of cluster analysis was used to verify the hypothesis. It classifies objects according to the degree of their similarity by selected features. The work "Evaluation of Human Capital in Selected EU Countries Using Cluster Analysis" (Parlińska, Pomichowski, 2016) is an interesting study describing the application of this method. The optimal number of clusters is determined arbitrarily or by using already formulated indices. One of them is the Caliński-Harabas index which was published in 1974 in the article "A Dendrite Method for Cluster Analysis" (Caliński, Harabasz, 1974). It takes the maximum value for the optimal number of clusters. For the purposes of this article, the number of clusters is set at 3, referring to the EU Member States accession order:

- countries of so-called "Old EU", i.e. EU-15,
- countries that entered the EU in 2004,
- countries that joined the EU after 2004 - in 2007 and 2013.

As already mentioned, the purpose of cluster analysis is to isolate homogeneous groups consisting of similar elements in terms of selected features. For this purpose many algorithms are used. The most popular one due to its low computational complexity is the k-means method. It requires declaring the initial set of clusters and it is very sensitive to outliers. It is about algebraic designation of the so-called centroid, or "center of group's gravity" which does not belong to the grouping elements. Then the grouping is done until the next grouping does not improve the criterion function. This function determines whether the next grouping is better than the previous one. The example of such a function

[5] The findings were described on the basis of data for 2007.
[6] Common Agricultural Policy.

is, among others, the average distance of the group elements from the center of the group's gravity. The analysis was performed in the R program using the "cluster" packages.

Results

Cluster analysis was carried out on data for the 27 EU Member States from 2005 and 2013. On the basis of the results it can be stated that in 2005 (Figure 2) Romania had the most unfavorable ratio of farms number (vertical axis) to their average size (horizontal axis). There were more than 4 million farms with an average area of less than 5 hectares (3.27 ha). According to the grouping analysis, Romania, together with Poland, created a two-part group that differed from other EU countries in terms of agrarian structure. Poland at that time had over 2.5 million agricultural holdings with an average size of about 6 hectares (5.95 hectares). The second group comprised, among others, countries such as Italy, Spain, and France, which had a lower numbers of farms and their average area was higher than in Poland. The best agrarian structure in this group of countries was observed in Spain and France. The number of farms amounted to respectively ca. 1 million and 0.57 million and the average size was more than 20 hectares and 40 hectares. The other countries that entered this group were Greece, Hungary and Bulgaria and the average size of the farm did not exceed 10 hectares. The third group was the largest, as it included the other 19 countries. They were different from the other groups due to a smaller number of farms and in most of these countries the average size of the farm was greater than 20 hectares. Agricultural farms in the Czech Republic, where the number of farms was 46,250 and their average size exceeded 80 hectares, had the best agrarian structure.

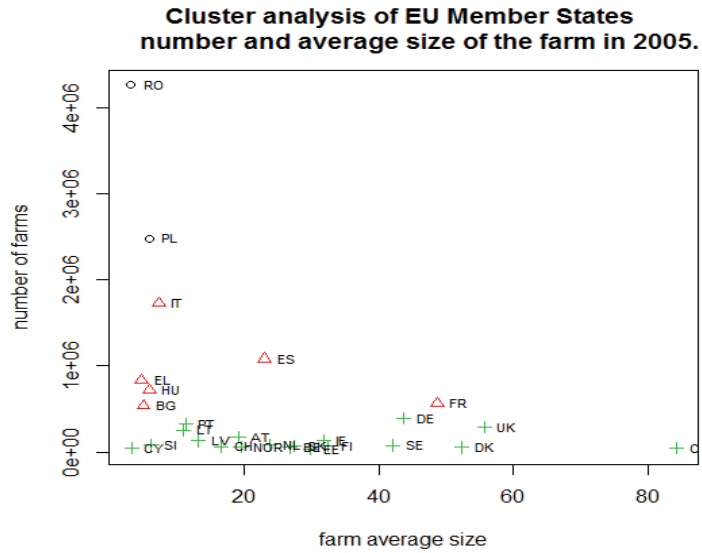

Fig. 2. Cluster analysis results for the 27 EU countries based on 2005 data.

Source: Author's own study.

Significant improvements in the agrarian structure for all countries can be observed in 2013 (Figure 3). There was a decline in the number of farms with an increase in the average agricultural area size. In terms of agrarian structure Romania created a separate group where the number and average size of farms were respectively 3.63 million and 3.60 hectares.

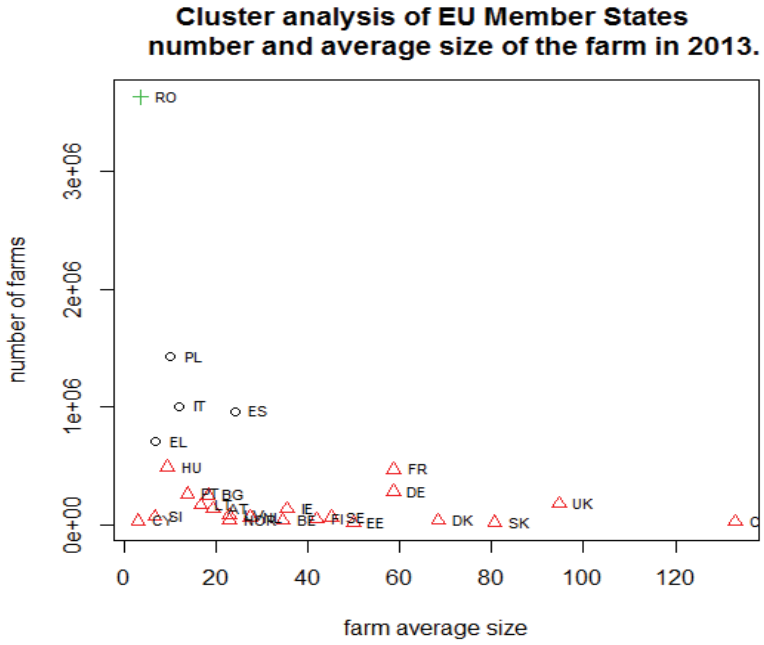

Figure 3. Cluster analysis results for 27 EU countries based on 2013 data.

Source: Author's own study.

Comparing to 2005, the second group changed because of Poland's promotion and exit of such countries as Hungary, Bulgaria and France. It can be assumed that processes improving the agrarian structure of these countries were faster than in other countries from this group. In Poland, there was a sharp decline in the number of farms to 1.43 million and the average size of the farm was 10 hectares. The smallest improvement in the structure of farms was recorded by Spain. The third group represented 22 countries with Hungary, Bulgaria and France joining in 2005. In this group, it seems that for some countries the improvement of agrarian structure is more related to the increase in average farm size than to the decrease in their number. However, the comparison of figures shows a strong negative correlation which means that with the increase in the average area the number of farms decreases (the optical illusion on the graph). For example, in the Czech Republic the average farm size increased from about 85 to over 120 hectares and the number of farms decreased to 26,250. The number of countries with an average farm size of more than 20 hectares also significantly increased.

Conclusion

From the above analysis for years 2005 and 2013 it is clear that Poland's agrarian structure significantly improved. The sharp decline in the number of farms resulted in an increase in the average farm size which promoted Poland to a second group of countries. This is probably due to the collapse of low-productivity and low-income farms which resulted in the transfer of production factors to more profitable farms. In addition, one can observe that countries classified to the second group on the basis of the cluster analysis are getting more similar to each other. The graph shows a significant improvement of Poland's agrarian structure in relation to the other countries that constitute the second group, i.e. Italy and Spain. Therefore, the hypothesis stated at the beginning of the paper can be considered right.

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The Economic Development in the Context of the Development of Foreign Trade in Poland – a Comparison to some EU Countries

Abstract. The themes of the impact of foreign trade on economic growth has been repeatedly assumed by investigators and were most often related to various aspects: the openness of the economies, economic prosperity, competitiveness and diversification of export. The objective of the research was the evaluation of changes in economic development and the development of foreign trade in Poland comparing them with the EU and some EU countries. Particular attention was given to the issue of diversification and competitiveness of exports by putting the hypothesis that the greater product diversification of Polish export, the greater its competitiveness, which leads to economic growth. The work uses the following test methods: descriptive methods, statistical methods, the indexing methods of which Indicator of the Absolute Deviations and Revealed Comparative Advantages were calculated. Export diversification can lead to speeding up the pace of economic growth. By analyzing in detail the situations in Poland can conclude that it is advisable to diversify of the export structure.

Key words: economic growth, export diversification, export competitiveness, comparative advantage

JEL Classification: F14, F43, R11

Introduction

The main objective followed out in the process of management of the economies should be permanent, stable and sustainable development which allow to achievement of the highest possible standard of living for their inhabitants. To meet their needs, the authority is committed, inter alia, to creation of new jobs, new businesses, shapes the relationships between human activities and the environment. These and other activities aimed at creation of such conditions that ensure the competitiveness of the economy. Among the factors affecting the economic development, the large role was played by foreign trade and its size and structure often determines the level of life for many people. Foreign trade affects the size of the GDP and its structure, leading to specialisation, enables and facilitates technological progress, leads to benefits achieved thanks to competition. As stated Rymarczyk (2007) countries participating in the international exchange gain, while countries closed to foreign trade – they lose. Otherwise presentation of the issue was by Rynarzewski (2013), which stated that although the modern international trade is growing faster than world production, affecting the economic development of countries, the benefits of participation in the international division of labour, however, are significantly higher in developed countries than in developing countries. Stressed that countries less economically advanced, which specialize in the production and export of raw materials, are exposed to

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particularly high instability of export revenues and adversely affect over a long period on terms of trade. The same foreign trade of these countries in terms of petrification their economic structure may not just positively as in developed countries affect their economic development.

In the paper, only export flows were analyzed. Particular attention was given to the issue of diversification and competitiveness of exports by putting the hypothesis that the greater product diversification of Polish export, then the greater its competitiveness, which leads to economic growth.

The issue in the literature

The themes of the impact of foreign trade on economic growth has been repeatedly assumed by investigators and were most often related to various aspects: the openness of the economies, the multiplier effect, economic prosperity, competitiveness of export and their impact on economic development. Analyzing the impact of international trade on economic growth, the diversification of exported goods was taken into account. The concept of diversification (heterogeneity) of foreign trade plays an important role in the theory of international economics. It is assumed that it refers to the degree of variability in the structure of foreign trade in a given period of time. Stands out the products and geographical diversification of this trade. By far the greater attention in the literature is devoted to the differentiation of the product of foreign trade (Cadot, Carrere, Strauss-Kahn, 2013; Parteka, Tamberi, 2013). Both types of diversification positively affect economic growth (Kenji, Mengistu, 2009). Greater diversification in terms of the number of exported products contributes to the economic development, however, in the literature of the subject can be found, and different test results. "On the one hand, an increase in the diversification of exports and increase in GDP per capita record both developing economies with quite diverse export, such as China and Poland, and the economy with fairly uniform export, such as Malta does Kuwait. r This type of phenomenon occurs, for example, in the United Arab Emirates or Brunei. There are also countries with highly diversified export structure such as Germany or United States, in which the degree of diversification of exports is not change together with the increase of GDP per capita" (Parteka, 2015, p. 17).

One of measures of the degree of concentration, is a pointer Herfindahla-Hirschmanna (HH). UN studies indicated a trend towards greater consolidation of product structure of this export. Between 1995 and 2011 there has been an increase in the average value of that measurement from 0.0915 to 0.1342. In the period 1995-2009 the degree of concentration of exports in developing countries as measured by the index of the Herfindahl-Hirschmanna was above the degree of concentration of exports in developed countries during the overall period of time (UNDP 2011, p. 24–25). According to Herzer and Nowak-Lehmann (2006), export diversification can positively affect economic growth by reducing the dependence of exports from a limited number of goods. This argument is true, in particular, in the case of developing countries dependent on the export of primary products (raw materials and agricultural products), which in accordance with the hypothesis of Prebisch-Singer leads to deterioration of the pricing terms of trade. This means that the developing countries achieve the benefits of diversification of exports as opposed to developed countries, that achieve higher dynamics of national income through greater specialization (Hesse 2008). According to empirical research carried out by Rynarzewskiego for 76 developing countries and 20

economically developed countries for two decades, 1963 – 1972 and 1973 – 1982 the average concentration of goods export measured by Hirschmanna index was for the countries poorly advanced respectively 0.540 and 0.524, and for developed countries 0.182 and 0.168 (Rynarzewski, 1992a). Although studies differ in the scope of time, however, the conclusions for significant differences between the levels of concentration of exports in developing countries and developed countries are fully identical.

Redding (1999) and Young (1991) have an opinion that countries at some period of development may need to choose (trade-off) between the specialization according to the theory of relative costs and specialization in those sectors of the economy, in which countries do not have the relative advantage. This choice stems from the fact that, despite the lack of actual relative advantage in these sectors can be expected to gain a competitive advantage in the future as a result of increasing productivity of the factors of production.

Another aspect of this work is the competitiveness of exports. One of the most frequently quoted definition of competitiveness is the one formulated by Tyson, which specifies that it is the ability to produce goods and services that are able to meet the international competition, while the citizens of the country are a sustainable and rising standard of living (Tyson, 1992, p. 317). In the assessment of the competitiveness of the country used a variety of indicators. In the presented definition focuses on two elements: countries' export position and level of life of the inhabitants. Their measurement can be carried out using different gauges, which of course gives different results of research, on which point Białowąs (2012) by calculating the competitiveness EU countries using different gauges. After analysing based on indexes revealed comparative advantage, stated that, the most competitive in exports of high technology products are France, the Netherlands, Ireland, in medium, and high technology (Germany) and in the modern market services and, in particular, the financial, insurance, business, computing and telecommunications - United Kingdom, Ireland, Luxembourg, Finland, Netherlands, Sweden. Similar results presented Śledziewska (2015), which stated that the Member States of the EU are losing on their competitive position in the global export. Declining share of most of the "old" EU (especially France, Germany and the United Kingdom) and the New Member States (NMS) showed the largest increases in competitive position before the 2004 year. In the export structure and their changes taking place between EU 15 and NMS has been observed great diversity. You can even invade general statement, that the "old" EU mainly exports high-tech products and the "new" low-technology. And during the established period was a systematic increase in low-competitive high-tech products in the export of NMS, including Polish (Śledziewska, 2015 s. 97). Polish advantage invest primarily in food and other consumer goods.

To summing up we can say:

- The factor that allows to change the size and structure of national income is the trade flows and its diversification and competitiveness.
- Through the foreign exchange we can better adapt the national income to the needs of interior accumulation.

Export allows you to expand production scale and is an incentive to invest, product and process innovation as well as other actions conducive to improving their competitiveness. Export contributes to the economic development.

These two categories of economic are double dependency; Helpman i Krugman (1985) argue that growth in the economy implies the development of export.

Entry to the EU, which means the elimination of export restrictions, created emerging economies attracted for significant investment, improvement of the product competitiveness on the international stage, gives the impulse to the expansion of the export.

Growing from a few years in Poland and other Central and Eastern European countries export is seen as a factor encouraging economic development.

The methodology

The general thesis about the diversification of exports and its impact on economic development can prove unreliable, as was pointed out in the literature of the subject. You need to classify countries in such a way as to be able to indicate the path of development for individual economies. The aim of the work is therefore to estimate the level of diversification of the Polish export on the EU market and to show the relationship between export competitiveness and economic development. By comparing the results obtained with a deliberately, three selected EU countries and putting together with the results of other researchers have attempted to indicate pathways for Poland.

In the research, it was used statistical base of the World Trade Organization – WTO and EU – Eurostat. Economic development regarded as long-term transformation process engaged in the economy, includes both quantitative and qualitative changes. In work presented quantitative changes. GDP was selected as a measure of economic development and export – one of the streams of foreign trade.

Analysis of the Polish export was performed on world market in relation to the EU, and some EU countries. Was made a deliberate choice of one country of Central and Eastern Europe and two Western European countries. The intention was to compare Poland to diverse and similar economies - first, developed and developing economies, the second had a different structure as Germany, which is an industrial and export-based economy and France, which in addition, has a well-developed agricultural sector and Hungary, which are at a similar level of development and have a similar structure of production (a traditional sector of the economy is agriculture) and that can be a big competitor in this sector, as France. Besides, according to the World Bank, Hungary recorded the largest change of relationships export to GDP.

The time framework covered the years 2000-2016, although a detailed analysis covers the period 2000-2013. The work uses the following research methods: descriptive methods, statistical methods, the indexing method of which two indicators were calculated. The formulas were presented below.

Indicator of the absolute deviations of the national export from world exports, calculated according to the following formula:

$$S_{jt} = \frac{\sum|h_{ijt} - h_{it}|}{2} \tag{1}$$

where: h_{ijt} – share of branches i in total countries' export j in times t, h_{it} – share of branches i in total world export in times t.

Diversification indicator shows whether the export commodity structure of a given country or group of countries differs from the structure of the world. This indicator takes values from 0 to 1. The higher the ratio the greater the differences between the export

structure of commodity given country or group of countries and the structure of goods of world export.

The following index was Revealed Comparative Advantages – RCA, that points to the involvement of the shares of the product group in the total exports compared with the involvement of those shares in analising partner.

$$RCA = \frac{E_{ik}}{E_i} : \frac{E_k}{E} \tag{2}$$

where: E_{ik}- export of commodity group i from country k, E_k – total export from country k, E_i – world export of commodity group i, E – total world export.

The indicator above 1 attests to the competitive advantage of the test country relative to partners, while the indicator below unity indicates a lack of this advantage.

The results of the research

As a result, the studies conducted, it can be concluded that in the surveyed countries reported is a systematic increase in GDP per capita from 2000 year. This measure in 2013 year oscillated in Germany 32 000 euro, in France close to 28 000 euro, in Polish and Hungary close to 17500 euro (fig. 1). Of course, in the "old" EU countries (OMS) is a different level of economic development, emerging above the EU average, although it should be noted that in the years 2000-2013 observed a higher rate of growth in the New Member States (NMS). It was in these countries, almost twice the GDP growth, while for Germany was 1.4 times and for France 1.3 (table 1).

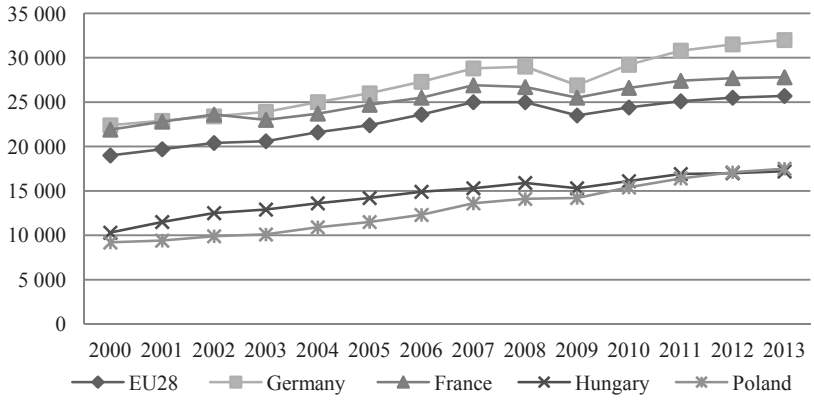

Fig. 1. GDP per capita (PPS) in UE and selective countries

Source: own elaboration based on Eurostat data.

It is worth noting that the pace of change in the countries was higher in 2004-2008 than 2000-2004; the exception was Hungary, where in the pre-accession period were the greatest rate of change. In the last five-year period observed was a decrease in the rate of growth in comparison with the previous period. During the 2013-2009, the fastest pace of development characterised by Poland, then Germany, Hungary and France.

Table 1. Changes of GDP per capita (PPS) in UE and selective countries in selective periods

	2013/2000	2004/2000	2008/2004	2013/2009
EU28	135,26	113,68	115,74	109,36
Germany	142,86	111,61	116,00	118,96
France	126,94	108,22	112,66	109,02
Hungary	166,99	132,04	116,91	112,42
Poland	190,22	118,48	129,36	123,24

Source: own elaboration based on Eurostat data.

Table 2 shows changes in the exports of the countries concerned in the same periods. From 2000-2013, the largest increases were observed for Polish, Hungary, Germany and France. Between 2008-2004 growth rate was higher than in the years 2004-2000 in all countries. In the last five years the largest export growth was in Poland, Hungary, Germany and France. The conclusions of the analysis of economic growth measured by GDP per capita and export growth are almost identical. Indicate that the changes of export affects the changes of GDP in different countries.

Table 2. Changes of export in UE and selective countries in selective periods

	2013-2000	2004-2000	2008-2004	2013-2009
EU28	172,00	113,97	133,53	138,32
Germany	182,12	122,43	134,42	135,50
France	123,32	102,47	115,28	125,69
Hungary	265,18	146,35	165,14	136,01
Poland	449,02	175,52	192,10	157,71

Source: own elaboration based on Eurostat data.

Further examined the competitiveness and diversification of the Polish export compared with individual countries. Poland against Germany and Hungary was more competitive on the world market in the case of goods: food and animal products and fuel and lubricants, did not have a competitive advantage in the case of manufactured goods, as the RCA rate fluctuated during the period in the limits of 0.91-0.95 (fig. 1 and 2).

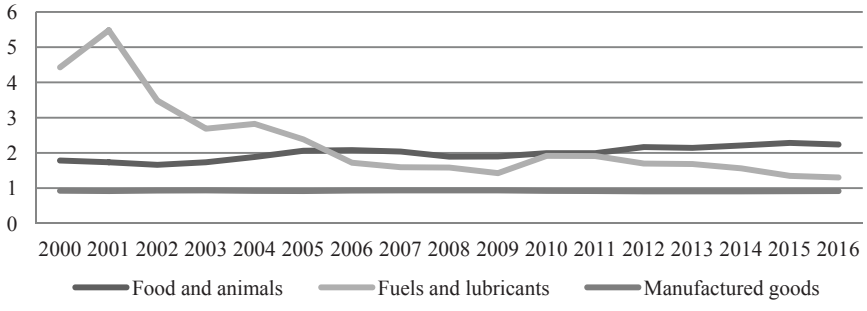

Fig. 2. Poland competitiveness in three commodity groups on the world market

Source: own elaboration based on Eurostat data.

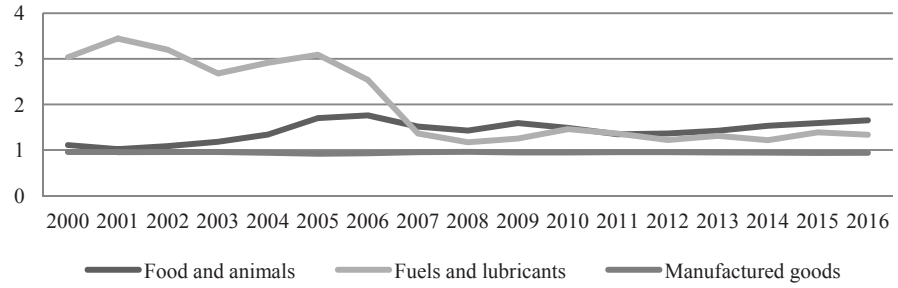

Fig. 3. Poland competitiveness in three commodity groups on the world market

Source: own elaboration based on Eurostat data.

In the case of comparison Polish export and French export you will notice that in recent years the RCA rate fluctuates within the limits of the unity. It means that relatively we have not any advantages nor competitive losses during the tested period. We ca observe strongly decreased in the fuel and lubricants group and slightly increased in the case of food and animals.

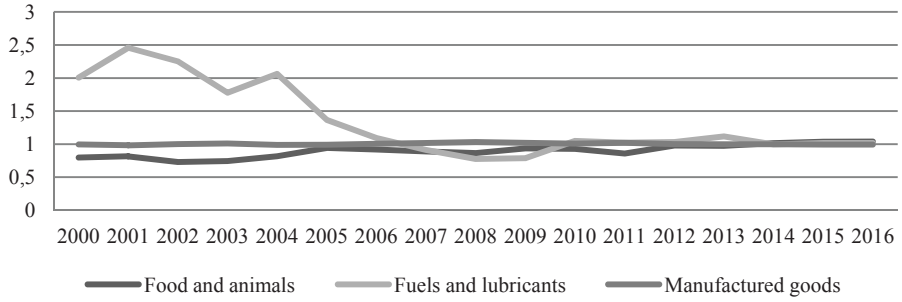

Fig. 4. Poland competitiveness in three commodity groups on the world market

Source: own elaboration based on Eurostat data.

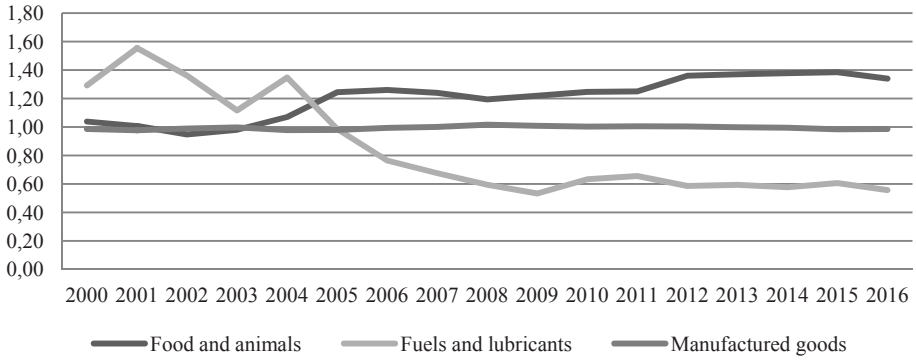

Fig. 5. Poland competitiveness in three commodity groups on the world market

Source: own elaboration based on Eurostat data.

Goods exported from Poland compared to goods exported from other EU countries to the world market have competitive advantage for food and animals, does not have this advantage for the product groups of fuel and lubricants and for manufactured goods the index of RCA was in the test period about 1.

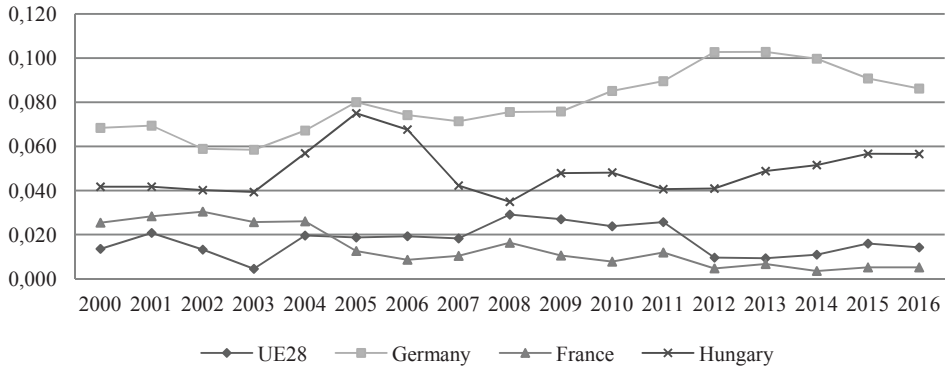

Fig. 6. Diversification of the Polish export versus EU and selected partners in 2000-2016

Source: own elaboration based on Eurostat data.

Polish export diversification indicator is presented in Figure 6. The most diverse is between Germany and Hungary export, where diversification indicators were 0.09 and 0.06, respectively. Much greater concentration of commodity structure of export is in the case of France and EU, where the rate fluctuated within the limits of 0.01 in the year 2016. It should be noted that this ratio during the period grew for Germany and Hungary and decreased for France and the EU. This leads to the conclusion that the more varied the export structure then the better indicators of competitiveness reached Poland.

Summary and conclusions

After analyzing the literature you can highlight the following groups of countries where GDP[2] growth

1. does not result from changes in the diversification of exports:
   a) the countries have high diversification index – the developed economies,
   b) the countries with a low index of diversification - economies exporting raw materials.
2. Results from the changes in the diversification of export structures:
   -countries with low and medium index of diversification - developing economies.

Poland is characterized by low diversification of exports. So belongs to the second group of countries, for which the path to development should be the product export diversification.

[2] Growth of GDP depends on many factors in the work only changes of the size and structure of export were under consideration.

Diversification of the Polish export was the biggest against Germany and Hungary. Relative to these countries Poland had a comparative advantage in export for a group of food and live animals, and fuels and lubricants. RCA for industrial goods was 0.91, 0.93 respectively. Poland against any country did not have a comparative advantage for industrial goods. So with the countries with a higher diversification of exports are higher comparative advantage. The hypothesis that the greater product diversification of Polish export, than the greater its competitiveness, which leads to economic growth was positively verified.

Export diversification can lead to speeding up the pace of economic growth in some countries. By analyzing in detail the situations in Poland can conclude that it should be the pursuit to diversify of the export structure.

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Prospects for Development of Highly Satiating Foods in Poland

Abstract. The high level of competition between food products on the market has encouraged the development of various types of functional foods. Consumer demands and requirements for both medicinal and healthy products has caused food manufacturers to widen their product offerings. The objective of this study was to present the legal status of functional food production and sales, as well as analyse the possibilities of developing customized foods, in particular, highly satiating foods. In this time of obesity epidemic, the use of specifically designed food products which suppress hunger and give the feeling of satiety could be an effective tool in preventing obesity and controlling body mass. There is an optimistic prognoses that this type of food will be introduced on the Polish market.

Key words: functional food, highly satiating food, obesity, Poland

JEL Classification: I12, M31, M37, O33

Introduction

Demand for different types of food has increased with population growth and the development of civilization. More and more, food is seen not only as a source of essential elements, but also as playing a role in promoting health. Among the wide range of products available on the Polish market, a high level of competition has triggered a dynamic development of organic functional and diet food (Szołtysek, Dziuba, 2006). It was not only competition but also the need and the search for high quality food, as a form of protest against industrial food, which resulted in the growth of the food products market. The development of food intended for different groups of people, so called "customized food," is observed in Poland more and more often. The interest in health, nutritional education, higher social awareness, and therefore, particularly specified expectations of consumers, has pushed food manufacturers to introduce functional food into the range of products that they offer.

The definition of designed functional food has not been unified. According to FUFOSE (1991), a product may be considered as functional if it is proved to be beneficial to one or more body functions, beyond the nutritional effect resulting from its traditional chemical composition.

- Functional food may be considered as functional if it is proved to be beneficial to one or more body functions, beyond its nutritional effect, by improving health conditions or reducing the risk of disease.

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- The form of functional food must resemble the form of traditional food.
- The higher health quality of functional food is mainly associated with the presence of bio-active substances, stimulating the desired process of metabolism.
- The designed food is intended for general consumption as a part of a daily diet.
- The beneficial effect of functional food should be documented scientifically, by clinical research on human subjects.
- Only scientifically documented benefits allow for recognizing the product as having health promoting properties (Martirosyan and Singh, 2015).

The definition has been constantly modified and discussed. However, it does not impede the development of functional food on the global markets. Its dynamic development is also observed in Poland. Poland is the innovation leader on the food markets of Eastern Europe. This is a good prognosis for all manufacturers who would like to extend their product offerings with innovative, therapeutic and health promoting products.

Legal Regulations Regarding the Sale of Functional Food

The issues regarding the production and distribution of food are regulated by food laws, in particular by the Act of Food Safety and Nutrition of 25th August 2006. In Poland, they are regulated by the said Act of 2016 and in the European Union by Regulation (EC) No. 178/2002 of the European Parliament and of the Council of 28th January 2002 on the general principles and requirements of food law, establishing the European Food Safety Authority and on the procedures in matters of food safety (with later amendments) Official Journal EU L31/1 of 01.02.2002. However, the Act concerns only conventional food. At this moment, there are no legal regulations concerning functional food in detail. Currently, in the countries of the European Union, food is classified as follows: conventional food, modified food, food intended for particular nutritional uses and medical food. All new types of food are determined as novel foods.

The wide range of products and the possibility of the application of designed food in various areas make it difficult to define it, and weakens the chances of establishing a unified principle. Some products considered as functional food are based on the following regulations:

1.) Regulation No. 2015/2283 of 25th November 2015 on novel foods. This Regulation becomes effective on 1st January 2018. According to the regulation, novel foods are subject to characteristic assessment of safety procedures and approval for sale. Under this Regulation, the Commission authorizes and includes a novel food in the EU list if it complies with the following conditions:

- the food does not, on the basis of the available scientific evidence, pose a safety risk to human health;
- the intended use does not mislead the consumers, especially when the food is intended to replace another food, and there is a significant change in the nutritional value;
- where the food is intended to replace another food, it does not differ from that food in such a way that its normal consumption would be nutritionally disadvantageous for the consumer.

2.) The Regulation of the Ministry of Health of 16th September 2010 on fortified food, determining the foodstuffs to which vitamins and minerals are added on compulsory basis.
3.) The Regulation of the Ministry of Agriculture and Rural Development of 10th July 2007 regulating the principles of food labelling.

Other functional food is introduced on the market in compliance with nutrition and health claims, regulated by Regulation (EC) 107/2008, replacing (EC) No. 1924/2006 on nutrition and health claims made on food with regard to executive authority granted to the Commission.

1. Nutrition claims - pursuant to Regulation No. 1924/2006, Art. 2, Par. 2, Point 4) - means any claim which states, suggests or implies that a food has particular beneficial nutritional properties due to the energy or nutrients:

- it contains (e.g. includes vitamin C, source of potassium),
- it contains, in an increased or decreased amount (e.g. high content of protein, of increased content of calcium),
- it does not contain (e.g. it does not include sodium, it does not include sugar).

An entrepreneur may use only these nutrition claims described in the Annex to the Regulation No. 1924/2006, if the product fulfils the conditions stated in the Annex.

2. Health claims - are issued in pursuance with the Annex to the Commission Regulation (EU) No. 432/2012 of 16th May 2012 establishing the list of permitted health claims made on foods, other than those referring to the reduction of disease risk and to children's development and health. On 23rd October 2013 some of the entries of the regulation were amended and Regulation No. 1018/2013 is currently in force. The Regulation describes in detail the approved claims and determines the conditions and limitations of application (Berry Ottaway and Jennings, 2011; Martirosyan and Singh, 2015).

Regulations regarding production, sale and distribution are not globally standardized. The definitions of world leading food manufacturers – Japan, the United States and Europe – are not standardized, which results in numerous global consequences. The lack of a standard definition for countries has led to health claims which have not been governed by any regulations. Even though functional food generates billions of dollars in profits all over the world, the lack of a standard definition hinders the action of scientists, researchers and food manufactures, remarkably affecting the possibility of supplying the food to people with chronic diseases (Berry Ottaway and Jennings, 2011).

Functional food should develop based on the needs and expectations of consumers. The designing of the final product must be connected with various areas of market interest. Scientific research into bio-active ingredients and their potential properties enables the development of health-promoting foods. The results of clinical research direct food technologists and manufacturers to design foods which have beneficial effects for the human body. Manufacturers are obliged to design food products with special health properties as well as food of appropriate nutritional value, physical properties and desired sensory features. Moreover, "novel food" must be safe. Food safety is a global interest, in the view of public health as well as international trade and the exchange of goods. The manufacturers of innovative food should consider the provisions regarding food quality and safety as one of the foundations of production, by using appropriate health and nutrition claims and providing HACCP system-based manufacturing processes (Sztajerska, 2015).

In Poland, the primary scientific assessment is provided by the Chief Sanitary Inspectorate. The assessment includes the analysis of any potential risk resulting from the

introduction of a novel food on the market. The assessment is based on the specification submitted by an applicant, including the results of production, experience, the characteristics of the recipients, and nutritional, toxicological and microbiological information. The Chief Sanitary Inspectorate decides whether an additional assessment will be required (Lipińska, 2015).

Due to the diversity of novel foods and new food ingredients, safety assessments are based on individual case studies (*case by case*), to allow for the adjustment of a given product (Sokołowski, 2014). If the Commission and other member countries do not object to the assessment, and at the same time, an additional assessment is not required, the applicant may introduce the product on the market.

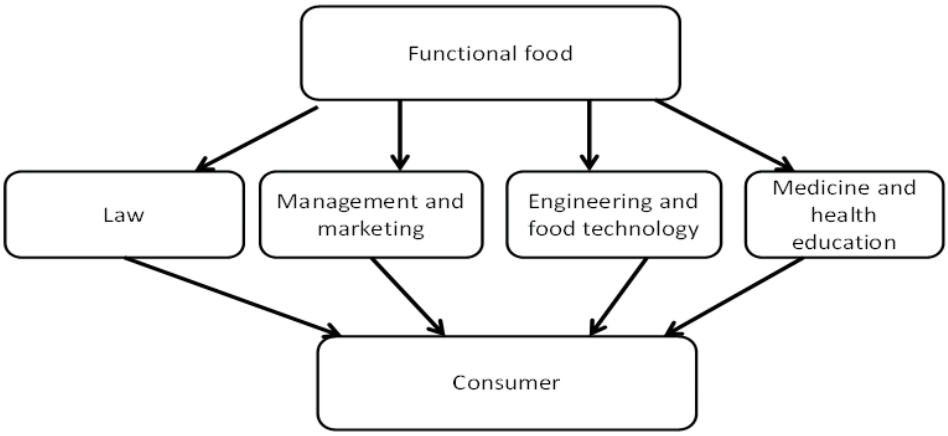

Fig. 1. The areas of interest in various fields influencing the development of functional foods, (authors' own elaboration)

Source: own elaboration.

Functional food combines numerous areas of interest in various fields. Apart from the legal provisions regulating the introduction of products on the market, the engineering and technology of production of functional foods are of primary importance. The design of innovative food products must meet the demands of the market. The requirements include modern production technologies, providing food safety and the use of innovative active packaging. It is essential to make use of the knowledge of scientists and medical doctors. Only combining these elements may result in the production of interesting products which meet the expectations of consumers. This will not be possible without efficient product management and marketing.

The Development of Functional Foods Around the World

In highly developed countries functional food is represented by numerous commonly available products which meet various expectations of consumers. The functional food market is the fastest growing branch of the food industry. Huge food corporations cooperating with the pharmaceutical industry and scientific centers have been preparing

global strategies and launching products on the world markets. Japan is the leader in functional food production. Most often, they offer food preventing dental caries, cardiovascular system disease, obesity and foods that slow down the ageing processes (Tomaszewska et al., 2014).

The production profile of food for special purposes in the United States is oriented on the diseases related to obesity and the complications related thereto. In addition, food dedicated to sportsmen has been developing dynamically, taking into account different sport disciplines and the type of exercise. It is estimated that almost half of the food in the US is bought for health reasons and that functional food will soon constitute half of the entire food market (Siró et al., 2008).

Products supporting heart disease prevention, lowering the level of cholesterol in blood or reducing the symptoms of menopause have been dominating in Europe. It is estimated that the value of functional food in the EU will reach 40 billion Euro in 2020. The main categories of food for special purposes in Europe are dairy products (50% of turnover) and cereal products (30%), however, in Japan and the USA drinks constitute 60% of share in the market (Zębek and Szwejkowska, 2014).

The Development of Functional Food in Poland

The food market in Poland is not very innovative in terms of the offered choice of products. The offered products hold little attraction for consumers. There are no original or groundbreaking projects. The cooperation between science, business and the market is not effective. This impeded cooperation has led to the poor development of innovative food. In spite of Poland's efforts to implement new production technologies the progress of functional food is not so dynamic as in other countries of Western Europe, Japan or USA. However, experts say this is a characteristic feature for developing countries. Products and technologies which have already been proved in other countries are preferred (Rejman, 2004). The quality and safety of the food already present on the market is increasing. The following factors build the strongest barriers against the progress of functional food:

- Unfavorable administrative structure showing the lack of supporting institutions
- Hindered access to knowledge in the field of designing, technology and participation in international projects
- Poor flow of reliable scientific research from university centers to interested enterprises
- Passive attitude of entrepreneurs and their limited creativity
- Difficulties in obtaining funds for research and development
- Poorly implemented marketing of the functional products which already exist on the market
- Passive and conservative attitude of the end consumer
- Prices which are too high in relation to conventional food (Kaczorowska, 2009).

The world market is more experienced than the Polish market. More extensive knowledge and awareness of consumers, better access to healthy food, higher purchasing power and advanced technologies allow it to offer a wide choice of products. Poland is far behind in this respect; however, it is slowly making up for it. Although consumers are not able to mention any functional products which have already been present on the market,

they declare their interest for new innovative products. Health-promoting foods have been gaining more and more supporters. The value of this market in Poland is estimated at about 1.4 billion euro (Olejniczak 2014). Optimistic prognoses allow an assessment that highly satiating foods will be included into the functional food offered on the Polish and European market.

Innovative Foods and Polish Consumers

The steady progress of economic, social and cultural changes and the growing risks of diseases have led to the development of new types of food that are adjusted to the various requirements and needs of modern consumers. Unfortunately, new products that create new demand appear only sporadically on the market (Czajkowska et al., 2013). The market for functional foods in Poland is determined by many factors;

- Consumer behaviour;
- Food safety;
- Medical treatment and prevention;
- Lifestyle;
- Fashion and prestige;
- Social status;
- Price.

Apart from the above-mentioned factors, consumer choice of health-promoting foods for special purposes is determined by its freshness, sensory properties, verified information on the packaging and its real influence on health. For this reason, manufacturers face a very difficult task in meeting the precise requirements consumers.

Today's consumer expects innovations on the food market. The companies which introduce new solutions are perceived by customers in a better light. This has been confirmed by numerous studies (Gutkowska et al., 2014; Szul, 2016). Manufacturers should design their products on this rising wave. The consumer must be important not only at the last stage as the final purchaser, but also at the very beginning. He or she should be the inspiration and indication for creating new solutions. Women are the main recipients in the context of functional food (Górecka et al., 2009) and it is their needs that the food market, including the highly satiating food market, should be oriented toward. According to Skotnicka and Platta (2017), interest in such foods is high and people expect to find foods which help control body mass and enhance weight loss.

However, refining the term "functional food" is the most important thing from the point of view of the Polish consumer. In most of the studies the respondents do not distinguish between convenience, functional or genetically modified food available on the market. This causes big concerns before purchasing any upgraded, enriched, vital or designed food. These terms have negative repercussion and suggest that foods designated for special purposes are modified, processed and unhealthy, and there is the feeling that the designation of foods as "health-oriented" is being abused (Gutkowska et al., 2014). As long as the Polish consumer does not understand what the food designed for a particular group of recipients is and what its objectives are, the chances for success of such a production is burdened with a high level of risk. Nevertheless, the dynamic progress of this type of food all over the world shows that such a trend could be shortly carried over onto the Polish domestic market (Kaur and Singh 2017).

Functional Food and Obesity Prevention

Obesity is one of the most common diseases related to poor nutrition. The World Health Organization (WHO) reports that obesity is a global problem and that it is the greatest global challenge of the 21st century. The number of obese people has tripled during the last 20 years. The highest percentage of obese people on a global scale (36.7%) live in the countries of the Persian Gulf Cooperation Council (Quatar, Quwait, UAE, Bahrain, Saudi Arabia, Oman). A similar situation is found in the United States where 33.7% of citizens are obese. It is scarcely better in the European countries. Unfortunately, Poland is in 5th place among the countries having most obese citizens (25.2%). If untreated this disease leads to a number of diet related disorders: circulatory diseases, type 2 diabetes, metabolic syndrome, hormonal disorders, and an increased risk for certain types of cancer (Al Nohair 2016, Cuschieni 2016, WHO 2016, Eurostat 2014).

For this reason, obesity was included in the Global Food Security Index in 2014 as one of two new measurement factors, next to food loss levels. Excess weight and obesity are the result of the lack of balance between the energy acquired with food and the energy expended. In the context of counteracting against excessive weight and obesity, it is not only the number of consumed calories which is important but also a properly balanced diet, physical activity and changing inappropriate nutritional habits.

It is extremely important to intensify promotion of proper nutrition and physical activity, and to treat excess weight and obesity both among children and adults. However, in spite of broad awareness in the developed and developing communities, the problem of excessive consumption has already reached over 50% of Europeans. The World Health Organization declares that unless some radical measures limiting obesity are undertaken, the rate of mortality due to diet-related diseases will increase. However, using restrictive diets is often ineffective. It is difficult to keep the patient in the dietary regime for a long time. After some time the motivation and strong will stops and the reward deficiency syndrome appears. For this reason a lot of weight loss therapies are not effective (Eurostat, 2014).

The application of food supporting obesity treatment and having a high satiating potential can be one of the ways to suppress this tendency. Research conducted all over the world is oriented on creating innovative functional products based on the knowledge of scientists, physicians and dieticians (Rebello et al., 2014). Two models of division are most often used in designing functional food that supports the treatment of obesity. The first model emphasizes the influencing of human metabolism. The second model depends on the use of bioactive substance.

- Decrease of lipids absorption;
- Decrease of energy supply;
- Increase of energy expenditure of the organisms;
- Decrease of adipocyte proliferation;
- Inhibiting lipogenesis and intensification of lipolysis process (Kostecka et al. 2017);
- Application of nutraceutics (Włochal et al. 2014, Aggarwal 2010).

The second model classifies food in terms of the bioactive ingredient included in the product. A part of these substances is included in the food we eat on daily basis. However,

the goal of modern technology is to acquire these substances and use them in a condensed and active form in modern functional food (Lai et al. 2015, Myrie and Jones, 2011). The active substances indicating a slimming effect include: Apigenin, Capsaicin, Myricetin, Resweratrol, Piperin (Baboota et al., 2013). Table 1 shows the most commonly used bioactive substances.

Table 1. The main substances used for the production of food supporting the treatment of obesity

Bioactive substance	Mechanism of action	Active compounds	Food source	Study
Dietary fiber	Suppressing the sensation of hunger, ability to bloat, delaying the process of stomach emptying	Glukomannan Psyllium b-glucans Starch resistant	Plantago ovata, Plantago psyllium L., Flax Cereals	Lopez-Rubio et al. 2016 Zalewski et al. 2015 de Boer et al. 2016 Brum et al. 2016 Schultes et al.2016
Chitosan	Water absorption ability and the feeling of satiety	Chitosan	Obtained from crustaceans	Gallo et al. 2016 Lopez-Rubio et al.2016
Plant Polyphenols	Suppressing the appetite, decreasing the absorption of glucose, Apoptosis induction and inhibiting lipogenesis	Genistein (EGCG) Curcumin Quercetin Sillibinin	Green tea, Turmeric, Onion, Paprica	Mi et al. 2017 Hamdaoui et al. 2016 Ding et al. 2016 Moon et al. 2013 Ahn et al. 2008
Probiotics, Prebiotics	The recovery of normal intestinal flora	*Lactobacillus rhamnosus* *Lactobacillus Gasseri* *Bifidobacterium, Enterococcus, Sacharomyces boulardii*	Fermented dairy products	Karimi et al. 2015 Baboota et al. 2013

Source: own elaboration

The Chances for the Development of Highly Satiating Foods

Highly satiating food is food characterized by a high level of satiety while consuming the same isocaloric portion. It is a kind of food which, due to its chemical and physical properties, can satiate the body quickly and for a long time, invoking the sensation of satiety which delays the time of hunger occurrence and the time of starting the next meal (Tremblay and Arguin, 2013).

The new generation food market has been addressed for the last few years to people who want to improve their appearance, enhance the functioning of their alimentary system and control their body weight while limiting the use of supplements and drugs. One of the proposals is to design foods with a high satiating potential that suppress the sensation of hunger. Such foods should be rich in nutritional fiber, both soluble and insoluble, which

causes bloating of the stomach contents thus satiating for a longer time (Arguin et al., 2012). Furthermore, such a product should contain a proper amount of water or be suitable for hydration in the case of products designed for instant preparation. The content of water and fiber causes bloating in the stomach and, by the same, slows down the process of emptying the stomach and intestinal passage of the digestive contents. Additionally, each product could be enriched with antioxidants which would additionally enhance body mass reduction through regulating the metabolic processes. In Japan and USA different kinds of hydrocolloids such as glucomannan (Zalewski et al., 2015), guar gum (Li and Nie, 2016) or xanthan gum (Fiszman and Varela, 2013) are used for designing snacks and drinks.

Global Production of Highly Satiating Foods

More and more attention is given to the production of food dedicated to a particular social group. Among the functional foods designed for body mass control and used in obesity prevention, special consideration should be given to the substances or food products which have a high satiating potential. The task of food engineers is to manufacture foods which will satiate the human body for a long time, limiting snacking between meals. Presently, around the world, such types of food are produced especially in Korea, Japan, USA and Canada. The production involves manufacturing snacks such as specially designed bars and drinks with the addition of natural plant ingredients (Gruenwald, 2009) and ready meals to be served hot. Advantage is taken from the satiating properties of homogenized and comminuted foods (Campbell et al., 2016).

This kind of functional food is not yet so popular in Europe. However, Consorium Satin has been operating for several years, comprising the leading European Universities involved in the research and design of this kind of food. Comprehensive studies are being conducted aimed at providing a whole range of satiating products (Scarabottolo, 2015; Lopez-Nicolas et al., 2015).

Unfortunately, such food products are perceived in Poland as niche products. The domestic manufacturers do not recognize the niche existing on the market. The vast majority of persons who are on a diet and taking different preparations and supplements for weight loss would enthusiastically take the opportunity to purchase this kind of food. Many new generation food projects have come into being in university laboratories, but we are not looking forward to realizing it. Many projects carried out in academic laboratories are looking forward to their realization. The limited possibilities of introducing highly satiating food make the Polish market very poor or even question its existence at all. In this case, it is essential to understand the need for mutual cooperation of the world of science, food manufacturers and consumers to state their expectations.

Summary – Future Trends

Nowadays, the manufacturers in Poland do not perceive the potential connected with functional food, including highly satiating food. The tendency on the world market shows that consumer nutritional habits and preferences are subject to change. Consumers have become more aware of the influence of diet on the functioning of the body and susceptibility to different diseases. It has been estimated that the diet in 2100 will be far

different from what we eat now. Most probably, it will be based on food specially designed for particular population groups (Heinrich and Preito, 2008).

The nutritional dietary profile of highly developed and of developing communities has changed remarkably during the last 50 years (De Fries et al., 2015). Wide choices of food available on the market has allowed for making individual choices. It means that diet is not monotonous and it takes consumer requirements and preferences into account. On the other hand, the development of industry, processing technology and global distribution has brought about risks related to food consumption. Allergies, alimentary intolerances, overconsumption, genetically modified food, convenience food, low fiber food with high content of fats and carbohydrates has created a space for the development of the safe, organic and functional food.

It has been estimated that by 2050 about 50% of food will have health promoting and therapeutic properties. Innovative progress in food technology will bring many economic and social benefits and it will contribute to increasing food safety. Introducing highly satiating products into the market may draw a remarkable interest, especially in these times of obesity epidemic. The application of functional products with satiating properties may become another tool in obesity prevention. The optimistic perspectives for the development of designed food in the world would lead to the conclusion that the Polish market will soon offer a wide range of this kind of products.

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Distribution of Organic Food in Poland

Abstract. Distribution of organic food in Poland has a number of weaknesses resulting from low and irregular supply as well as dispersion of producers and intermediaries. The paper presents the outcomes of research carried out in 2012 in three types of retail outlets offering organic food, i.e. specialist shops, groceries and retail networks. The investigation was conducted in the form of in-depth interviews using a standardised questionnaire. As the research shows, only in specialist stores does the product range satisfy consumer needs, whereas in the other outlets it is limited generally to processed products. Wholesalers, organic farms and brokers are the main providers of the surveyed retail outlets; nevertheless, specialist shops use the services of more providers than the other types of outlets. Low supply of organic food results in high retail prices. Specialist shops and groceries apply margins up to 40% on average, while retail networks have margins up to 20%.

Key words: organic food, distribution, retail, product range, supply sources, price level, Poland

JEL Classification: D22, M31, Q13

Introduction

Organic farming is one of the key elements of sustainable development. Opposite to intensive agriculture, based mainly on economic goals, it harmoniously links environmental with economic and social aims (Chmielak, 2000). In Poland, there are suitable conditions for development of organic production methods, mostly because of low chemicalization of agriculture. This system is more labour consuming than conventional farming, and therefore it fosters maintenance of workplaces in rural areas. Furthermore, price premiums for organic produce and subsidies to organic areas contribute to growth of farmer incomes.

Although organic farming in Poland has been developing since the early 1990s, a significant growth in this field occurred in 2004, when Poland entered the EU and organic farmers got the opportunity to use the support in the framework of the agro-environmental programmes. Afterwards, the organic areas increased significantly. In 2016, there were 22,435 organic farms and the organic area amounted to 537 thousand ha (Zdrojewska, 2017). Currently, Poland takes fifth place in Europe when it comes to organic area and the sixth place in terms of number of producers (Willer and Lernoud, 2017).

High dynamics of growth in organic areas has not induced the expected supply volume increase. Some of the converted farms do not deliver produce to the market. Moreover, one problem of organic food distribution is the fact that farms are dispersed all over the country and the efficient flow of goods is very difficult (Żakowska-Biemans and Gutkowska, 2003). Therefore, direct selling has dominated in distribution of organic food, which is typical for countries with low levels of market development. Recently indirect distribution channels, particularly specialist shops, grocery outlets and retail networks, have been becoming more

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and more important. Nevertheless, they are slightly identified; thus, there is a need to investigate indirect forms of distribution.

The main objective of the paper is to recognise and discuss the state and factors influencing the organic food distribution in Poland. The specific objectives concern the recognition of the width and depth of product range, determining supply sources of the outlets offering organic food, discussion on the problems occurring in the distribution sphere as well as prices of organic food.

Material and Methods

As was mentioned before, the organic food market in Poland is small and characterised by low transparency. Its participants hardly have access to information on production, sale or level and diversification of prices; therefore, it is necessary to investigate deeply this sphere. Distribution is of particular importance, because it has significant influence on profitability of organic farms and functioning of the entire market. For that reason, it is necessary to identify the main elements and the state of market development.

In order to achieve this goal, in 2012 research on retail outlets dealing with organic food was undertaken. The investigated units were located in the eight largest agglomerations in Poland (Table 1). The research had the form of an inquiry based on a standardised questionnaire (PAPI method), conducted by trained interviewers. The surveyed units were chosen using purposive selection. Each of them offered at least three different product groups of organic food. The investigation covered 131 specialist shops, 109 general grocery stores and 179 units of retail networks. The collected data was coded and processed in an Excel environment. The results were presented and discussed with the use of descriptive statistics instruments.

Table 1. Distribution of the investigated outlets

Agglomeration	Specialist shops		Grocery outlets		Retail networks	
	Amount	Share (%)	Amount	Share (%)	Amount	Share (%)
Warszawska	29	22.1	26	23.9	43	24.0
Górnośląska	23	17.6	21	19.3	31	17.4
Krakowska	19	14.5	17	15.6	25	14.0
Poznańska	16	12.1	13	11.9	21	11.7
Gdańska	14	10.7	10	9.2	18	9.5
Wrocławska	12	9.1	9	8.2	17	10.0
Łódzka	9	6.9	7	6.4	14	7.8
Szczecińska	9	6.9	6	5.5	10	5.6
Total	131	100	109	100	179	100

Source: author's own research.

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The Main Organic Food Distribution Channels

For years, direct selling to individual consumers has been the most important distribution channel on the Polish organic food market, because it generates lower costs and margins, due to which it is possible to offer products at competitive prices (Czubała, 2001). However, a disadvantage of this form of selling is the fact that it occurs only on rural areas. Currently, consumer studies show that specialist shops and supermarkets are the basic supply sources in organic food. Other forms are of little importance (Pilarczyk and Nestorowicz, 2010; Łuczka-Bakuła and Smoluk-Sikorska, 2011).

Meanwhile, in Western countries, organic food has emerged as an important segment of retailing in recent years. The organic food industry has moved from niche to mainstream markets (Jones et al., 2001). The most organic produce is sold through supermarkets. The market share of retail networks in total sale of organic food is in the range between 60% and 90% in Austria, Belgium, Croatia, Czech Republic, Luxembourg, and the UK. Meanwhile, in Italy, France, Germany and the Netherlands the share ranges between 40% and 60%, because in these countries traditional organic retailers, mostly specialist shops, are still important market players (Organic in Europe, 2016).

The advantage of the supermarkets is that they sell at lower prices, offer a wide product range, have sufficient space, good equipment and may carry out promotion actions (Richter and Hempfling, 2003; Pilarczyk and Nestorowicz, 2010). In turn, a narrow and shallow product range that results in an incomplete selection, low environmental awareness and knowledge of organic food among the selling staff, may be recognised as their downsides (Doležalova et al., 2009).

According to Richter and Hempfling (2003), there are three types of supermarkets on the organic food market:

- supermarkets with a maximal strategy, offering more than 400 organic products and who engage in their promotion,
- supermarkets with a basic strategy (between 50 and 250 organic products),
- supermarkets with minimal strategy (less than 50 organic products).

If the retail chains take the risk and start to engage in organic farming using maximal strategy in countries with emerging markets, like Tesco and Sainsbury in the UK in the 1990s, they will probably gain the largest market share (Atănăsoaie, 2011). However, supermarkets require assured supplies of homogenous quality and large volumes. This poses a problem because in these countries, organic food is produced in rather small quantities. In terms of the small size of the industry, the resources of supply are limited and unstable. Therefore, large retail networks very often import organic food, which results in relatively higher prices (Wier and Calverly, 2002).

Nevertheless, in countries with a less developed market, the largest share of organic food is still sold thorough specialist shops (Atănăsoaie, 2011). Specialist shops are important for consumers, who expect close contact with salespersons. They require from the staff full information on organic products. Furthermore, specialist retailers conduct educational activities and play a role as communicators. They have to be innovative and develop new concepts, so that they can assure a wide product range and attract new clients, in order to compete with retail networks (Santucci et al. 1999).

In Poland, the number of specialist shops is estimated at over 500. Currently, in cities, one observes a growth of units dealing solely with organic food, offering over 1000

products. These are generally self-service stores that satisfy consumer needs, but they sell at higher prices than supermarkets. Therefore, recently this retail form, as well as groceries, have been becoming more and more active players on the organic food market.

Product Range

The key actions in running a commercial activity are decisions on the product range (Szulce, 1998). As the research shows, specialist shops have a much wider selection – 57% of the units sold over 200 different organic products. Over 3/4 of grocery shops offered up to 100 products, which proves that generally organic food supplements their basic assortment. When it comes to the retail networks, between 200 and 300 organic products were available in nearly 44% of the surveyed outlets. It indicates that these are the supermarkets with basic strategy according to the classification proposed by Richter and Hempfling (2003).

Concerning the width of the assortment, the most specialist shops offered cereal products, fruit and vegetables products, dairy products as well as spices. In turn, in the groceries, cereal products, fruit and vegetable products could be found in the assortment, whereas mainly processed products were available in the retail networks (Table 2). Only a few of those outlets offered fresh products, i.e. vegetables, fruit and meat products and none of them offered fresh meat. Such product range is a result of organic food processing in Poland, because the majority of companies deal with cereals, fruit and vegetables (in 2016 – 17.2% and 31.1%), while only 6.1% with meat (Zdrojewska, 2017). Underdevelopment of this part of the market causes shortages, because currently the consumer interest in organic meat has been growing (Łuczka-Bakuła, 2007).

Table 2. Product range in the investigated outlets

Product group	Share of outlets offering a given product group (%)			Average number of offered products in given product groups		
	1	2	3	1	2	3
Bread	69.0	20.2	47.5	12.7	3.0	4.2
Cereal products	72.6	95.4	83.4	40.4	32.9	37.3
Fruit	65.5	51.4	12.1	15.1	6.8	5.3
Vegetables	65.5	27.5	17.4	18.2	7.2	6.7
Fruit products	67.9	77.1	73.7	29.8	8.3	15.3
Vegetable products	67.9	71.6	83.2	29.4	10.0	24.7
Spices	69.0	70.6	45.3	42.5	21.8	9.4
Oils	67.9	80.7	63.4	18.1	6.5	12.1
Dairy products	67.9	32.1	31.3	23.4	5.6	11.3
Eggs	69.0	51.4	89.4	3.4	2.1	1.7
Sausages	40.5	22.9	8.7	19.4	4.6	3.4
Meat	31.0	9.2	-	10.0	5.0	-
Coffee, tea	67.9	70.6	43.2	29.6	16.9	7.8
Sweets	67.9	53.2	73.9	31.6	7.5	17.5

1-specialist outlets; 2-general grocery stores; 3-retail networks.

Source: author's own research.

The distributors are aware that organic food accessibility is insufficient. Almost 70% of the investigated specialist and grocery outlets claimed that sometimes there is a lack of particular wanted products. According to every fifth specialist retailer, their selection completely satisfies consumer needs, whereas in over 1/3 of grocery outlets, often or very often there is a lack of certain wanted products. This indicates the need for widening the product range within certain food groups, in those cases where there are shortages – for instance, meat.

The study proves that retailers tried to satisfy client needs and therefore about 3/4 of specialist shops and 1/4 of groceries made individual orders for customers. This question was not directed to the retail networks, because they do not provide individualised customer service. In turn, they were asked if the assortment of organics is sufficient in the investigated unit and in 73.4% of cases, the answer was positive. This results from the fact that customers of these outlets mostly purchase conventional food and occasionally decide to buy organic food.

A positive fact is that almost 93% of specialist shops, over 60% of general grocery stores and 56% of units of retail networks aim to widen their product range in future; however, it depends on particular factors, such as demand growth, price decrease and wider selection of suppliers.

Supply Sources

The purchase of goods is one of the basic functions of a trading company. It requires assuring deliveries of goods appropriately in terms of type, quantity, time, place and quality to demand, including stock policy (Sławińska, 2002). These factors determine the need for searching for alternative supply sources. On the organic market a retailer has two ways of supply: directly from the producer or through intermediaries. The average number of suppliers for a specialist shop amounted to about 24, while groceries had 4.

A significant obstacle for organic market development is the fact that the wholesale industry is still underdeveloped (Table 3). Organic food wholesalers are very often local microenterprises and some of them do not have appropriate equipment to assure complete selections of fresh produce. Moreover, organic food has features of innovative products, which influences the fact that indirect chains are not willing to assume the risk of introducing them to the market.

According to the investigated retailers, the strongest advantage of wholesale purchases in is a broader selections, which results mainly from the fact that farmers, compared to wholesalers, deliver only selected products. Those surveyed recognize that the possibility of placing an order is a very important attribute of wholesale purchased. The retailers claim that wholesalers should engage more in gaining market information or carrying out consumer studies. They also ought to participate in promotion of organic food, also through collaboration with retail chains, e.g. through organizing common group advertisements that would allow for dividing advertising costs on more enterprises (Pilarczyk, 1999).

Farms were the second important source of supply for retail stores. The most essential advantages of these purchases were product freshness, maintaining collaboration with

farmers and contracts to guarantee regularity of supply, and the possibility to negotiate favourable price conditions.

Processors (fruit and vegetable processing companies, cereal processing companies, bakeries, butchers, etc.) are quite an important group of providers, especially for retail networks and specialist shops. A downside of this kind of supply source is dispersion of the enterprises and related to this – distance. On one hand, in the case of cereal processing companies, the distance is shorter because there are more of them, and on the other hand, the smaller number of butchers makes direct purchase difficult. When it comes to large retail networks the situation is different, because they are able to assure fast and elastic transportation of goods, both fresh and processed; nevertheless, they do not deal with organic meat and its products. Particular supermarkets purchase thorough producer groups, because they guarantee stable conditions and regular deliveries of high quality products.

Brokers are also quite important providers of the surveyed specialist shops. Brokers accept orders, create client databases, and collaborate with customers regarding volume and frequency of deliveries as well as gather information on market demand. They also cooperate with producers by carrying out specialized trainings and enable establishing trade contacts as well as entering new market segments. Brokers usually charge lower commissions compared to wholesale margins (Czubała, 2001). Due to their contacts with a number of producers, they contribute to diversification of the product range available on the market, which has particular meaning in the case of organic food.

Table 3. Supply sources of the inquired outlets (%)

Product	Farm		Wholesaler			Processing company			Farmers' market	Broker		Producers' group	
	1	2	1	2	3	1	2	3	1	1	2	1	3
Bread	43.4	23.8	38.2	50.0	47.3	25.0	26.2	54.9	-	9.2	11.9	3.0	-
Cereal products	27.8	10.6	83.5	100	76.5	16.5	-	34.7	-	17.7	10.6	-	23.4
Fruit	68.9	35.7	54.1	64.3	87.5	-	-	-	1.4	6.8	-	-	17.8
Vegetables	74.7	55.6	54.7	44.4	78.4	-	-	-	1.3	6.7	-	-	23.6
Fruit products	20.0	6.7	71.3	87.6	65.1	22.5	19.1	34.6	-	20.0	-	-	36.3
Vegetable products	25.0	8.2	72.5	76.7	73.4	21.3	23.3	45.7	-	20.0	-	-	28.1
Spices	8.8	-	85.0	100	67.4	16.3	-	23.4	-	8.8	6.1	-	11.3
Oils	15.0	13.3	85.0	80.7	85.3	26.3	-	37.5		7.5	6.0	-	
Dairy products	44.3	57.1	54.4	42.9	45.7	22.8	57.1	68.3	-	10.1	-	6.0	
Eggs	86.1	82.1	27.8	35.7	87.3	2.5	8.9		1.3	5.1	-	-	17.4
Sausages	27.3	-	40.9	40.0	-	43.2	60.0	100	-	4.5	-	-	-
Meat	35.3	-	41.2	-	-	41.2	100	-	-	2.9	-	-	-
Coffee, tea	-	-	94.9	93.5	67.8	11.4	-	56.3	-	15.2	6.5	-	-
Sweets	-	-	96.0	90.5	87.4	12.0	19.0	35.6	-	14.7	-	-	-

1-specialist outlets; 2-general grocery stores; 3-retail networks.

Source: author's own research.

Only every 10th inquired retailer collaborated with providers, mainly with farmers. This collaboration included contracts on deliveries of products. Retail networks offered similar agreements. Such a purchase system guarantees delivery of the required type and quality of products and reduces the risk of shortages (Szczepankiewicz, 2004).

As was mentioned before, one of the most important limitations of the efficient supply of retail outlets in organic food is dispersion of providers. The basic means of transportation is cost-consuming motor transportation. According to research, the average distance from the investigated specialist shops to wholesalers amounted to nearly 146 km, whereas to general grocery shops almost 160 km (Table 4). The distance to brokers was shorter (respectively 75 and 50 km), which results from the fact that they deliver goods to places where the demand occurs.

Table 4. The distance between retail outlets and suppliers

Supplier	Distance (km)		Who covers the transportation cost (%)				
	1	2	Supplier		Outlet		Commonly
			1	2	1	2	1
Wholesaler	145.9	159.1	39.7	48.8	50.9	51.2	9.4
Broker	75.7	50.0	10.0	50.0	75.0	50.0	15.0
Processing company	169.7	52.4	30.3	80.8	51.5	19.2	18.2
Farmer	101.4	76.0	36.6	77.1	56.1	22.9	7.3

1-specialist outlets; 2-general grocery stores.

Source: author's own research.

Quite significant differences were observed in the distance to processors (170 km – specialist outlets and 52 km – groceries). Processors supply groceries generally when they are located in the neighbourhood of an outlet. Similar dependence arises with deliveries from farms – they were located 101 km away from specialist shops and 76 km away from grocery outlets. Usually farmers were responsible for the transportation to the surveyed shops. This further distance between specialist shops and suppliers, compared to groceries, generally resulted from the necessity to assure a differentiated product range as well as the need to search for suppliers offering a diverse assortment. In the case of retail networks, the situation is different, because the purchase is usually made for the entire network from wholesalers which are between 20 and 70 km distant, and processing companies located 15-300 km away from the supermarket.

Prices of Organic Food

The relatively high price level of organic food in Poland results from low and irregular supply. The price premiums are relatively high and differentiated. They range from a dozen in vegetables and cereal products, to even 600 hundred percent in the case of olive oil and other processed products (Łuczka Bakuła and Smoluk-Sikorska, 2011).

Immaturity of the Polish organic market and its weak recognition contributes to the fact that in the process of pricing, it is not possible to take into account a number of factors of market character (e.g. demand or competition). Factors specific for the market in the

initial stage of growth have the highest influence on price for organic food. In the process of pricing, the cost method dominates in the inquired shops. Only small a part of those surveyed declared the use of methods based on demand or competitor observation (Fig. 1).

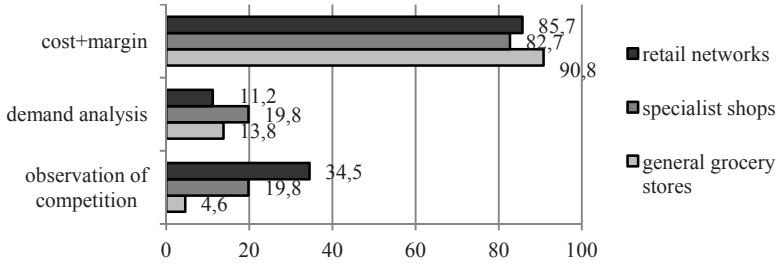

Fig. 1 Methods of pricing in the investigated outlets (%)

Source: author's own research.

One of the most important determinants of price is margin level. The functioning of the trade margin system in specialist shops or at specialist wholesalers depends mainly on freedom in establishing margin rates and the strategy adopted by the company. Margins are also influenced by such factors as turnover, range of performed trade functions and their costs as well as elasticity of demand (Rogoda, 2003). Higher margins are applied in cities and shopping centres, where the operational costs are relatively high. In turn, the margins are lower in local stores in smaller towns. Large retail networks, in relation to high turnover and economies of scale, also apply smaller margins.

The investigated specialist and grocery shops (over 60%) usually apply margins between 21% and 40%. This covers operational costs and allows to maintain demand quantity assuring sufficient turnover. Nonetheless, one should notice that margins on organic products in specialist shops are higher in relation to the business specifics of the outlet, which includes employing qualified staff, service and consulting. In turn, retail networks declared margin up to 20%.

Retail margins have a greater share in price on less durable products requiring special storage devices, i.e. meat, sausages or eggs (Fig. 2). For products with lower storage requirements, the margin share is smaller. Margins are also lower for products with high demand, i.e. vegetables, fruit, dairy or bread. Definitely, higher margin levels for all product groups occurred in specialist shops. Higher margins indicate that the outlets apply a high-price strategy, but also that they have high operational costs.

In the retail networks, the margin level was lower according to the applied low-price strategy. Moreover, the customers of retail networks have lower incomes; therefore, too high margins would result in lowered demand.

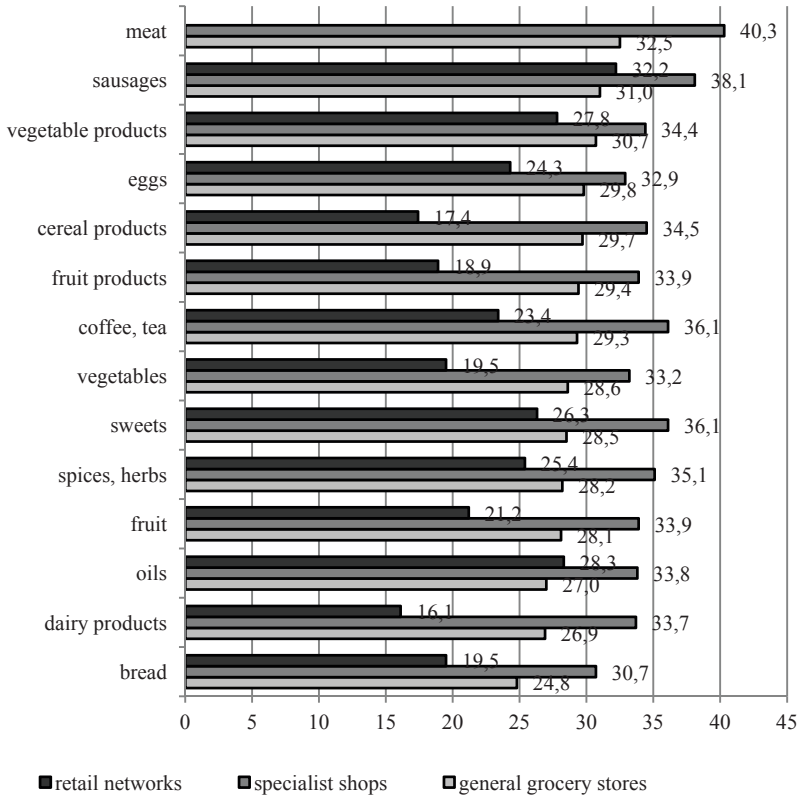

Fig. 2. Declared margin level on particular products (%)

Source: author's own research.

When it comes to Polish consumers, price is the main determinant of demand for organics, unlike in Western European countries, where non-price determinants are more important. It is highly probable that in future, as the Polish market develops, such factors as quality or uniqueness of products will be more effectual.

Conclusions

As shown by the research, the indirect organic food distribution channels in Poland come to specialist shops with increasing significance of groceries and retail networks. The selection of organic food, especially in outlets of retail networks, consists of processed products with longer expiration terms. The product range lacks fruit, vegetables and meat (it is respectively offered by none, 12% and 17% of supermarkets), which are of high consumer interest. In turn, the amount of specialist shops is insufficient to satisfy consumer expectations. Dispersion of supply sources and high price levels are significant problems of the distribution sphere as well. An incomplete selection of providers results in the necessity

for purchasing from a number of different supply sources (even over 20 in the case of specialist shops), which shifts the transaction cost. The most important providers for specialist shops and groceries are wholesalers, farms and processing companies, whereas for supermarkets – wholesalers and processing companies. An additional problem is that the supply sources are quite distant from the surveyed outlets – wholesalers about 150 km from specialist shops and groceries and in the case of farms – respectively over 100 and 76 km. Therefore, the research results show that despite some improvement, the trade availability of organic food is still limited.

Development of the organic food market and simultaneously of distribution requires engagement and common undertakings from its participants. Support from public institutions and strong market players would influence the functioning of the market. In addition, vertical integration of larger units, small specialist shops and wholesalers would allow improvement of the assortment selection, entrance to new markets and gain larger groups of consumers.

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Demographical Ageing of the EU Member States' Societies

Abstract. A spatial differentiation of the level of demographical senility was illustrated in the study, along with determination of dynamics of the European Union Member States ageing process (EU 27). The research period included years 1996-2016. The measures of demographical senility were used in the static and dynamical aspect. Country grouping due to the level of demographical senility advancement was performed based on statistical measures. A significant differentiation of the demographical senility level and population ageing process in the spatial system were found. The highest degree of demographical senility advancement was observed in the countries of "the old" Union but the greatest dynamics of this process was shown in the case of new Member States, including Poland and Baltic States.

Key words: population ageing, demographical ageing, measures of demographical senility, European Union Member States

JEL Classification: J11, J14, N34

Introduction

The 20th century and the beginning of this century is a period of very important population changes in Europe and around the world the dynamics and direction of which evoke many concerns (Urbaniak, 2015). Those changes lead to the phenomenon of society ageing, i.e. constantly increasing share of elderly people in the population, and the problem affects societies all over the world, in particular highly developed countries, including European Union Member States. A lot of modern day European nations are coping with the growing proportion of elderly citizens (Italy, Nordic and Balkan nations are some notable examples). These demographic changes have brought several important burden in different areas of social life. The first and most concerning one is the fact that most domestic-driven European labor forces are gradually shrinking. Long term and continuing shortages of labor are particularly visible in some areas such as professional medical and nursing staff (Jakovljevic, 2015).

The reasons for society ageing are sought in civilizational, social and cultural changes (Blaikie, 1999; Coulmas, 2007). This long term evolution was encircled with decreasing female fertility, improved early childhood survival, falling mortality rates and extended longevity (Jakovljevic, 2015). An important factor that accelerates the society ageing process is also the negative migration balance (Buchanan, 2010), especially if those who emigrate are people of young and average age (Rakowska, 2016).

Ageing has not only a demographical dimension, but also influences various spheres of social-economic life, in particular the labour market, social security, public services,

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consumption, public expenses, including expenses for retirement-pension purposes (Ogura, Jakovljevic, 2014). That is why the issue of changes of population condition and structure is extremely important and it must be taken into consideration in the national social-economic policy (Kłos, Russel, 2016).

The aim of the study is to determine the spatial differentiation of the level of demographical senility as well as to determine the dynamics of society ageing in the European Union Member States (EU 27)[2]. The static analysis was conducted for years 1996 and 2016, and the dynamic analysis for the period of 1996-2016. The source material was composed of data published by the Statistical Office of the European Union – Eurostat (Eurostat, 2017).

Research method

The primary issue in the research of demographical ageing is to point out the lower margin of individual senility from the level of which the human individual should be qualified as an old one, i.e. "the threshold of senility". In the subject-matter literature, the "threshold of senility" is usually considered to be the metrical age of 60 or 65. Currently, due to extension of life time, the majority of researchers are in favour of adoption of the "threshold of senility" at the level of 65 years - in accordance with the concept proposed by the United Nations (Król, 2014). However, it is worth mentioning that this margin is conventional and in the future, due to expected extension of the average life, it time will surely be changed (Gierańczyk, Sadoch, 2016).

Studies regarding population aging can be conducted both in a statistic and dynamic system. An analysis of the phenomenon in the statistical system aims to determine the advancement of the demographical senility within a given territory in a specific period of time. On the other hand, research carried out in the dynamic system leads to determination of changes in this scope (Kurek, 2008).

The following quantitative characteristics were used to evaluate the demographical senility advancement degree in statistical terms (at the given moment t) (Cieślak, 1992; Kurek, 2008; Kurkiewicz, 2010):

1. The old-age rate (OAR) determining the share of population included in the elderly age population in the general number of population. Adopting 65 years as the threshold of senility, this measure is expressed as follows:

$$OAR = \frac{P_{65+}}{P} \cdot 100\% \tag{1}$$

where:
P_{65+} – population at the age of 65 or older at the moment t,
P – general population at the moment t.

[2] Since 1st July 2013 European Union has 28 member states. Only 27 EU countries have been researched in the paper. Croatia is excluded from research, because necessary data for Croatia were not available due to the fact that it's the newest EU member state.

The structure ratio *OAR* is determined as senility rate and it indicates the percentage of the elderly population in the general population.

The scale of demographical senility is developed based on the senility rate. Contemporarily, the modified UN scale is applied for the purpose of measurement of the degree of population ageing process advancement according to which the share of population at the age of 65 or more (*OAR*) indicates the degree of population ageing process advancement in the following manner (Jurek, 2012):

below 4% – young population,
from 4% to 7% – mature population,
from 7% to 14% – ageing population,
from 14% to 21% – old population,
over 21% – hyper-old (venerable) population.

2. The venerable senility rate (*VSR*) expressing the share of the population at the age of 80 or more in the general number of population:

$$VSR = \frac{P_{80+}}{P} \cdot 100\% \tag{2}$$

where:
P_{80+} – population at the age of 80 and more at the moment *t,*
P – general population at the moment *t.*

3. The double ageing ratio (*DAR*) determining the share of the oldest population (at the age of 85 or more) in the population of the elderly (at the age of 65 or more):

$$DAR = \frac{P_{85+}}{P_{65+}} \cdot 100\% \tag{3}$$

where:
P_{85+} – population at the age of 85 of more at the moment *t*,
P_{65+} – population at the age of 65 or more at the moment *t*.

4. The ageing index (*AI*), also known as the dependency ratio is established as a quotient of the number of people at the age of 65 or more and the number of children and teenagers at the age of 0-14:

$$AI = \frac{P_{65+}}{P_{0-14}} \cdot 100 \tag{4}$$

where:
P_{65+} – population at the age of 65 or older at the moment *t,*
$P_{0\text{-}14}$ – population at the age between 0-14 at the moment *t*.

The ageing index *AI* determines the dependency of the youngest group (0-14 year-old) and the group of the elderly (aged 65 and older). Adopting conventionally the population of the elderly as the population of “grandparents", and the population of the youngest persons as the population of “grandchildren”, the ageing index is interpreted as the number of

"grandparents" corresponding to 100 "grandchildren". The higher the value of the ageing index *AI* is, the older the society is, because a higher number of the elderly population corresponds to a given number of the youngest persons. A proper population demographical senility starts if the age group 0-14 becomes less numerous than the group 65+, i.e. when the ageing index (*AI*) values are higher than 100 (Kowaleski, 2011).

In order to create a ranking of the European Union Member States from the point of view of demographic senility advancement, the aggregated measure constructed using the rank method was employed (Kowaleski, Majdzińska, 2012; Malina, Wanat, 1995; Panek, Zwierzchowski, 2013). The essence of this measure is "averaging" of places taken by particular countries in the rankings created on the basis of previously presented senility measures (old-age rate, venerable senility ratio, double ageing ratio and ageing index). At the beginning, separate rankings were established based on the determined measures. The ranking was decremental which means that the country with the highest value of the given measure took the first place in the ranking (rank *n*), and the country with the lowest value - the last place (rank 1). In each consecutive year the arithmetic mean $\bar{r}_i$ of the ranks allocated to each country was determined due to all examined measures of senility, according to the following formula:

$$\bar{r}_i = \frac{1}{m}\sum_{j=1}^{m} r_{ij} \quad (i = 1, ..., n) \tag{5}$$

where:

r_{ij} – rank given to i^{th} country due to j^{th} measure of senility,

m – number of examined senility measures.

Such a calculated rank mean is the aggregated measure that was employed to order the countries in terms of demographic senility level expressed with multiple measures. The higher value of the aggregated measure $\bar{r}_i$, the higher position in the ranking the country has from the point of view of senility advancement.

The constructed aggregated measure was also the basis for division of the analysed countries into groups characterised by the similarity of the level of demographic old age. Having ordered the countries according to the adopted criterion, using the value of the arithmetic mean and standard deviation of the aggregated measure, they were divided into four groups in the following manner (Malina, 2004):

group I: when $\bar{r}_i \in (\bar{r} + s; r_{\max}]$ – the oldest group,

group II: when $\bar{r}_i \in (\bar{r}; \bar{r} + s]$,

group III: when $\bar{r}_i \in (\bar{r} - s; \bar{r}]$,

group IV: when $\bar{r}_i \in [r_{\min}; \bar{r} - s]$ – the youngest group,

where:

$\bar{r}$ – arithmetic mean of the aggregated measure $\bar{r}_i$,

s – standard deviation of the aggregated measure $\bar{r}_i$,

$r_{\min}$ – the lowest value of the aggregated measure $\bar{r}_i$,

$r_{\max}$ – the highest value of the aggregated measure $\bar{r}_i$.

For the purpose of assessment of the population ageing process advancement in dynamic approach (in a specific period of time), the ageing rate (*AR*) was employed which is based on the point differences between the share of young and old population (Długosz, 1998), expressed with the following formula:

$$AR = [S_{0-14,t} - S_{0-14,t+n}] + [S_{65+,t+n} - S_{65+,t}] \tag{6}$$

where:

$S_{0\text{-}14,t}$ – share of population at the age of 0-14 in the general population at the beginning of examined period,

$S_{0\text{-}14,t+n}$ – share of population at the age of 0-14 in the general population at the end of examined period,

$S_{65+,t}$ – share of population at the age of 65 or older in the general population at the beginning of examined period,

$S_{65+,t+n}$ – share of population at the age of 65 or older in the general population at the end of examined period.

The value of ratio *AR* higher than zero indicated population aging, and the higher the ratio, the higher the population aging process population dynamics. The negative values of the ratio *AR* indicate rejuvenation of the population – the more intensive it is, the smaller the values of the ratio are.

Research results

In the period 1996-2016 the number of residents of the European Union systematically increased and in 2016 it was 506 million residents in 27 EU Member States (Eurostat, 2017). The overall size of the population is projected to be slightly larger by 2070 than in 2016. The EU population is projected to increase by about 3.5% between 2016 and 2040 when it will peak, to then remain stable until 2050 and to thereafter decline to 520 million in 2070. While the total EU population will increase by 1.8% over 2016-2070, there are wide differences in population trends across Member States, with the population increasing in half of the EU countries and falling in the other half (The 2018 Ageing Report, 2017). These population expansions came dominantly at the expenses of geopolitical expansions and positive net migration into the labor-attractive EU countries.

The growth of the general population is accompanied by the growth of the number of people belonging to the oldest age group with simultaneous decrease of the number of persons aged between 0-14. Within the period of twenty years (1996-2016), the general population 27 EU increased by 5.8%, whereas the increase of number of persons aged 65 and older was 36.0% and the drop in the number of the youngest persons (0-14 years old) was 8.8%. Corresponding changes of the population age structure were also noted in the examined period. The share of persons aged 65 and older increased by 4.3 p.p. (to 19.2% in 2016), with concurrent decrease of the share of the youngest people by 2.5 p.p. (to 15.6% in 2016) – fig.1. The observed changes reflect the on-going demographic transformations. Low fertility rate and extension of the average life span caused an increase in the number of the older persons and their share in the general population, thus resulting in society ageing.

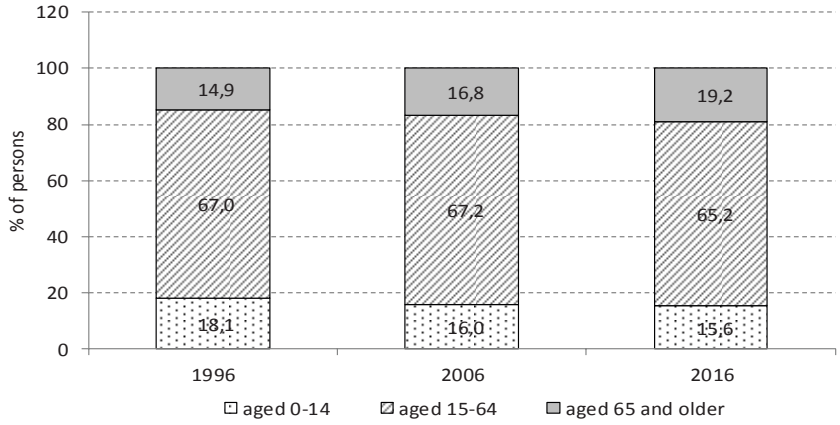

Fig. 1. Structure of population of the European Union (EU 27) in years 1996-2016 according to age groups
Source: own study on the basis of Eurostat data.

The share of people at the age of 65+ in the general population (old-age rate) in the particular countries is illustrated in fig. 2. Although in 1996 the share of persons aged 65+ fell within the range from 10.9% in Slovakia to 17.5% in Sweden and reached the average of 14.9% in the EU, the same share increased significantly in all countries and reached 19.2% in 2016. The share of people at the age of 65+ in the general population increased in this period by 3.5 p.p., and in Sweden by 2.3 p.p. The most distressing situation from the point of view of the pace of growth of the old-age rate was observed in Malta where this factor increased in 1996-2016 by over 7.7 p.p. In 2016 the lowest level of the old-age rate was observed in Ireland (13.2%), Luxemburg (14.2%) and Slovakia (14.4%), and the highest – in Italy (22.0%), Greece (21.3%) and Germany (21.1%). In Poland, the share of people aged 65 + came closer to the level of 16% in 2016.

Referring to the modified UN scale used currently for the purpose of assessment of the demographic old-age rate advancement degree, it must be stated that in 1996 12 member states of the current EU could be included in the ageing group (old-age rate in the range of 7%-14%), whereas other countries – in the old country group (old-age rate in the range 14%-21%). Only 20 years later, the ageing country group included only 1 country (Ireland), whereas the 3 oldest countries formed a hyper-old country group (old-age rate over 21%). Such tendencies indicate a very quickly advancing ageing process in the European Union Member States. It means a very significant growth of the old-age dependency ratio regarding people in the post-production age.

The share of the oldest people i.e. at the age of 80 or older, increased in the analysed period of 1996-2016 in the entire Union as well as in the particular Member States. It is expressed by the ratio of venerable senility (fig. 3). This share in the Member States of the current EU was 3.5% on average, and in the period of twenty years it increased by over 50% and in was 5.4% in 2016. This means that in 2016 almost every eighteenth EU resident was at the age of 80 or older. The following countries were included in 1996 among the countries characterised with the highest percentage of the oldest people (80+): Sweden (4.7%), Italy (4.1%) and Germany, France and Great Britain (4.0%), and in 2016 –

Italy (6.7%), Greece (6.5%) and Spain (6.0%). The lowest percentage of people over 80 years of age was noted in 1996 in Romania, Slovakia Poland (2.1%) and Malta (2.2%), and in 2016 – in Ireland (3.1%), Slovakia (3.2%) and Cyprus (3.3%).

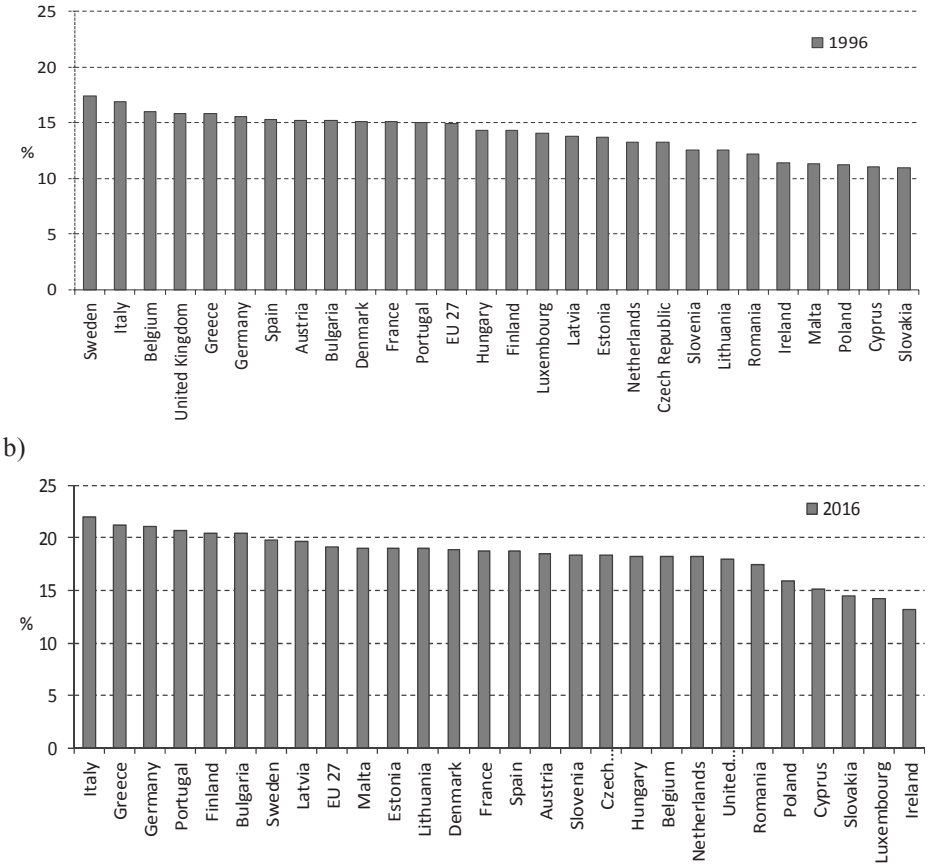

Fig. 2. The old-age rate *OAR* (percentage of persons at the age of 65+) in the EU countries in 1996 and 2016
Source: own study on the basis of Eurostat data.

Subpopulation of the elderly people (at the age of 65 or older) is characterized with a different age structure in the particular countries. What is particularly important from the point of view of shaping of social and economic policy of the state is the share of the elderly people (at the age of 85 and older) in this subpopulation. There should be different solutions implemented if the dominant persons among the elderly are people at a venerable age, and different ones if the dominant people still belong in the group of professionally active persons (Gierańczyk, Sadoch, 2016). The share of the eldest persons (85+) in the subpopulation of the elderly (65+) is expressed by the double ageing ratio (fig. 4). This share fell in the range from 5.4% (Bulgaria) to 12.6% (France), reaching the value of 10.1% on average for the current UE Member States. In the period between 1996-2016, the double

ageing ration increased by 3.4 percent point on average and in 2016 it reached 13.4% which means that almost every seventh person among the elderly is at the venerable age (85+). The highest value of the double ageing ratio in 2016 was noted in France (16.1%), Spain (15.6%) and Italy (14.9%), and the lowest – in Bulgaria (8.8%), Cyprus and Malta (9.3%). The Observed tendencies show that along with the growth of the old-age rate in the society, the share of the venerable persons increases in the subpopulation of the elderly.

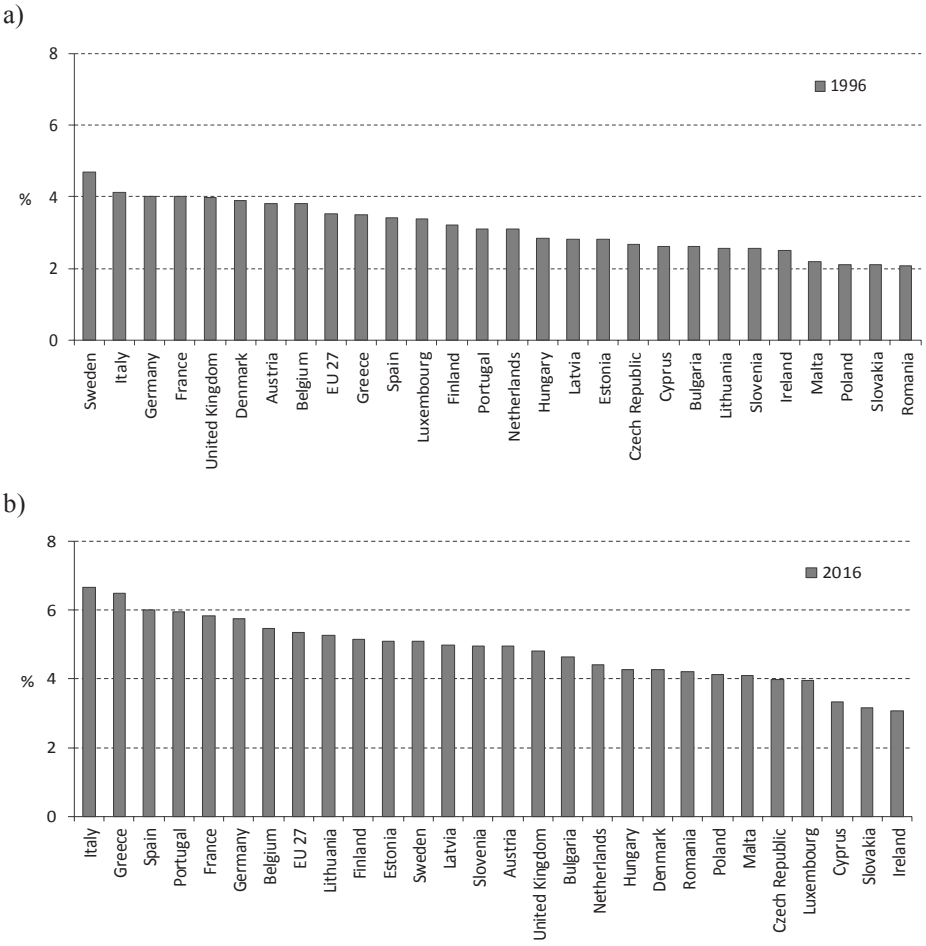

Fig. 3. The venerable senility ratio *VSR* (percentage of persons at the age of 80+) in the EU Member States in 1996 and 2016

Source: own study on the basis of Eurostat data.

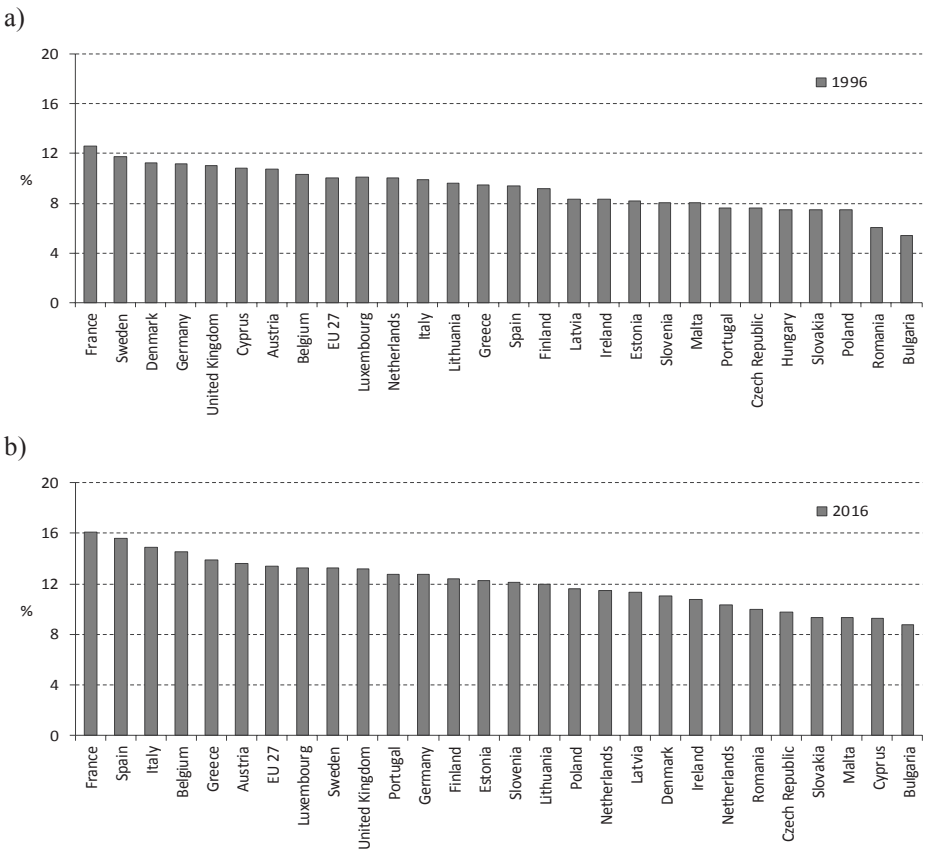

Fig. 4. The double ageing ratio *DAR* (share of persons at the age of 85+ in the subpopulation of people at the age of 65+) in the EU Member States in 1996 and 2016

Source: own study on the basis of Eurostat data.

The demographical ageing process cannot be considered only in relation to the elderly persons. A more comprehensive image of the demographical situation is expressed by taking into consideration the share of children and teenagers in the population. The ageing index (*AI*) based on the relation between the number of the old people (aged 65 and older) and the group of the youngest persons (aged 0-14) indicates a worryingly high ageing process advancement degree in the population of the EU Member States (fig. 5). In 1996 the ageing index was 82.4 on average for the current EU Member States, and it exceeded the value of 100 only in Italy (115.5), but in 2016 this index was higher than 100 in most Member States, reaching the average level of 122.9 in the European Union. It means that the majority of EU Member States in 2016 the number of elderly people (aged 65 and older) exceeded the number of children and teenagers at the age between 0-14. The alarmingly high demographic old-age rate was recorded in 2016 in Italy (161.4) and in Germany (159.0), indicating a high dependency ratio of the youngest age group and the group of the elderly (65+) in those countries. It should be emphasized that in 2016 in only

four out of all EU Member States the number of children and youth was higher than the number of the elderly persons (65+). Those countries included: Ireland (60.2), Luxemburg (86.4), Cyprus (91.9) and Slovakia (94.2). Referring to the ageing index, a population is deemed old when the measure exceeds the value of 100. Therefore, in 2016, the majority of UE Member States (85%) can be deemed demographically old.

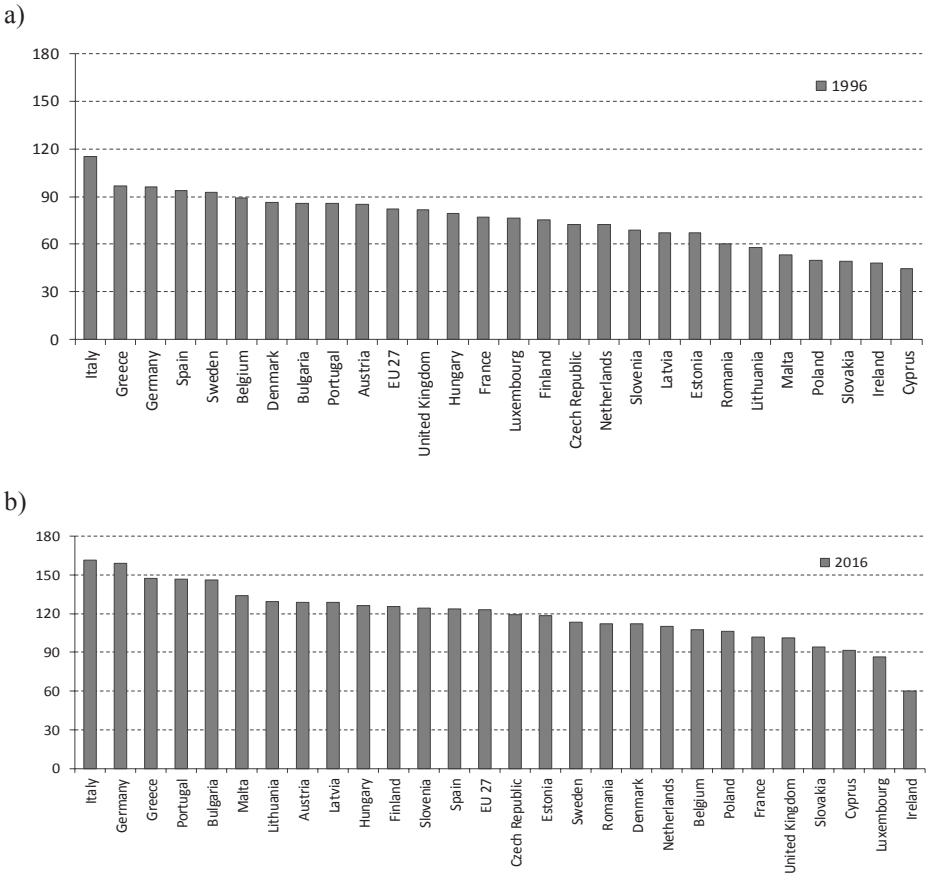

Fig. 5. The ageing index *AI* (number of persons at the age of 65+ per 100 people aged between 0-14) in the EU Member States in 1996 and 2016

Source: own study on the basis of Eurostat data.

The presented measures of demographical senility (old-age ratio, venerable senility ratio, double aging ratio and ageing index) allowed for creation of a ranking of countries from the point of view of all analysed measures. Two separate rankings of demographical senility of the EU Member States were prepared for the compared years 1996 and 2016 using the aggregated measure (5). In the next year, on the basis of prepared rankings, the countries were divided into 4 groups characterized by the similarity of the senility level (table 1). The rankings were constructed according to the decreasing value of aggregated

measure, therefore the oldest countries were classified in group I and the youngest countries in group IV, respectively.

Table 1. Ranking of countries according to the level of demographical senility in 1996 and 2016

Group	1999		2016	
	Country	Aggregated measure value	Country	Aggregated measure value
I the oldest countries	Sweden	25.8	Italy	26.5
	Germany	24.0	Greece	25.0
	Italy	24.0	Portugal	22.5
	United Kingdom	21.8	Germany	22.5
	Belgium	21.8		
	Denmark	21.5		
II	France	20.8	Spain	20.0
	Greece	20.8	Finland	18.8
	Austria	20.0	France	17.8
	Spain	19.3	Lithuania	17.8
	Luxemburg	15.8	Sweden	17.5
	Portugal	14.3	Austria	17.3
			Latvia	16.3
			Estonia	16.0
			Belgium	15.5
			Bulgaria	14.5
III	Finland	14.0	Slovenia	14.3
	Netherlands	13.3	Malta	12.5
	Hungary	12.3	Hungary	11.3
	Bulgaria	12.0	United Kingdom	11.0
	Latvia	11.3	Denmark	11.0
	Estonia	10.0	Netherlands	9.8
	Czech Republic	9.3	Czech Republic	8.8
	Lithuania	9.0	Poland	7.8
	Cyprus	8.5	Romania	7.8
	Slovenia	8.3		
IV the youngest countries	Ireland	5.8	Luxemburg	7.3
	Malta	5.3	Slovakia	3.3
	Romania	4.0	Cyprus	3.0
	Poland	3.3	Ireland	2.8
	Slovakia	2.5		

Source: own study.

In 1996, the following countries were included in the oldest country group (group I): Sweden, Germany, Italy, Great Britain, Belgium, Denmark, i.e. countries of the "old" Union, on the other hand, the following countries were included in the youngest country group (group IV): Slovakia, Poland, Romania, Malta, Ireland, where the youngest country was Slovakia.

In 2016, the ordering of the countries was changed, but a part of them did not change their appurtenance to the typological group. Italy and Germany remained in the group of the oldest countries, but Italy took the first position in the ranking, becoming the oldest country in the EU. Greece and Portugal joined the group of the oldest countries in 2016. In 2016, the youngest country in the Union was Ireland, next to which in Group IV were the following countries: Cyprus, Slovakia and Luxembourg. The reasons for the relatively good demographic situation of Ireland should be sought in the highest birth rate and one of the highest fertility rates among the EU Member States.

The synthetic determination of the ageing process advancement level in dynamic terms was carried out using the ageing rate (*AR*) which provides for the concurrent changes in the number of the old and young population (fig. 6). The *AR* ratio was determined for the period of 1999-2016 with breakdown into ten years' periods. The values of this ratio shows a significant differentiation of dynamics of population ageing processes in the particular counties. The mean Union value of the *AR* ratio was ca. 0.07 and the range of variability was between 0.02 to 0.15. All countries of the "new" Union, including Poland and Baltic States, were characterised with a significant ageing dynamics, exceeding the mean Union value.

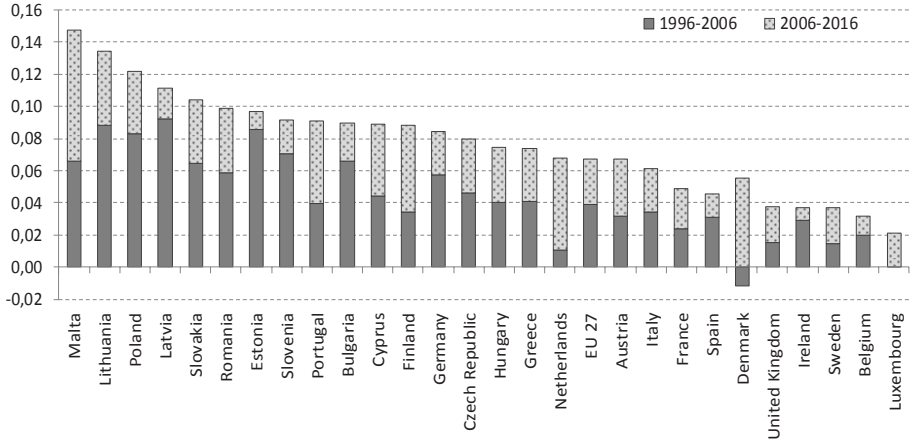

Fig. 6. The ageing rate *AR* in the EU Member States in the period of 1996 - 2016

Source: own study on the basis of Eurostat data.

In Malta, Lithuania, Poland, Latvia and Slovakia, the analysed ratio exceeded the value of 0.10 which indicates a rapid process of demographical ageing in those counties. A specifically dramatic situation can be found in Malta where this ratio reached the level of ca. 0.15 in the period of 1996-2016, with the ageing process dynamics being visibly higher in the second decade of the examined period. It should be emphasized that Malta belonged to the group of the youngest countries (group IV) in 1996, but after 20 years – in

a relatively short period of time, it moved in the ranking of demographical senility to a place close to the a position (table 1). In the "new" Union Member States there were exceptionally unfavourable changes in the age structure, leading to a high rate of society ageing, whereas the "old" Union Member States were generally characterised with slower ageing rates (Jakovljevic, Laaser, 2015). The counties of the lowest ageing dynamics in the period of 1996-2016 include the following: Luxembourg, Belgium, Sweden, Ireland and United Kingdom. Here, the *AR* ratio did not exceed the value of 0.04. The relatively low intensity of the ageing process of those counties may indicate their growing demographical potential. The reasons for the observed tendencies could be sought in the migration wave, particularly in case of young people, from the countries of the former socialist states to the remaining EU member states – with a higher level of social-economic development due to the possibility of taking up work there (Jakovljevic et al., 2016). The example of the positive influence of immigration on the demographical situation of a country is Germany which, in the sphere of natural movement, are characterised with a negative birth rate and very low levels of fertility rate, but due to the inflow of economic immigrants, its population situation was stablised effectively (Żołędowski, 2012). In relation to the counties of the "new" Union, the outflow of young people accelerates the ageing dynamics (Jakovljevic et al., 2017). The goal of the policy of such countries should be commercial activation through creation of conditions for inflow of various types of investments and offering new places of work to prevent further outflow of young people (Kurek, 2008).

Summary

1. In the period of 1996-2016, the European Union Member States were characterised with an advancing ageing process, in the countries of "old" Union, the highest level of demographical senility advancement was observed along with lower dynamics of this process than in the countries which are new members of the Community.

2. The degree of population senility advancement (in accordance to the aggregated measure) in 1996 was the highest in Sweden, while the lowest was in Slovakia. In 2016, the group of the oldest European Union countries included: Italy, Greece, Portugal, Germany The youngest countries were: Ireland, Cyprus, Slovakia and Luxembourg.

3. The highest dynamics of population ageing was observed in the countries of the "new" Union, in particular in Malta, Lithuania, Poland, Latvia and Slovakia. Quick pace of population ageing in those counties can be determined by the migration level of young people to the counties with a higher level of social-economic development due to the possibility of taking up work in those countries. The northern counties of the "old" Union were characterized with the lowest pace of ageing, including: Luxembourg, Belgium, Sweden, Ireland and United Kingdom.

4. Population ageing is a highly differentiated process in spatial terms. The current assessment of the demographical situation as well as constant monitoring of population processes can be helpful in determination and elimination of negative effects of society ageing as well as in adjustment of social-economic development aiding tools at the scale of a nation as well as in the local and regional dimension (Jakovljevic et al., 2017).

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The Scope and Conditions of the European Union's Innovation Policy

Abstract. This article aims to present the nature and the many directions of support for innovation processes in the EU on the one hand and to indicate the orientations of this support that could be used by Poland, including by agribusiness, on the other. The article covers the following: the nature, objectives and tools of innovation policy implementation, evolution of the European Union's innovation policy, characteristics of EU innovation policy measures after 2010, and characteristics of EU innovation policy measures in agribusiness after 2010. It is clear from the discussion herein that innovative actions and their support in the EU encompass not only technological but also social and environmental issues, with innovation and its support being the cornerstones of various policies, hence it is important to address them systemically. In particular, tools for implementing innovation policy and innovation partnerships at various levels play a role in this respect. The article is based on the related literature as well as documents and materials concerning the EU's innovation policy.

Key words: innovation, innovation policy, innovation policy tools

JEL Classification: M1, O1, O3.

Introduction

The European Union pursues a policy of structural change and reduction of the differences between countries and regions. One of the structural policy instruments is innovation oriented towards restructuring and development as well as enhancement of competitiveness of the economies of EU countries and regions. This is done by means of various legal, economic and institutional instruments that have given rise to innovation policy (Czerniak, 2013; Weresa, 2014). The scope of this policy and its tools evolve over consecutive years as changes occur in innovation needs and expectations that should be satisfied through innovation implementation.

Given the current interest in innovation and the role that it is meant to play in society and the economy, this article attempts to present the scope and determinants of the EU's innovation policy. It aims to present the nature and the many directions of support for innovation processes in the EU on the one hand and to indicate the orientations of this support that could be used by Poland, including by agribusiness, on the other.

The article is based on the related literature as well as documents and materials concerning the EU's innovation policy. The foundation for considerations was provided by data processing methods, i.e. analysis and synthesis. The considerations are mainly made at the macroeconomic level.

The article covers the following: the nature, objectives and tools of innovation policy implementation, phases of the European Union's innovation policy, characteristics of EU

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innovation policy measures after 2010, and characteristics of EU innovation policy measures in agribusiness after 2010.

The nature, objectives and tools of innovation policy implementation

Innovation issues have been present in economic policy for years, but their significance has been changing. Initially, innovation was associated primarily with science or science and technology, hence it derived from scientific policy or scientific and technological policy. Since innovation was mostly material and implemented in industry, that policy was also referred to as industrial or innovation and industrial (cf. Ciborowski, 2014; Czerniak, 2013; Okoń-Horodyńska, 2014; Staśkiewicz, 2013; Stryjek, 2015). Since the 1970s, the approach to innovation has changed, chiefly driven by the European Union, the USA and Japan. Innovation began to be seen as a leading development trigger contributing to structural change and the competitiveness of companies and economies, thereby extending the scope of innovation impact. The reason was that the objective of scientific and technological policy was principally to broaden the knowledge base and educate the scientific staff, whereas innovation policy aims to support development through the use of these resources (Czerniak, 2013). Moreover, attention was paid to the intangible aspect and a comprehensive view of innovation through knowledge management (Baruk, 2006), which is reflected in the definitions of innovation policy:

1. "Innovation policy comprises all these intentional actions of authorities that are intended to influence the creation and diffusion of innovation" (Czerniak, 2013);
2. "Innovation policy is defined as all actions aimed at stimulating the innovative development of economic entities by creating appropriate, broadly understood, systemic conditions for them" (Stryjek, 2015);
3. "Innovation policy can be best defined as the area of state intervention focused on faster innovation. Its overriding goal is to intensify the processes of creating, diffusing and applying knowledge in the economy, thereby generating new or significantly improved products, services, technological processes and organisation and management techniques" (Nazarko, 2015);
4. "Innovation policy is the conscious and deliberate activity of public authorities aiming directly or indirectly to support innovation and thus the competitiveness of the economy" (Ciok, Dobrowolska-Kaniewska, 2009);
5. "Innovation policy is a set of elements of scientific policy and technological policy. Its purpose is to support the economy's innovative performance, namely to assist in the introduction of new products, services, technological processes and management techniques. Its impact is mainly focused on enterprises, notably small ones, that bear the risk of failed innovation. This is done by creating a climate conducive to innovation, supporting the innovation culture of enterprises and developing services for innovation" (Stawasz, 2011).

These definitions suggest that innovation policy is a deliberate activity of public authorities that supports innovation diffusion and implementation. This activity applies to both tangible products and services and intangible accompanying elements such as consulting, organisation, management, logistics, marketing, etc. Furthermore, innovation policy consists of a variety of interrelated policies. It is based on economic and social policies in combination with scientific policy and technological policy but also with

sectoral (industrial, agricultural, etc.) policies and spatial, especially regional, policy (Ciborowski, 2014; Jasiński, 2013; Nazarko, 2015). Innovation policy is one of the structural policies, and its primary goal is to increase the innovative performance of countries and individual regions (Stanisławski, 2010). It now encompasses material and non-material innovation as well as support for innovation processes in the economy and society. Simultaneously, it is becoming less and less sectoral and more and more cross-sectoral, horizontal, achieving ever more social and environmental goals (Wiatrak, 2017).

Innovation policy is implemented at three levels (see Okon-Horodyńska, 2014):

1. Macroeconomic level – this is innovation policy of a country or supranational structures such as the EU but also international organisations (e.g. OECD or ILO);
2. Mesoeconomic level – innovation policy implemented at the regional level (e.g. voivodships in Poland);
3. Microeconomic level – innovation policy implemented locally and by organisations.

When analysing the individual levels of innovation policy, it should be noted that at the macroeconomic (and partly mesoeconomic) level, creation of a climate oriented towards supporting innovation processes, innovation culture, research and new technological processes, etc., is a more frequent exercise than other innovation policy directions. On the other hand, at the microeconomic level, the introduction of new technological processes, new products and services, innovative organisational solutions, etc., is more important.

Today's innovation policy (Stawasz, 2011):

- supports innovation processes in the economy and society,
- treats innovation as a network process involving public, civil society and private organisations working in various fields and areas,
- is becoming less and less sectoral and more and more cross-sectoral, horizontal,
- achieves ever more social and environmental goals,
- is oriented towards improving the ability of organisations to adopt and diffuse innovation,
- promotes innovation processes and activities.

The scope of impact of innovation policy evolves over time, yet it is based on changes and implementation of new solutions. Innovation policy comprises actions targeted at stimulating innovation processes and encouraging organisations to take them up. This is done by means of various tools such as strategies and programmes, institutional and financial support, public-private partnerships, etc. All tools (instruments) for innovation implementation can be divided into the following groups (Czerniak, 2013; Jasiński, 2014; Stryjek, 2015):

- *Coercive measures* in the form of *legal instruments*, including norms, standards, limits, prohibitions, orders, rules and regulations on the protection of the environment, consumers, competition and intellectual property, defining boundary conditions for the activities of different actors in respect of innovation;
- *Stimulating* or *dissuasive measures* (i.e. *economic instruments*) for introducing a specific type of innovation such as differentiated tax burdens, tax reductions and exemptions, utility charges, interest rates on loans, financial incentives, credit guarantees, etc., depending on the degree of preference for a given type of innovation;

- *National, local and regional government programmes and projects* aimed at accomplishing specific objectives and tasks (e.g. smart specialisations), including public procurement, public-private partnerships;
- *Institutional measures* – setting up institutions or changing the scope of their activities to aid in innovation implementation, support the actors involved in innovation processes, provide help in establishing innovative partnerships, etc. (e.g. the Polish Agency for Enterprise Development, technology parks, business incubators, innovation and technology transfer centres);
- *Information measures* – providing information on undertaken innovation activities and ensuring communication among stakeholders, notably those interested in implementing specific innovation (e.g. aid and information on innovation and its implementation provided to the agricultural sector by the Agricultural Advisory Centre);
- *Structural measures* – covering education at various levels as well as national and international research programmes.

In order to function efficiently, these instruments need to be connected within a system that ensures their complementarity. In the absence of a systemic connection, they are illegible, do not provide synergies and may even impede innovation implementation. It should be noted that these measures may vary in nature that defines the scope of innovation policy and the objectives of supporting it. Such measures may be (Ciok, Dobrowolska-Kaniewska, 2009):

- *regulatory*, when the public sector affects the course of innovation processes through legal instruments,
- *supportive*, through provision of innovation-related institutional and information assistance to actors (primarily research institutions and enterprises), which assistance fosters actions for innovation and innovation implementation, cooperation between stakeholders, support for innovative projects, etc.,
- *participatory*, when the public sector is totally or partly involved through financing research and implementation costs or through public procurement.

The scope of innovation policy is defined by the tools for its implementation, yet what needs to be first and foremost taken into account is the basis for pursuing this policy that lies in legal, institutional, information, structural, etc., measures as a preparation for innovation implementation. For example, exerting the impact on the improvement of labour qualifications and skills promotes the interest in innovation and its better use, consequently fostering the launch of innovation processes. As a result, economic instruments for innovation implementation can be used to a greater degree and more efficiently. Qualifications also contribute to the search and development of so-called smart specialisations.

Evolution of the European Union's innovation policy

Innovation policy changes in consecutive years as a result of the need to tackle emerging development problems formulated by economic, social and environmental policies but also to take into account scientific and technological achievements. Innovation policy is influenced primarily by the objectives that it intends to achieve, followed by its implementation to date and the effects of its application. The evolutionary nature of

innovation policy can be exemplified by the European Union, where three phases of this policy may be distinguished (Okoń-Horodyńska, 2014; Romanowska, 2014):

1. The sectoral policy phase (1952–1973), which established innovation policy foundations supporting research on selected sectors: coal, steel and nuclear energy. The core objectives of that policy were to shape cooperation among research centres of the member states and to finance that cooperation by national governments and enterprises.
2. The scientific and technological policy phase (1973–1992), which established a common policy covering research cooperation, scientific and technological research programmes (including research framework programmes), technology transfer, development of industry standards, etc., and the rules for coordinating these issues and their funding. Innovation policy in this phase is defined, in particular, by:
   - The action programme for research, science and education – so-called R. Dahrendorf's 1973 report;
   - The Community Research and Development Programme of 1982;
   - Single European Act of 1986 – establishing a legal and institutional framework for a comprehensive research and development policy.
3. The cross-sectoral policy phase (since 1992) – characterised by a comprehensive and systemic approach to innovation towards a horizontal view of innovation. The foundation was provided by the Treaty on European Union of 1992, which extended the objectives of innovation policy to include environmental issues, transport, the development of SMEs and the competitiveness of the economy. In particular, these changes are confirmed by the following documents and programmes:
   - White Paper on Growth, Competitiveness and Employment of 1993 stipulating the need for innovative entrepreneurship;
   - Green Paper on Innovation of 1995 containing the fundamentals of innovation policy, regional innovation strategies and technology transfer;
   - Lisbon Strategy of 2000, with its subsequent modifications, based on three pillars: social, environmental and economic, with the following priorities: innovation, entrepreneurship, social cohesion, sustainable development and liberalisation. The strategy provides that the EU objective is to promote and strengthen its research and technological base through integrated projects and the creation of a European Research Area;
   - EUROPE 2020 – A strategy for smart, sustainable and inclusive growth underlining the need for further development of the knowledge- and innovation-based EU economy that is environmentally-friendly and efficiently uses existing natural resources. The strategy promotes cooperation among organisations for building an entrepreneurial, cohesive and competitive Innovation Union.

The brief description of EU innovation policy shows that it is being further developed. Innovation is not only a technological issue but also a social, environmental and economic one.

Characteristics of EU innovation policy measures after 2010

In 2010, the Lisbon Strategy was replaced by the Europe 2020 agenda. The agenda specified the following priority areas (EU, 2010a):

1. Smart growth – developing an economy based on knowledge and innovation;
2. Sustainable growth – covering environmental protection, promoting green growth through innovation, mitigating and adapting to climate change, etc.;
3. Inclusive growth – supporting employment and retraining of employees and preserving social structures that will ensure economic, social and territorial cohesion.

For the implementation of the priority areas, 5 objectives, 10 integrated guidelines and 7 flagship initiatives are foreseen, aimed at, among others (EU, 2010a):

- improving the conditions for scientific and research activities,
- strengthening the knowledge triangle and unleashing the potential of the digital economy,
- working towards new skills and jobs, while developing a skilled workforce,
- improving resource efficiency and reducing greenhouse gases emissions,
- reducing poverty in order to lift people out of poverty and social exclusion and promoting actions in this respect.

A broad action programme was adopted, containing a reference to the functioning and development of organisations in various areas of activity, from science, through the economic sphere (industry, agriculture, construction, etc.), to social and environmental areas invoking health and quality of life. With a view to implementation, individual organisations may get involved by cooperating with other organisations and by taking action on their own. One of the flagship initiatives defining such action is the Innovation Union supporting, in particular (EU, 2010b):

- cooperation between the world of science and the world of business,
- investment in education, research and development,
- creation and implementation of innovation, including social and eco-innovation,
- the understanding of the concept of innovation in the public sector along with its impact on the private sector and civil society organisations,
- the search and promotion of successful innovation initiatives and the measurement of progress in their implementation.

These actions should be aided by European Innovation Partnerships launched "...to accelerate research, development and market deployment of innovations to tackle major societal challenges, pool expertise and resources and boost the competitiveness of EU industry" (EU, 2010b). These Partnerships are a tool to promote development and innovation through cooperation of various public, social and private actors undertaken to counteract the negative effects of the so-called global societal challenges such as climate change, the scarcity of raw materials, demographic changes, etc. Priority areas to be supported include (EU, 2010b):

- active and healthy ageing through the improvement of social protection and health care systems, the development of new drugs and methods of treatment, research cooperation in this field, etc.,
- sustainable supply and availability of raw materials for a modern society by developing innovative methods of sourcing raw materials, securing the supply of raw materials other than energy, finding substitutes and recycling,
- efficient water management by promoting innovative innovative actions in the water sector, reducing water consumption and ensuring water security,

- efficient and sustainable agriculture through the use and development of technologies that will promote the efficient use of raw materials, soil and water to preserve the natural environment while producing safe food,
- smart cities, a partnership to support large cities that are committed to reducing carbon emissions by more than 20%, increasing renewable energy shares in electricity generation, heating and cooling by 20%, increasing energy efficiency by 20%, etc.,
- smart mobility for European citizens and organisations that will ensure that Europeans can travel smoothly, with effective logistics through the development and deployment of intelligent transport and travel services.

These priority areas of action specify the range of innovative activities that are associated with the whole social and economic life, hence with the impact of many policies. For example, smart mobility for European citizens and organisations can be seen from the perspective of innovation policy combined with social, tourism and transport policies, but also with economic, regional and environmental policies. The smart city programme, on the other hand, combines innovation policy with environmental, social and urban policies, but also with construction, energy, industrial and economic policies. In turn, efficient and sustainable agriculture directly integrates innovation policy with economic, social, rural, agricultural and environmental policies, but also indirectly with spatial, regional, tourist, etc., policies. In the implementation of innovation policy objectives in the different priority areas, the EU is expected to play a particular role as regards smart specialisations developed as a result of collaboration of the public sector, science and business and supporting innovation through focus on the most promising areas of comparative advantage (Foray, 2009). The public sector plays the key role in cooperation and innovation partnership (Sørensen, Torfing, 2012).

Characteristics of EU innovation policy measures in agribusiness after 2010

One of the priority areas where innovation is to be supported is agribusiness, which should consume less water, fossil fuels, mineral fertilizers and plant protection products in order to ensure food supply, while making better use of the complementarity between crops and livestock rearing, organic waste management, renewable energy generation, etc. It is assumed that "... a shift required from the agricultural sector, needed because of increasing urgency for resource efficiency, will result in primarily producing more food in a more sustainable way, but also in supplying a variety of different societal services and bio-based products, related to health, leisure, land management, waste management, feed, fibres and renewable energy" (EU, 2013). To this end, the European Innovation Partnership "Agricultural Productivity and Sustainability" programme was developed with activities focused predominantly on (EU, 2012):

1. increased agricultural productivity, output, and resource efficiency to save resources and the environment (especially natural resources), reduce the losses in agricultural production and make use of biological progress;
2. innovation in support of the bio-based economy in the whole food production and supply chain through the promotion of environmentally sound technologies, e.g.

integrated biological plant protection, the reduction of greenhouse gas emissions, the use of biomass, bio-fermentation, bio-refinery, recycling, etc.;
3. biodiversity, ecosystem services, and soil functionality through improved land management, integrated agro-ecological systems, natural methods of ecosystem protection, etc.;
4. development and deployment of innovative products, devices and services, alongside with establishing a sustainable and efficiently managed food supply chain;
5. food quality, food safety and healthy lifestyles – through actions mentioned in the previous paragraphs on the one hand and through information and education in this respect on the other hand.

The actions taken are diverse, but they share an innovative approach that promotes sustainable management in agribusiness combined with the use of biological and ecological drivers of development. At the same time attention is paid to the improved use of organisational drivers of development through production management and distribution systems and an efficient information and monitoring system that enables integration of the various links of the food chain. Organisational drivers of development and innovation implementation in agribusiness also include cooperation and collaboration, among others, at the local and regional levels, where the potential for economic and social dynamics is the biggest (Wiatrak, 2017). Consideration should be given to the fact that food- and nutrition-related issues are fundamental, which makes the consensus on development directions so important. The tools for these actions and implementation comprise national smart specialisations and regional smart specialisations (RIS3) that target a particular area and its resources, including specific and marginal resources, to name a few (Foray, 2009). Simultaneously, smart specialisation strategies, as the preferred mode of action, can both stimulate private investment and foster more efficient and effective use of public funds, together with aid funds in individual countries and regions. "They can help regions to concentrate resources on few key priorities rather than spreading investment thinly across areas and business sector. They can also be a key element in developing multi-level governance for integrated innovation policies. In addition, they must be closely linked to other policies and need to understand the strengths of the region as compared to others and the possible benefits of interregional and international cooperation" (EU, 2010c).

Poland's accession to the European Union necessitated many changes in agribusiness and these changes continue to date. They have their source in programmes implemented under consecutive financial perspectives, including the current one, which addresses innovation issues in the most comprehensive way. As regards agribusiness in Poland, they are included in the Rural Development Programme for 2014–2020, which points to a poor innovative performance in agriculture, the food industry and other agribusiness links as well as to small interest in acquiring new knowledge and marketing new products. It is therefore proposed to (Program, 2013):

- increase R&D investment, including environmentally-friendly and climate-friendly solutions;
- improve the qualifications of employees, notably in agriculture, and their awareness of new production methods, also those conserving the environment;
- improve the competences of advisers who should play a greater role in innovation diffusion;
- establish operational groups for innovation (EIPs);

- strengthen the mechanisms for transfer of information, knowledge and innovation;
- support investment in agribusiness and agribusiness infrastructure to implement specific innovative processes, e.g. modern processing technologies.

These directions of innovative actions confirm that agricultural and rural policies are oriented towards creating conditions for innovation development and implementation. These actions rely on knowledge and preparation for change. Simultaneously, the focus is on cooperation between agribusiness and research institutions so that innovation that will be most suitable for implementation can be jointly developed.

Conclusion

It is clear from the discussion herein that:

1. Innovative actions and their support in the EU encompass not only technological but also social and environmental issues, with innovation and its support being the cornerstones of various policies, hence it is important to address them systemically;
2. The diverse and growing range of innovative actions included in EU policies requires innovative actions to be pursued by innovation partnerships at various levels, comprising the public sector, science and business on the one hand and individual actors across and within different sectors on the other;
3. Particular attention should be paid to tools for implementing innovation policy that are diversified (legal, economic, institutional, etc.) but combined into a complementary system supporting the policy objectives;
4. All tools for implementing innovation policy are important, yet what should be used first is structural measures that create conditions for innovation and their practical application through education at various levels and research programmes;
5. The implementation of the various orientations of EU support for innovation can significantly contribute to the reconstruction of Poland's socio-economic structure, including in agribusiness, where the needs for production modernisation and organisational changes are the greatest;
6. The partnership of individual agribusiness links with research institutions aims not only to support the implementation of innovation but primarily to develop new innovation.

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Agriculture in Poland and Ukraine – Potential and Dynamics of Changes in Production

Abstract. The article attempts to compare the importance of agriculture and the dynamics of its development in Ukraine and Poland. The most important constraints on the development of Ukrainian agriculture were identified, including the unregulated land market, lack of coherent support programs for agriculture and rural areas, poorly developed infrastructure of the agricultural environment and lack of capital for development. It was found that agriculture in Ukraine is characterized by a high growth rate of productivity and production. The observed output gap in relation to agriculture in Poland is about 10 years. The agricultural sector in Ukraine has about 10% share in generating GDP and as much as 40% share in exports. Such high importance can be maintained even in the conditions of economic development, as there are large reserves in the development of agribusiness. The most important development factors include the introduction of a coherent program for the development of the agribusiness sector, including production of goods with high added value and increasing the availability of capital for the development of agriculture. A great opportunity is the development of trade in the conditions of affiliation with the EU.

Key words: productivity gap, agriculture efficiency, production factors, agriculture development

JEL Classification: Q00, Q17, O13, P32

Introduction

In Ukraine, as in most countries of the former Eastern bloc, after the period of economic transformation, the time has come to build new economic structures. Such activities also concerned agriculture. The situation of agriculture in individual countries varied. A strong sector of private, individual farms has been preserved in Poland, and state-owned farms had only about 20 per cent share in land use. In Ukraine, all agriculture functioned in the form of state-owned or co-operative farms. After the period of economic changes, the changes towards the marketization of economic relations in Ukrainian agriculture were much slower than in Poland. However, some developmental analogies can be noticed. Changes in agriculture are taking place there with a delay in relation to the situation in Poland, but they have a similar course. At the same time, Ukrainian agriculture is becoming a major producer of food not only in Europe, but also on a global scale.

Ukraine as one of the largest countries in Europe has a huge potential for the development of agricultural production. A special feature is that in Ukraine there are some of the most fertile soils in the world, and arable land resources are over 32 million ha.

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After the formation of independent Ukraine, the old economic structures have disintegrated. This was also true for agriculture and led to a strong decline in production, but also to a significant deterioration of the infrastructure in agriculture and its environment. After the transformation, tens of thousands of large farms were established there, but the land was given to several million small owners, who often do not even have machines for production. Strong obstacles in the development of agriculture are still such matters as the unorganized situation on the agricultural land markets, the lack of a stable law with regard to agricultural support, but also a very low level of development of the purchasing, processing and distribution system of agricultural production (Wicki and Orlykovskyi, 2016). The restriction for changes is the obsolete equipment of farms and the shortage of funds for investments (Zaika et al., 2017). It is the limited resources for development that constitute a significant barrier to changes in agriculture and the entire agribusiness in Ukraine. It is still an important sector of the economy with a 10% share in generating GDP. In Poland, after the transformation, the importance of agriculture and agribusiness in the economy decreased with the increase in the total production value of the sector, but also the share of agricultural processing in the agribusiness structure increased, which required significant investments (Wicka et al., 2016).

The inflow of funds to the agricultural sector in Ukraine is limited for many reasons. The basic one is low domestic demand for food resulting from the low purchasing power of the population (Cherevko, 2017; Grużewska et al., 2017). This affects not only the volume of production, but also its structure, because the demand for more expensive animal products is limited, and the development of such production is difficult (Cherevko, 2017). Still, part of the population consumes too little protein from animal products due to their high prices (Nemchenko, 2013; Nemchenko, 2013). Significant disturbances in the development of agriculture also appeared in connection with the financial crisis within the period 2007-2009 and the decline in the export of agricultural products and their prices (Dibrova, Dibrova, 2009; Grużewska et al., 2017).

Support for agricultural development from the Ukrainian state is considered too low, which results from budgetary constraints, but is often not properly targeted, therefore is not enough to modernize agriculture (Dibrova et al., 2015; Dibrova, Chan-khi, 2013). It is believed that without institutional support under the programs for agricultural development it will be difficult to obtain the expected increase in agricultural production (Malik and Zaburanna, 2014). Support programs should be aimed at supporting those agricultural sectors that are the most delayed in development (Mazur and Pimenova, 2014) and mainly concern the introduction of modern production techniques (Dibrova et al., 2011). The importance of technical progress in the growth of agricultural productivity is now higher than the importance of increasing land inputs or industrial production resources, which is observed in countries at every level of economic development (Wicki, 2016). Due to different needs emerging in particular regions of the country, agricultural development programs must also be regionally differentiated (Chemerys and Krupin, 2015), taking into account the needs of medium and small farms (Melnyk, 2013; Orlykovskyi, Wicki, 2016) and support sustainable rural development (Moroz, 2012).

Very good production conditions as well as access to large land resources in organized units favored the emergence of very large enterprises dealing in agriculture and the appearance of foreign investments in agricultural farms (Heyenko, 2010). Many large, vertically integrated agricultural holdings were established, which raise capital even on foreign stock exchanges, also in Warsaw (Cherevko, 2012; Melnyk, 2013). The

development of agroholdings leads to an increase in the scope of food processing and export from Ukraine.

Agriculture in Ukraine has a stable share in generating GDP and in exports (Cherevko, 2015). The opening of foreign markets, including EU markets, to agricultural products from Ukraine enables further development of production, especially when not only exports of raw materials, but also exports of more processed products would take place (Dibrova et al., 2014; Bukin et al., 2015). In the structure of value-added production in agribusiness, agriculture should take the second place after food processing. This result was achieved in Poland twenty years after the transformation (Wicki and Grontkowska 2015). Another direction of development may be an increase in biomass consumption for biofuels (Galchynska et al., 2015). According to some authors, the production of rape for transport biofuels is profitable under Ukrainian farming conditions and can be implemented on a large scale (Cherevko, 2016; Zaika et al., 2014). However, such production competes with food production (Wicki, 2017), and is also heavily exposed to production and market risks (Wicka, 2013).

According to the energy balance, in 2013, the share of energy produced from biomass in Ukraine did not exceed 2%. Potentially as much as 18% of the total primary energy consumption can be generated there from the available biomass. Presently for the production of electricity in Ukraine, wood chips and sunflower husks are used the most. The use of wood biomass potential reaches 80%, whereas of husks – 59%. Therefore, it is required to concentrate on technologies, which can be cost competitive, such as biomass in by-products, energy and biogas produced from waste. Unfortunately, with low world fuel prices, the production of energy from biomass is usually unprofitable.

Agriculture in Ukraine has many strengths. These are: high quality of soils, large land resources, the possibility of obtaining surplus production in relation to domestic demand, as well as low production costs. However, the financing of agricultural development is still a problem that needs to be solved. In Ukraine there is too little capital for financing the developmental needs of agriculture due to many other, competitive applications (Vaschyk, 2012). Agricultural farms are increasingly using bank loans in financing development (Adamenko et al., 2015), but for smaller entities, access to loans is difficult (Borisova, 2009), and some managers, fearing the risk, prefer to use safer, internal financing sources (Zabolotnyy, 2016). The economic crisis observed in recent years leads to further limitation of the financing development possibilities.

In view of the many challenges faced by Ukrainian agriculture, similar to those observed in Poland since the mid-1990s, it seems reasonable to make a comparative analysis of the development trends of Polish and Ukrainian agriculture.

Aim and methodological assumptions

The aim of this study is a comparative assessment of development trends in agriculture in Poland and Ukraine, establishing development similarities and presenting perspectives for further agricultural development in Ukraine.

The study includes a critical analysis of the literature, which was used as the basis for determining the direction of further research. In the next stage statistical data presented by the FAO were used in order to make a comparative analysis of Polish and Ukrainian agriculture. This data source was chosen because of the possibility of obtaining comparable

data for longer periods. The analysis covered the years 1995-2014. The data was compiled in the form of time series and the differences in the dynamics and level of presented phenomena were assessed. A time gap in achieving productivity gains was also identified.

The comparison of Polish and Ukrainian agriculture was made in the area of overall efficiency of production factors, size and efficiency of plant and animal production as well as the size and dynamics of foreign trade in agro-food products.

Resources of production factors in agriculture and their productivity

Comparison of changes in agriculture in Poland and Ukraine is justified because in the 1990s, both countries transformed the system and reformed the economy. There are significant developmental analogies, including a decline in agricultural production during the restructuring period and its development in subsequent years. The observed development gap is the basis for determining the analogy in changes occurring in agriculture. It is also possible to define medium-term prospects for using the potential of agriculture in Ukraine, taking into account the dynamics and level of productivity achieved in Poland.

Agriculture in the analysed countries has a different role in the economy. In Poland after the political transformation in the 90s of the 20th century, the importance of agriculture decreased from almost 10% to 5% of GDP. After 2000, the share of agriculture in the economy did not exceed 3% and remained at this level. In the Ukrainian economy, agriculture plays a greater role. By 2004, it was 10-14% of GDP, and in subsequent years it did not fall below 6% (fig. 1).

In Ukraine, the production potential of agriculture is very high, mainly due to the large agricultural land resources and a significant share of soils with high usefulness for agricultural production. The total area of the country is 603 thousand km^2, and the area of agricultural land is 41.3 million ha, of which arable land is 32.5 million ha. It is more than twice as much as in Poland, where the area of agricultural land does not exceed 15 million ha, and the arable land area is around 11 million ha (fig. 2).

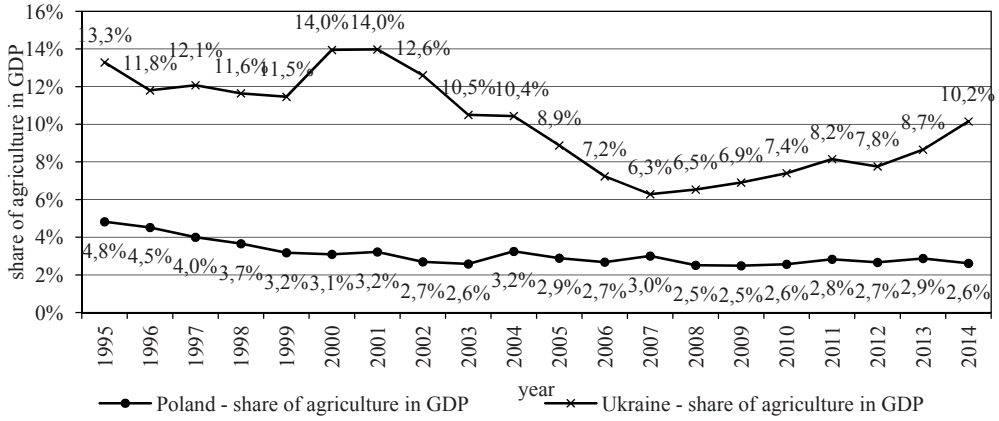

Fig. 1. Share of agriculture in GDP in Poland and Ukraine in period 1995-2014

Source: own elaboration based on FAO data.

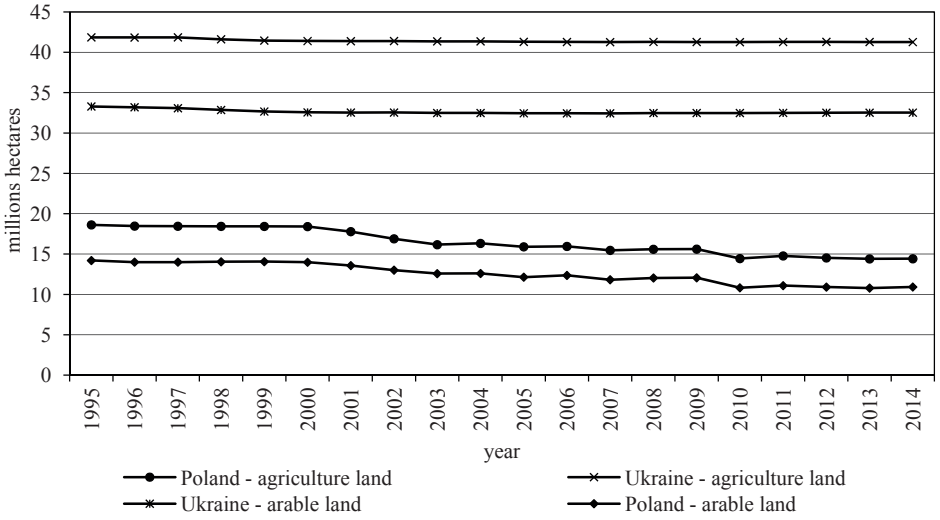

Fig. 2. Area of agriculture land in Poland and Ukraine (million hectares)

Source: own elaboration based on FAO data.

About 2 million people work in agriculture in Poland. There is a visible downward trend. In Ukraine, it is estimated that about 3 million people work in agriculture, but they are both people working on large farms and on family farms (fig. 3). It should be noted that the data presented by the FAO differ from the data provided in other statistical data for Ukraine, in which the number of 3.1 million employed in agriculture was presented (Orlykovskyi et al., 2016), which results from a different inclusion of wage workers in statistics. The level of employment in agriculture in Poland varied from around 18 people per 100 ha of agricultural land in 1995 to 13 people per 100 ha in 2014. In Ukraine, in the same period there was a reduction in the employment rate from 12.7 to 9.9 people per 100 ha of agricultural land. Significant differences occur in the structure of farms. There are about 53,000 agricultural enterprises in Ukraine with various ownership forms, of which around 74% are farms, but the number of large agroholdings is also significant, especially in land use. Agriculture in Poland is very fragmented, in 2015 there were about 1.3 million farms with an average area of just 10 ha. This means that Ukrainian agriculture has much greater opportunities in agricultural production, and thus it can be much more competitive, especially on international markets. In the whole agribusiness, a similar percentage of employees in both compared countries is employed. It is about 17% of employees (Wicki, Grontkowska, 2015).

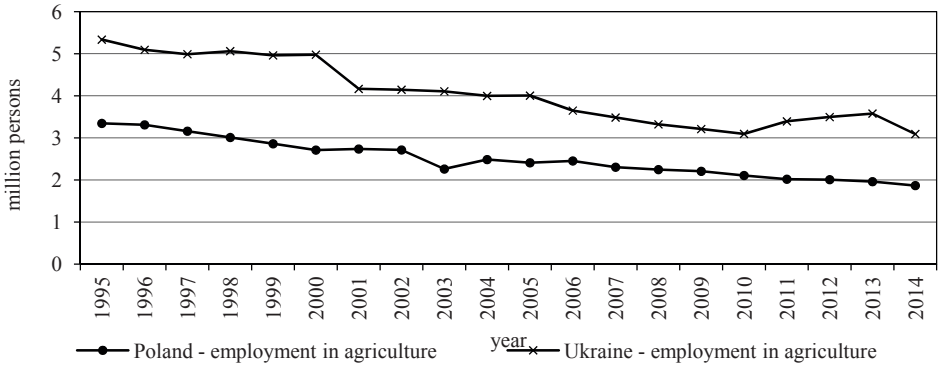

Fig. 3. Employment in Polish and Ukrainian agriculture in period 1995–2014 in million persons

Source: own elaboration based on FAO data.

Since 2000, the total value of production in Ukrainian agriculture is higher than in Poland. In addition, a steady upward trend can be noted, while in Poland there is no visible increase in production. In 2000, the volume of agricultural production was comparable, and in 2014, agricultural production in Ukraine was already 60% higher than the value of agricultural production in Poland. With a large difference in the resources of production factors, the differences in the volume of production in the compared countries are not large. Figure 4 and Table 1 present a comparison of the value of agricultural production in Poland and Ukraine. The value of production in Poland is much higher per 1 ha of agricultural land and per one worker in agriculture due to the higher production efficiency in some sectors, but also due to the different production structure. In Poland, higher processed animal production, reaching higher prices, accounts for about 60% of agricultural production, and in Ukraine it is about 30%. The increase in the value of production can therefore be obtained by supplying higher-processed agricultural products. This is discouraged by high productivity in crop production, which is relatively easy to obtain on good soils in Ukraine. This means that the potential of agriculture in Ukraine is still not fully exploited.

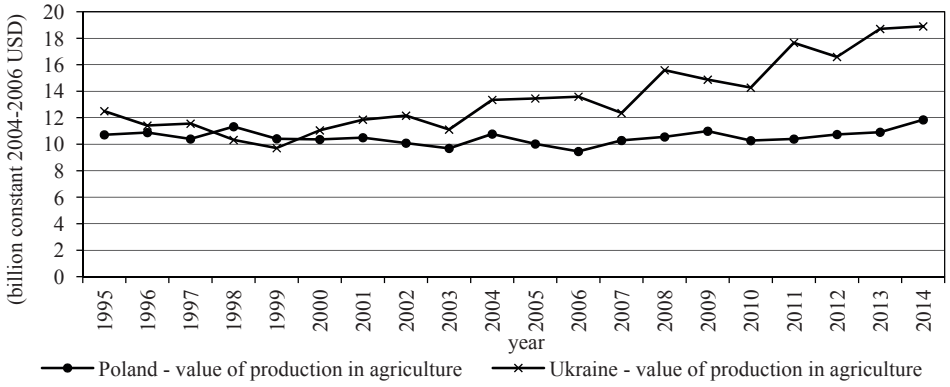

Fig. 4. Value of agriculture production in Poland and Ukraine in period 1995–2014

Source: own elaboration based on FAO data.

Taking into account the productivity of labour and land, it is worth noting that the growth rate of productivity in Ukrainian agriculture was much higher than that observed in Poland (tab. 1).

Table 1. Labor and agriculture land productivity in Poland and Ukraine (constant 2004-2006 USD)

Year	Labor productivity per worker in thousand constant 2004-2006 USD		Agriculture land productivity per 1 ha in constant 2004-2006 USD	
	Poland	Ukraine	Poland	Ukraine
1995	3204	2343	575	299
1996	3289	2241	589	273
1997	3291	2318	563	276
1998	3763	2041	614	248
1999	3642	1957	565	234
2000	3823	2221	563	267
2001	3837	2846	590	286
2002	3718	2934	597	294
2003	3900	2705	599	269
2004	4473	3339	660	323
2005	4088	3360	630	326
2006	4105	3725	593	329
2007	4579	3547	665	299
2008	4784	4694	677	378
2009	5216	4634	704	361
2010	5091	4612	711	346
2011	5177	5204	703	428
2012	5480	4745	739	402
2013	5845	5230	757	453
2014	6510	6113	821	458
Change (1995-1999/2010-2014), (1995-1999=100)	163	238	128	157
CAGR (%)	3.3	5.8	1.7	2.9

Source: own elaboration based on FAO and State Statistics Service of Ukraine data.

Labour productivity in Ukrainian agriculture grew at a rate of 5.8% per annum, and in Poland it was only 3.3% per annum. It should be emphasized that labour productivity in agriculture in Poland is still significantly lower than that observed in more developed EU countries (Wicki 2012). Similar differences were observed in the rate of increase in land productivity. In Polish agriculture, an average annual growth of 1.7% was observed in the analysed period, and in Ukraine it was 2.9% per annum.

The amount and efficiency of production in agriculture

The amount of agricultural production depends both on the sown area of individual plants and the number of animals, as well as on productivity. While the production area is stable under normal conditions, performance changes can have a significant effect on production. Table 2 shows the production area and population of selected groups of plants and animals. The size of production in Ukrainian agriculture is much higher than in Poland. The decrease in cereal and potato production and the increase in the production area of oilseeds is evident in both countries. It is also worth noting the strong growth of poultry production in Ukraine with a strong, over 30% decline in cattle and pigs. In Poland, changes in production volumes were much lower, which proves a more stable situation in agriculture and its environment.

Table 2. Area of main crops and livestock population in Poland and Ukraine

Year	Cereals		Potato		Sugar beet		Rape		Sunflower		Cattle		Poultry		Pigs	
	PL	UA	PL	UA	PL	UA	PL	UA	PL	UA	PL	UA	PL	UA	PL	UA
	in million hectares										in million heads					
1995	8.6	12.9	1.5	1.5	0.4	1.4	0.6	0.0	0.0	2.0	7.3	20.4	53.6	157.0	20.4	13.9
1996	8.7	11.7	1.3	1.5	0.5	1.3	0.3	0.0	0.0	2.0	7.1	18.0	51.7	143.0	18.0	13.1
1997	8.9	13.8	1.3	1.6	0.4	1.0	0.3	0.0	0.0	2.0	7.3	18.1	56.3	145.0	18.1	11.2
1998	8.8	12.2	1.3	1.5	0.4	0.9	0.5	0.1	0.0	2.4	7.0	19.2	54.7	138.0	19.2	9.5
1999	8.7	12.0	1.3	1.6	0.4	0.9	0.5	0.2	0.0	2.8	6.6	18.5	54.3	129.0	18.5	10.1
2000	8.8	12.2	1.3	1.6	0.3	0.7	0.4	0.2	0.0	2.8	6.1	17.1	54.6	139.0	17.1	10.1
2001	8.8	14.3	1.2	1.6	0.3	0.9	0.4	0.1	0.0	2.4	5.7	17.1	53.3	123.7	17.1	7.7
2002	8.3	13.8	0.8	1.6	0.3	0.8	0.4	0.1	0.0	2.7	5.5	18.7	55.6	136.8	18.7	8.4
2003	8.2	10.6	0.8	1.6	0.3	0.7	0.4	0.1	0.0	3.8	5.5	18.6	173.9	146.9	18.6	9.2
2004	8.4	14.4	0.7	1.6	0.3	0.7	0.5	0.1	0.0	3.4	5.4	17.0	167.6	141.9	17.0	7.3
2005	8.3	14.2	0.6	1.5	0.3	0.6	0.6	0.2	0.0	3.7	5.5	18.1	152.8	152.1	18.1	6.5
2006	8.4	13.8	0.6	1.5	0.3	0.8	0.6	0.4	0.0	3.9	5.6	18.9	141.6	161.5	18.9	7.1
2007	8.4	13.1	0.5	1.5	0.2	0.6	0.8	0.8	0.0	3.4	5.7	18.1	150.5	166.2	18.1	8.1
2008	8.6	15.1	0.5	1.4	0.2	0.4	0.8	1.4	0.0	4.3	5.8	15.4	145.3	168.8	15.4	7.0
2009	8.5	15.1	0.5	1.4	0.2	0.3	0.8	1.0	0.0	4.2	5.7	14.3	140.6	176.5	14.3	6.5
2010	7.9	14.2	0.5	1.4	0.2	0.5	0.9	0.9	0.0	4.5	5.7	14.9	131.9	190.1	14.9	7.6
2011	7.7	15.0	0.4	1.4	0.2	0.5	0.8	0.8	0.0	4.7	5.8	13.5	143.3	202.5	13.5	8.0
2012	7.6	14.5	0.4	1.4	0.2	0.4	0.7	0.5	0.0	5.1	5.8	11.6	130.0	199.8	11.6	7.4
2013	7.5	15.5	0.3	1.4	0.2	0.3	0.9	1.0	0.0	5.1	5.9	11.2	140.4	213.2	11.2	7.6
2014	7.5	14.4	0.3	1.3	0.2	0.3	1.0	0.9	0.0	5.2	5.9	11.7	146.6	229.0	11.7	7.9
Change*	87	118	28	91	48	36	197	1017	-	219	82	67	-	145	67	66
CAGR (%)	-0.8	1.1	-8.7	-0.8	-4.7	-7.1	5.1	19.2	-	5.3	-1.1	-2.6	-	2.5	-2.5	-2.8

* - change between 1995-1999 and 2010-2014, (1995-2000=100), "-" no data or indicator cannot be calculated because of differences in time data collection method

Source: own elaboration based on FAO and State Statistics Service of Ukraine data.

In the analysed period, an increase in productivity in plant and animal production was observed in both countries. The level of productivity in Poland is still higher than in Ukraine, despite the average worse conditions for production, but yields have already been obtained in the production of cereals and rape (tab. 3). The dynamics of cereal yield increase in Poland amounted to 1.6% per year, and in Ukraine 3.2% per year. Similar growth dynamics was obtained for other plant species and in the case of milk yield of cows (fig. 5). Productivity in Ukrainian agriculture grew much faster than Polish. This is another proof of the high potential of Ukrainian agriculture, which has not been and is still not fully used.

Table 3. Yields in agriculture in Poland and Ukraine

Item	Poland		Ukraine	
	average in 1995-1999	average in 2010-2014	average in 1995-1999	average in 2010-2014
Cereals (dt/ha)	30	37	22	36
Potato (dt/ha)	177	223	101	160
Sugar beet (dt/ha)	367	580	179	386
Rape (dt/ha)	20	27	9	21
Milk yield per cow (litres)	3594	5211	2186	4315

Source: own elaboration based on FAO data.

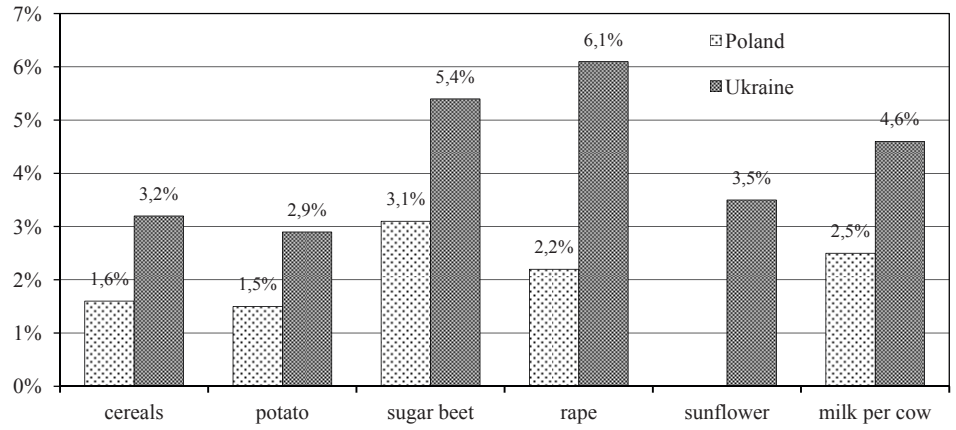

Fig. 5. Average annual growth rate of yields in Polish and Ukrainian agriculture in period 1995–2014

Source: own elaboration based on FAO data.

Changes in the area of plant cultivation and animal population as well as the increase in unit productivity result in changes in the production volume. Despite increasing productivity, production of some agricultural raw materials decreased. Cereal and oil crops increased and production of potatoes and sugar beet decreased. A significant increase was observed in cereal production in Ukraine, which almost doubled from 30 to over 60 million tonnes per year. In Poland, cereal crops increased by 10%. Beet harvest decreased by over 20%, rapeseed harvest increased significantly. n Poland, it was a 150% increase and in

Ukraine it was multiple (tab. 4). In animal production, the changes were slightly smaller. Milk production in Ukraine even decreased, and in the production of meat there was a change in the internal structure of production - pork production decreased and poultry production increased. It is worth noting that in the analysed period there was no increase in animal production in Ukraine, with the exception of poultry production, which developed in large industrial farms. Production of cereals, potatoes and oil increased in crop production. No such large changes were observed in Poland, but the production of oilseeds and poultry meat increased. It can be assumed that with the development of agriculture in Ukraine, animal production will be increased, which can be done based on feed from domestic production.

Table 4. Changes in production of main agricultural commodities in Poland and Ukraine (million tons)

Commodity	Poland		Ukraine	
	average in 1995-1999	average in 2010-2014	average in 1995-1999	average in 2010-2014
	milion tons			
Cereals	25.9	28.4	28.0	53.3
Potato	23.8	8.2	15.6	22.4
Sugar beet	15.0	11.7	20.0	15.5
Rape	0.9	2.4	0.1	1.7
Sunflower	-	-	2.5	9.0
Beef	0.4	0.4	0.9	0.4
Pork	2.0	1.9	0.7	0.7
Poultry	0.5	1.5	0.2	1.1
Milk	12.1	12.6	14.6	11.0

Source: own elaboration based on FAO data.

Foreign trade in food products

The products of agriculture and the food industry constitute a significant share in the foreign trade turnover both in Poland and in Ukraine. Exports of grocery products from Poland reached about USD 26 billion, and the positive balance amounted to about USD 8 billion (fig. 6). The share of agricultural and grocery products in exports in recent years amounted to 11-13%. Exports of agricultural and food products from Ukraine was increasing and reached USD 17 billion, with imports of around USD 7 billion. The positive trade balance in agricultural products was therefore even USD 10 billion. Export of agricultural products from Ukraine constitutes up to 40% of the total export. Cereals and vegetable oils have the largest share - as much as 65%. With the development of agri-food processing, it will be possible to increase the share of highly processed products in exports and increase its profitability.

Considering the importance of exporting agri-food products in Ukraine's exports, it should be noted that it is much higher than the share of agribusiness in the economy, which is ca. 16%, and also higher than the share of employment in this sector (17%). The value of

Ukrainian foreign trade in agri-food products may grow with the further development of agriculture and agribusiness in this country unless new trade barriers emerge. The increase in the share of agri-food products in foreign trade turnover has not been recorded since 2013 despite the increase in turnover in nominal terms. Considering the stable level of production in agriculture, it can be assumed that there will be no further increase in the importance of agribusiness in Polish foreign trade. In Ukraine, the level of saturation in the development of foreign trade in agri-food products has not yet been achieved.

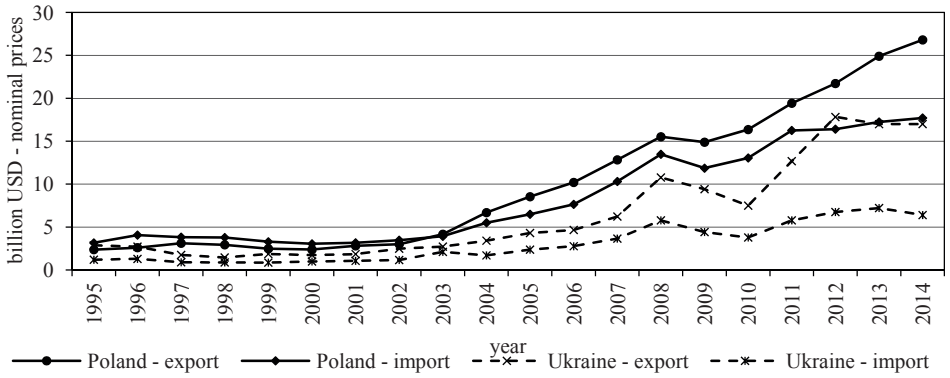

Fig. 6. Foreign trade in agri-food products in Poland and Ukraine in period 1995–2014

Source: own elaboration based on FAO data.

Conclusions

1. Agriculture in Ukraine has a high share in the creation of gross domestic product. Its development may contribute to the development of the entire economy and to achieving a higher standard of living. There are significant limitations in this respect. The most important ones include: lack of regulation of land ownership, limited access to capital for agricultural development, as well as insufficient preparation of domestic programs for the development of agriculture and rural areas. Strengths include high land provision, the opportunity to obtain surplus food relative to domestic consumption, as well as low production costs.
2. An important factor for the growth of the agribusiness sector is the legislative and financial support for the development of the agricultural environment, such as production and distribution infrastructure. At present, only large agro-holdings have a sufficiently vertically integrated system covering production, processing and distribution. Farms need support to develop this type of integration on an arm's length basis.
3. In Ukrainian agriculture, similar productivity was achieved as in Polish agriculture, but land productivity is twice lower there. An opportunity for further, rapid increase in labour productivity is a high concentration of land in farms in Ukraine, and for increasing land productivity - an increase in production intensity.

4. In the years 1995-2014, an increase in productivity in plant and animal production was observed in Ukraine. The development gap in this respect in relation to Polish agriculture concerns the production of rapeseed, sugar beet, potatoes and milk production. The time gap is about 10 years.
5. In Ukrainian agriculture, there was a faster growth in crop production than in Poland. This resulted both from the lower reference base and the greater potential associated with good natural conditions for production development. It should be assumed that in the Ukrainian agriculture it is possible to obtain higher yield in crop production than in Poland in the perspective of 10-15 years.
6. The production of basic agricultural raw materials in Ukraine: cereals and oilseeds, exceeds domestic demand. This is the basis for the development of export of agricultural products. The share of agricultural exports in total Ukrainian exports is as much as 40%. There is also a USD 10 billion trade surplus observed. With the development of animal production, the profitability of production exports may increase.
7. Ukraine is a major producer and exporter of agri-food products in the world and can benefit from favourable natural conditions to increase the production of grocery raw materials, food with high added value. There is a rapid increase in productivity and production in agriculture. In the period of 10-15 years, it is possible to achieve the level of efficiency observed in other countries of Central and Eastern Europe.
8. The success in further development of agribusiness in Ukraine depends to a large extent on the introduction of nationwide programs for the development and support of agriculture and rural areas. The unstable economic and political situation in Ukraine observed for several years and the related deficiencies in making pro-development regulations and in accessing capital is one of the main factors limiting the development of the sector.

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Vegetables Price Volatility in Poland – Onion and Carrot Case

Abstract. There are the producers who takes the weakest position on the agricultural market. Their activity is especially exposed to the risk factors. Price volatility which stays behind the price risk is one of the most important threats for producers' incomes. Economic stability is a base for investment and development. That is why the price volatility is worth to having a look at. There are two species examined in this paper: onion and carrot. Both have a significant share in Polish vegetable production. Onion crops are mostly exported but carrot is being sold on the domestic market. Apart from the sales market there was no significant difference in analyzed period between farm-gate price volatility for both species. The measured volatility was getting lower in consecutive years of analyzed period; only in years of unfavorable weather conditions there were some growth. The analyze was conducted with usage of descriptive statistic on the logarithmic rates of return.

Key words: price volatility, seasonal fluctuations, standard deviation, producer export price, onion, carrot

JEL Classification: Q11, Q13, Q14, Q17

Introduction

Agricultural production belongs to the industry branches especially exposed to the risk factors. Alongside by inner risk factors, that are able to be controlled, there is a group of external factors which stays out of control or estimation. The ongoing globalization process has strengthened linkages and dependencies between the national markets. Nowadays the problems, which emerge in other, often distant countries, may be reflected on Polish domestic market; so the prices that purchases producer for vegetable depend on the other markets situation like never before. What else influences on the price level, that producer receive for vegetable, is the situation on other related markets. For example high prices of leeks cause their substitution by onion (f. e. in soup mixtures).

The information that is important for a production management concerns, most of all, relative prices (what means that commodity prices are comparable with the others) (Friedman, 1994). The vegetable producers have to make their decisions in relation to current prices. But the problem is, they don't know the future market circumstances, when the production process will end. The prices reveal their work by encouraging farmers to increase production volume, when become higher, and equally to backtrack on those species, which make a loss because of an unsatisfied price. Can one really contemporary observe an escalation of this unfavorable phenomenon of increasing price volatility on the vegetable market in Poland? When the seasonal price changes are well known and surprises no one, than the unexpected changes have negative influence on the income situation of Polish producers, and other market players, as well. The higher is the price volatility, the

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higher are costs of price risk management (as higher insurance costs, deposit security in forward transactions, and so on). Higher costs of risk management result in growth of production costs, and similarly higher food prices (Figiel, 2012). That is why this problem is worth to be analyzed.

The main goal set in this paper was to evaluate if the price volatility for farm-gate vegetable prices grows, in terms of trade liberalization. There were two species compared and characterized by different ways of usage. First of them – onion - is mostly exported, the second – carrot – is mostly consumed on the domestic market. Consequently the farm gate onion prices should be characterized by higher influence of external factors, which reflect in growth of unanticipated price volatility. The carrot price should be more stable since there is less number of factors – mostly domestic, which influence on its value.

Literature overview

The price system is one of the best ways to connect sellers and buyers with each other. This mechanism does not even require any personal contact between them, as Milton Friedman noticed. Prices which derive from free trade are able to coordinate actions of many people, who care only for their own business; it is also the main reason of growing wealth of each of the market players. The price mechanism works so good and efficiently, that we often do not think of it (Friedman, 1994). What is important for a proper work of this mechanism is a free market. In such environment, the prices act in three directions: as a data medium, as a tool for income distribution, and finally prices lead towards the cheapest production method. All these three functions are closely related (Friedman, 1994). Unfortunately the pure price mechanism seems not to work properly under the horticulture market conditions.

In food sector the economic power of various market players groups is different. There are farmers who are the weakest ones; each of them represents small supply, and what is worse, often act separately (Rembisz, 2007). Furthermore, horticultural production is highly vulnerable to weather conditions, which stay mostly out of control. That is one of the reasons why farmers' incomes in Poland are unstable and lower than in non-agricultural sectors. This problem is widely analyzed by many scientists (Czyżewski, Poczta, Rembisz). As a solution which makes disparities between incomes level lower, the national support instruments are advised. It disturbs, to a certain extent, in the work of price mechanism, but is meaningful; it facilitates to equal income levels (it has many other advantages, but being beyond this paper scope). In other words, it is a cost of sustain farmers' incomes on the social acceptable level, but also weakens the efficiency of farming.

Weak crops result in prices spike; outstanding crops cause the prices drop. By a low demand flexibility the move of supply curve may result in high price volatility, while sales volume remains constant (as for the equilibrium state). Hamulczuk and the others (2016) noticed that the main food price change factor, in short periods, is supply determinant. Regarding the fact that increase of food consumption is limited, the demand for vegetables is in the long period inelastic. The price volatility of demand is, however, able to growth mainly due to substitution possibility (Hamulczuk, 2016). In short periods the supply of vegetables is possible not to be flexible. It results from the fact that there is no possibility to gain production volume after it has started. In terms of relatively inflexible food demand even a slight change in the supply curve results in significant change of equilibrium price.

At the same time growth of need for vegetables (food) is inelastic (Hamulczuk, 2016). Different flexibility in supply and demand on the horticulture market results in discrepancies in parameters in market game is known as cobweb effect; it leads to slump on the horticulture market (Rembisz, 2007). In general increasing price volatility translates into greater price risk exposure (Figiel, 2012). It reveals by the uncertainty as for the income and the economic situation general. This influences market decisions, investments, and operational costs of units from whole agricultural sector. Higher price volatility boosts price risk management costs for example higher insurance contributions, higher deposit security in futures contracts (Figiel, 2012). That is why the knowledge of methods of measurement and analyze of price volatility and related price risk gain on importance.

What is also important is the fact, that the vegetable sector in Poland, in comparison with fruit sector, is by a long run more fragmented. The horizontal cooperation between producers is weak. That is one of the reasons why producers are more vulnerable to negative market changes (Nosecka, 2017). It is the organization ratio what, beside of the market parameters interactions, is crucial for proficient function of the horticulture sector (Rembisz, 2007).

Data and methods

Farm-gate prices are an outcome of several factors. One of them – trend-cycle is an relatively constant value. The second – seasonal fluctuations - are well known already. All the market players expect some variability as price drop when supply rises, and price increases in terms of higher demand. What also shapes the price value is its volatility. The volatility is unable to be calculated, but still it can be assessed. The higher the volatility is, the more uncertain and risky is the economic environment for producers. Their decisions might be inefficient, as well as management costs gets higher.

For the evaluation of price volatility there were the time series of export prices paid producers for carrot and onion taken. These species were chosen due to their significance in Polish vegetable production. Onion share in the structure of the vegetable production has been varying in 2004-2016 at 14-15% level; a bit higher has been the carrot share – 18-19% (Nosecka, 2017). What differs these two species is their share in the Polish vegetable export. Depending on the year 19-25% onion crops has been exported, but only 2-5% carrot. Greater importance of export in onion crops disposal should result in bigger influence of external factors which can shape prices on Polish domestic market. That is why the onion price volatility is expected to be higher than the carrot one (carrot is mostly sold on inner market).

As a first step all the time series were logarithm, afterward logarithmic rates of return were calculated, according to the equation:

$$r_t = \ln(p_t) - \ln(p_{t-1}).$$

Where r_t is the rate of return and p_t denotes value of price variable in period t. It resulted in trend elimination. For the assessment of the stationarity there was the Augmented Dickey-Fuller (ADF) test used. The ADF test is one that tests for a unit root in a time series sample. By the null hypothesis assumes that a unit root is present in a time series sample. The alternative hypothesis accepts stationarity or trend-stationarity. The

ADF statistic, used in the test, is a negative number. The more negative it is, the stronger the rejection of the hypothesis that there is a unit root at some level of confidence

There was the following model used to verify null hypothesis:

$$\Delta Y_t = \alpha + \delta Y_{t-1} + \gamma_1 Y_{t-1} + \gamma_2 Y_{t-2} + \cdots + \gamma_k Y_{t-k} + \varepsilon_t$$

In case of no basis to reject H_0 the nonstationary is concluded. The whole procedure needs to be repeated then, for the first differences series. Instead of Y_t the ΔY_t is taken, and instead of ΔY_{t-1} second differences. If first differences are stationary (H_0 is rejected) then one can assume that the series is integrated in the first level. Seasonality effect was identified using dummy variables (0,1). Saved residuals were a subject of further analysis with use of descriptive statistic. In this part the assessment of the volatility change was conducted by calculation of an average, median, standard deviation and annualized standard deviation with 52 weeks window length.

Analyzed period covers consecutive weeks of years 2004-2016. The data were gathered in Horticulture Economics Department, Institute of Agricultural and Food Economics - NRI.

The analyze contained in this paper was conducted in order to evaluate the farm-gate price volatility. The scope covered onion and carrot prices. Onion represents high share of export in the crops management, and in case of carrot the domestic demand is in prevalence. The aim of this paper is to answer the question: If the choice of species to be produced may affect further income stabilization.

Results

Before Polish accession to the EU the influence of international trade on vegetable prices was negligible. The prices and their volatility were highly dependable upon crops and domestic demand. The spike of the export share in production disposal has started to rise in the post accession period, since the linkages between Polish and other markets have got tighter (Hamulczuk, 2016).

Price value is an outcome of several components which stay in mutual relations. Some of them are regular and predictable, so also well-known for the market players. It is trend-cycle which shows general direction of the change and can linger at least few years. The second factor, seasonal fluctuations, is related to the production process which in horticulture depends on plant vegetation. Also price seasonal volatility is already well known phenomenon even for producers. It is characterized by shorter, few months lasting periods. Producers can minimalize its action for example by storing crops in cold stores waiting for a satisfying price offer. The final factor which is the most important reason (in this case) of income instability is random fluctuations known as white noise. This factor is unfortunately unpredictable. Random fluctuations reflect among other things the situation in other countries, on other markets, not directly linked with the Polish onion and carrot market. According to global trends of food prices growth there were expectations for noticeable upward trend in price levels of both species. Preliminary analyze of gathered prices does not however confirm this general trend on Polish market.

The very first step in the evaluation if the prices have been changing during analyzed period, was their stationarity assessment. There were two tests: ADF and KPSS used.

Table 1. The results of ADF and KPSS tests

	ADF				KPSS	
	a-1 estimated value	Tau statistic	p value	lag	Critical value	Test value
			level of variable			
onion	-0,041269	-3,44791	0,009458	6	0,348	0,840505
carrot	-0,109036	-6,13234	5,717e-008	2	0,348	1,25995
			first difference of variable			
onion	-1,24083	-14,2593	6,446e-033	6	0,348	0,0302
carrot	-0,12219	-6,4911	6,469e-008	2	0,348	0,0081

Source: own study on the basis of Horticulture Economics Department of Institute of Agricultural and Food Economics – NRI records.

The ADF test did not allow to accept H0 which says that the time series is nonstationary because of unit root occurrence. However KPSS test revealed nonstationary of time series both onion and carrot prices on the 0-variable level (test statistics were higher than critical value). Both tests for the first difference of variables, showed stationarity in both cases (see table 1). By the reason of this fact, further volatility analyze was conducted with the use of price logarithms differences, what let to expurgate the seasonal influence.

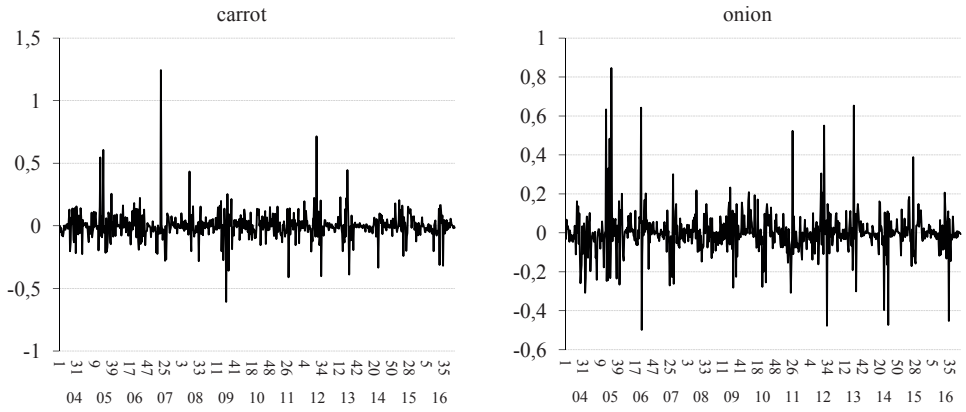

Fig. 1. Price residuals volatility of carrot and onion

Source: own study on the basis of Horticulture Economics Department of Institute of Agricultural and Food Economics – NRI records.

The charts of residuals for both carrot and onion show no trends; on the basis of visual evaluation one can state their randomness. The volatility of onion prices is however higher than carrot, but on the other hand, there is no visible growth of volatility. Due to the fact, that the median value (in tables 2 and 3) is mostly close to zero, one can confirm randomness of residuals. Standard deviation shows concentration of observations value round an average.

Table 2. Descriptive statistics of the stochastic component of logarithmic increments of weekly onion prices

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
average	-0,03	0,01	0,02	-0,01	0,00	0,01	0,01	-0,03	0,01	0,01	-0,01	0,01	-0,01
median	-0,02	0,00	0,02	0,00	0,00	0,00	0,00	-0,01	0,00	0,00	0,00	0,00	0,00
standard deviation	0,12	0,22	0,13	0,09	0,07	0,10	0,10	0,12	0,14	0,13	0,11	0,09	0,11
annualized deviation	0,85	1,62	0,96	0,65	0,52	0,73	0,69	0,86	1,00	0,91	0,81	0,68	0,77

Source: own study.

Table 3. Descriptive statistics of the stochastic component of logarithmic increments of weekly carrot prices

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
average	-0,01	0,01	0,00	0,00	0,00	0,00	0,01	-0,01	0,01	0,00	0,00	0,02	-0,01
median	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
standard deviation	0,09	0,19	0,10	0,22	0,11	0,15	0,07	0,10	0,16	0,13	0,08	0,07	0,08
annualized deviation	0,65	1,34	0,72	1,59	0,77	1,06	0,49	0,71	1,12	0,93	0,59	0,55	0,55

Source: own study.

The analyze of standard deviation in months let to have a closer look at the price volatility. As one could expect the standard deviation of onion prices has more diversified values in comparison with carrot one. It derives from higher influence of external markets where onion is exported. The highest volatility level in onion chart is observed after the Polish accession to the EU. This period was characterized by uncertainty, which came along with a new market circumstances. What may be confusing it was negligible reaction of price volatility in 2008 and 2009, when the global crisis had begun. Standard deviation was varying more in 2011-2013, when onion crops in Poland were weaker. What definitely cannot be observed it is the increase of volatility level of onion price during whole analyzed period.

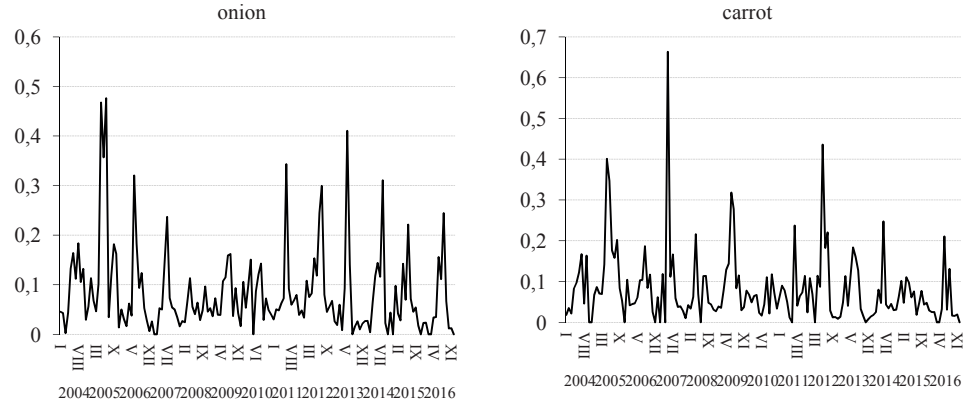

Fig. 2. Moving standard deviation for seasonally adjusted log returns of price series of carrot and onion in Poland (window length – 52 weeks)

Source: own study on the basis of Horticulture Economics Department of Institute of Agricultural and Food Economics – NRI records.

Because of the fact, that the biggest part of carrot production volume is located on the domestic market, unknown factors which influenced on the volatility ratio result more from the weather conditions. The extraordinary gain of standard deviation recorded in 2005 is explained however, just like onion, by structural and political circumstances. The most significant peak of standard deviation value was recorded on the beginning of 2007. It was caused by the lower, due to the drought, crops in 2006. Price volatility in 2006 was stable because of increased import which covered domestic demand. On the beginning of 2007 the cold storages were empty already and the market was waiting for a new crops of 2007. This complex situation made volatility soaring. The drought in 2011 stood for a common situation in 2012.

The common European market is the mature market with properly working economic mechanisms. These mechanisms have positive influence on the price stabilization. There is however, a question of further trade liberalization which can spoil equilibrium.

Summary

On the basis of the conducted analyze one is manage to state some influence of external situation on the onion price volatility. This influence on carrot prices is slightly weaker. For both species price volatility in 2004-2016 was the biggest in the period of Polish accession to the EU, when the market equilibrium which being then in force has been changed. The weather conditions is the most important factor which boosts the price uncertainty. For both onion and carrot one cannot state that price volatility during analyzed period has been increasing. The tighten cooperation between European markets results in drop of price volatility. During three last years of the analyze there was a plunge in the price volatility spotted. The price risk borne by producers gets slightly lower. It is a positive information also for government administration bodies because it means, that currently implemented policy is successful.

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