AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

ANNALS OF THE POLISH ASSOCIATION
OF AGRICULTURAL AND AGRIBUSINESS ECONOMISTS

received: 01.10.2019
acceptance: 27.10.2019
published: 15.12.2019

Annals PAAAE • 2019 • Vol. XXI • No. (4)

JEL codes: Q12

DOI: 10.5604/01.3001.0013.5484

JOANNA KISIELIŃSKA

Warsaw University of Life Sciences – SGGW, Poland

CONCENTRATION OF PRODUCTION FACTORS AND SUPPORT AND THEIR PRODUCTIVITY IN EU FARMS

Key words: concentration and productivity, production factors, EU farms, FADN database, CAP

ABSTRACT. The aim of the study was to assess the level of concentration of production factors and support in classes of farms distinguished by economic size. The Gini coefficient was used to assess the level of concentration. Moreover, using the Pearson correlation coefficient, the strength of the relationship between the concentration of production and support factors and their productivity was assessed. The research objects were commercial farms from EU countries. The research shows that the level of concentration of all production and support factors on EU farms is increasing, although this conclusion does not apply to all countries. In countries where the concentration of capital and labor is higher, productivity is usually higher. In turn, a higher concentration of agricultural area and support is usually accompanied by lower productivity. The article draws attention to the limited possibilities for applying statistical tests when using FADN data. The FADN database is a sample of farms obtained as a result of stratified drawing, with layers being countries. If the subject of study are countries, one cannot speak of a sample but of the entire population. Formulating statistical hypotheses regarding the population of countries (or the situation of farms in these countries) is pointless in such a case.

INTRODUCTION

As observed by Andrzej Czyżewski [2015, p. 13], concentration, specialization and technical progress can be seen as sources of competitive ability of agriculture. It should be remembered that in surroundings of agriculture, concentration processes increase, deteriorating the market position of a farmer [Czyżewski 2015, p. 14]. Wojciech Ziętara [2014, p. 164] links the increase in concentration and specialization of Polish farms with the integration of Poland with the EU, noting that this mainly applies to large-scale production farms. On the other hand, the introduction of direct payments has caused some farmers to maintain farms only to receive such payments [Ziętara 2014, p. 164, Kacprzak 2014, p. 441], and this phenomenon inhibits concentration processes. The following questions can be posed – in what direction is agriculture in the EU going? Will it be conventional (centralized) or alternative (decentralized)[1] farming or perhaps a combination of both models?

[1] Andrzej Czyżewski [2015, p. 17, 18] compares conventional and alternative farming using a range of characteristics.

The research presented in the article aims to assess the level of concentration[2] of production factors on farms in EU countries. Due to the important role of support from EU funds on the situation of these farms, it was also included in the study. An attempt was also made to answer the question of whether there is a relationship between the concentration of factors of production and support and their productivity. For years 2004 and 2016, measures of concentration were determined for individual countries, which allowed to determine the direction of its changes. Productivity was determined for 2016, and a correlation coefficient was used to assess their relationship with concentration. The scope of research was limited to commercial farms. According to FADN methodology, they include farms with a standard production value of over EUR 4,000[3] in Poland. Commercial farms in Poland account for about half of all farms but generate most of agricultural production [among others, Kisielińska 2019, p. 38]. This is considered similar in other countries.

REMARKS ON THE POSSIBILITY OF USING STATISTICAL TESTS WHEN USING THE FADN DATABASE

In 2016, there were 4,672,880 commercial farms from EU countries in the FADN observation field. Separately for each country, from the population of commercial farms a sample was drawn, which included a total of 86,235 farms. The number of farms in the sample in 2016 from individual countries are found in the Institute of Agricultural Economics and Food Economy [IERiGŻ-PIB 2017, p. 12]. It should be noted that the FADN database is a sample obtained using stratified sampling. Farms were drawn for all countries, separately for each one. This has significant repercussions when it comes to the need and possibility of applying statistical tests. Statistical tests are only worth conducting if all EU commercial farms or all commercial farms from a given country are treated as the population. The verification of the statistical hypotheses regarding these populations is usually only possible on the basis of individual data, whereas only arithmetical averages are provided for in the FADN database. If the examined population are EU countries, then the formulation of statistical hypotheses is inappropriate – there is no sample but the population in 2016 including 28 countries (there are many examples in literature of the use of statistical tests in such cases, especially tests regarding the significance of the correlation coefficient). The data contained in the FADN database are the values of specific features characterizing farms from individual countries. However, it should be noted that the data provided are averages calculated for the sample of farms, and not the entire population. Therefore, the use of this data requires the assumption that the sample is large and representative[4], and the averages calculated only differ slightly from those calculated for the entire population.

---

[2] The research concerns concentration understood as an uneven division of the phenomenon in the collectivity [Sobczak 2007, p. 60].

[3] The method of setting down standard production (SO) is presented, among others, by [Goraj and others 2012].

[4] The team that develops standard results ensures that the sample is representative e.g. in the Institute of Agricultural Economics and Food Economy [IERiGŻ-PIB 2017, p. 10].

MATERIAL AND RESEARCH METHODS

The concentration of production and support factors was studied in classes of farms distinguished by economic size using the ES6 classification (division into six classes, a description of which can be found in the Institute of Agricultural Economics and Food Economy [IERiGŻ-PIB 2017, p. 17]). The Gini concentration coefficient (in the version for grouped data, based on the Lorenz curve) was used to measure the level of concentration, understood as an uneven division of phenomenon in the collectivity. This indicator can be calculated according to the formula:

$$G = 1 - \frac{CZ_1^{śr} \cdot n_1^2 + \sum_{i=2}^{k} \left[n_i \cdot \left(CZ_i^{śr} \cdot n_i + 2 * \sum_{j=1}^{i-1} CZ_j^{śr} \cdot n_j \right) \right]}{\sum_{i=1}^{k} \left(CZ_i^{śr} \cdot n_i \right) \cdot \sum_{i=1}^{k} n_i}$$

where: k – number of classes (in the case of ES6 k = 6), n_i – number of farms in the i-th class (in the case of FADN data it can be assumed that this is the number of farms represented in a given class [SYS02]), $CZ_i^{śr}$ – average level of the production factor on the farm belonging to the i-th class.

The Gini coefficient is the most commonly used measure in the study of concentration of various phenomena, which has its justification in a very clear interpretation – especially in the version for grouped data. The Gini coefficient assumes values in the range of [0,1]. The value of 0 means uniform distribution (no concentration), while 1 represents total concentration. The following assessments of the degree of concentration were adopted: (0; 0.2) – very poor, [0.2; 0.4) –weak, [0.4; 0.6) – moderate, [0.6; 0.8) – strong, [0.8; 1) – very strong.

Pearson's correlation coefficient was used to study the relationship between concentration and productivity of factors of production. If the coefficient is calculated on the basis of data from the entire population, there is no need to verify hypotheses about its significance[5], and the distribution of the examined features is also irrelevant. The assessment of the strength of the relationship was made according to limits given by Aleksander Zeliaś [2000, p. 80] at levels of 0.2; 0.4; 0.7 and 0.9.

Table 1 presents the features from the FADN database used in the study, the variables calculated on their basis characterizing the resources of production and support factors and their productivity.

[5] As is done by e.g. Agnieszka Baer-Nawrocka and Natalia Markiewicz [2013 p. 13], where the entire population of EU member states is studied.

Table 1. Features from the FADN database used in research and variables characterizing the resources of production and support factors, and their productivity

Characteristics from the FADN database	Variables
Farms represented [SYS02] Total labor input in AWU [SE010] Total utilized agricultural area in ha [SE025] Total output in EUR [SE131] Subsidies on investment in EURO [SE406] Total assets in EUR [SE436] Total subsidies – excluding on investments in EUR [SE605]	Agricultural area resources in ha [SE025·SYS02] Labor resources at AWU [SE010·SYS02] Capital resources in EUR [SE436·SYS02] Support resources in EUR [(SE406+SE600) · SYS02] Agricultural area productivity in EUR/ha [SE131/SE025] Labor productivity EURO/AWU [SE131/SE010] Capital productivity [SE131/SE436] Support productivity [SE131/(SE406+SE600)]

Source: own study

RESULTS OF RESEARCH

Table 2 presents concentration indicators of agricultural area, labor, capital and support in 2004 and 2016 as well as their productivity in 2016 in six classes of farms from EU countries according to economic size.

AGRICULTURAL AREA CONCENTRATION

The degree of land concentration in the classes of European farm in 2004 and 2016 was moderate, but in the period under review, a 0.09 increase in the Gini coefficient could be observed. The largest concentration of land occurs in post-communist countries, which is a consequence of post-war, forced collectivization of agriculture. According to conventionally accepted assessments, in the year 2016, the following groups of countries could be distinguished by degree of land concentration:

– very strong: Bulgaria,
– strong: the Czech Republic, Hungary, Estonia, Romania,
– moderate: Latvia, Slovakia, Lithuania, Cyprus, Croatia, Portugal, Denmark, Poland, Germany,
– weak: Italy, Sweden, Greece, Spain, Slovenia, Austria, Finland, Ireland, the United Kingdom, Luxembourg,
– very weak: France, Malta, Holland and Belgium.

Over the course of twelve years – from 2004 to 2016, agricultural area concentration increased in 19 countries and decreased only in 6.

Land concentration on EU farms is a fact [Agricultural Atlas 2019, p. 22, Majchrzak 2014, p. 228], but there appears some doubt as to how to assess this state of affairs. The consequence of land concentration is certainly to boost the economic strength of some farms and eliminate other, usually weaker ones. The strengthening of parts of farms gives hope for becoming independent from external subsidies, but on the other hand, a variety of entities operating in agriculture increases food security.

Table 2. Coefficients of concentration of production factors and support and their productivity

Countries	Agricultural area			Labor			Capital			Support		
	WG 04	WG 16	PZ 16	WG 04	WG 16	PP 16	WG 04	WG 16	PK 16	WG 04	WG 16	PW 16
Austria	0.16	0.27	2,753	0.10	0.14	50,461	0.13	0.18	0.17	0.11	0.20	4.3
Belgium	0.13	0.10	4,999	0.14	0.21	124,143	0.20	0.26	0.28	0.8	0.12	9.8
Bulgaria	-	0.85	959	-	0.35	16,629	-	0.76	0.43	-	0.77	3.9
Croatia	-	0.46	1,508	-	0.12	16,059	-	0.18	0.15	-	0.46	4.5
Cyprus	0.44	0.47	3,208	0.27	0.19	25,455	0.38	0.26	0.24	0.44	0.43	7.3
Czech Rep.	0.69	0.69	1,502	0.72	0.63	54,897	0.70	0.68	0.44	0.70	0.71	3.4
Denmark	0.36	0.42	3,951	0.39	0.40	221,385	0.37	0.40	0.16	0.35	0.42	10.9
Estonia	0.53	0.67	809	0.48	0.47	55,092	0.61	0.68	0.35	0.61	0.65	4.4
Finland	0.12	0.23	1,750	0.28	0.39	82,841	0.24	0.33	0.22	0.26	0.37	2.1
France	0.13	0.18	2,171	0.19	0.19	92,879	0.22	0.25	0.43	0.13	0.14	6.3
Germany	0.41	0.40	2,819	0.27	0.33	111,776	0.18	0.29	0.27	0.39	0.36	6.9
Greece	0.26	0.37	2,174	0.13	0.23	21,701	0.21	0.19	0.18	0.20	0.36	3.4
Hungary	0.66	0.68	1,593	0.50	0.52	48,625	0.56	0.60	0.38	0.71	0.72	4.5
Ireland	0.26	0.22	1,389	0.15	0.14	58,146	0.33	0.27	0.07	0.23	0.20	3.5
Italy	0.48	0.39	3,368	0.26	0.25	54,583	0.46	0.42	0.14	0.42	0.43	7.9
Lativia	0.41	0.55	850	0.31	0.28	27,499	0.51	0.67	0.36	0.48	0.45	2.8
Lithuania	0.34	0.51	706	0.07	0.16	20,375	0.27	0.52	0.27	0.33	0.43	2.4
Luxemburg	0.17	0.21	2,280	0.10	0.13	106,999	0.12	0.23	0.16	0.16	0.24	3.0
Malta	0.14	0.15	15,759	0.17	0.22	31,632	0.35	0.30	0.22	0.55	0.36	16.0
Netherlands	0.09	0.15	13,524	0.21	0.31	175,235	0.20	0.22	0.21	0.06	0.15	24.5
Poland	0.37	0.41	1,398	0.12	0.16	16,102	0.32	0.37	0.16	0.37	0.40	4.5
Portugal	0.42	0.46	1,403	0.10	0.11	21,006	0.23	0.31	0.32	0.44	0.34	3.9
Romania	-	0.61	1,258	-	0.10	11,123	-	0.31	0.32	-	0.58	5.1
Slovakia	0.57	0.52	1,266	0.64	0.53	54,307	0.68	0.53	0.56	0.50	0.52	4.0
Slovenia	0.28	0.31	2,446	0.09	0.17	19,604	0.22	0.28	0.12	0.38	0.38	3.2
Spain	0.37	0.34	1,705	0.19	0.28	50,454	0.29	0.32	0.23	0.37	0.33	6.8
Sweden	0.32	0.38	2,032	0.24	0.33	141,739	0.30	0.35	0.21	0.30	0.43	5.4
United Kingdom	0.20	0.21	1,529	0.27	0.32	112,864	0.25	0.28	0.12	0.23	0.22	6.2
EU	0.50	0.59	2,094	0.22	0.24	47,893	0.49	0.59	0.21	0.52	0.58	6.0

Symbols: WG04, WG16 – Gini coefficient for the years 2004 and 2016, PZ16, PP16, PK16, PW16 – productivity of agricultural area, labor, capital and support in 2016
Source: own study

According to data in Table 2, the agriculture of the Netherlands and Malta has the highest agricultural area productivity, where agricultural area concentration is very low. Relatively low agricultural area productivity in some countries with a strong and very strong concentration of agricultural area is often due to a low level of development. The correlation coefficient between the Gini coefficient and soil productivity is -0.50 (a moderate relationship). A negative value of the coefficient means that a high concentration of agricultural area is usually accompanied by low productivity. Research presented by Jakub Staniszewski [2016, p. 241][6] also indicates the existence of a negative correlation, although very weak. It should be emphasized that confirmation of the causal relationship between these features would require much wider research. It can be suspected that an increase in concentration will be accompanied by a decrease in agricultural area productivity, which results from the fact that the smaller the farm, the higher the agricultural area productivity is and vice versa. For example Tadeusz Sobczyński [2017, p. 38] estimated the contour line of equipping the farmer with soil and its productivity. The contour line indicates that there is an inversely proportional relationship between these characteristics.

CONCENTRATION OF LABOR

The degree of concentration of labor in classes of farms for all EU countries in 2004 and 2016 was weak – definitely lower than the degree of agricultural area concentration. Over the period considered, the Gini coefficient increased by only 0.02. In 2016, the following groups of countries with varying degrees of concentration of labor can be distinguished:

- strong: the Czech Republic,
- moderate: Slovakia, Hungary, Estonia, Denmark,
- weak: Finland, Bulgaria, Sweden, Germany, Great Britain, Holland, Latvia, Italy, Greece, Malta, Belgium,
- very weak: France, Cyprus, Slovenia, Lithuania, Poland, Ireland, Austria, Luxembourg, Croatia, Portugal, Romania.

From 2004 to 2016, the concentration of labor increased in 17 countries and decreased in 8.

The Gini coefficients show that labor resources are distributed quite evenly in most EU countries. The lack of necessity to concentrate labor resources on farms of various economic sizes is caused by mechanization – very large farms employ relatively few employees.

There is only a slight relationship between the concentration of labor and its productivity (the correlation coefficient is 0.28). The highest labor productivity is in Denmark agriculture – over EUR 200,000 per full-time employee, followed by six developed EU countries (the Netherlands, Sweden, Belgium, Great Britain, Germany and Luxembourg) – over 100,000. The average level of labor productivity, but higher than the average in the Union, is found in the rest of developed countries of Western Europe and four post-communist countries (Estonia, the Czech Republic, Slovakia and Hungary) and Spain. Agriculture in southern Europe and other post-communist countries is characterized by

[6] Jakub Staniszewski created regressive models to study the relationship between the concentration of land and economic and environmental productivity. The conducted statistical analyses may give rise to certain doubts. EU countries are a studied population – therefore, there is no statistical sample – thus, there is no need to conduct statistical tests.

very low labor productivity. Poland is in third place from the end, only ahead of Croatian and Romanian agriculture.

Research presented by Wojciech Józwiak et al. [2018, p. 36] shows that labor productivity on European farms is increasing. The authors emphasize the important role of large farms (100 ha and more) in this process. Włodzimierz Dzun and Wojciech Józwiak point to the dynamic increase in labour productivity along with an increase in the economic size of farms [Dzun, Józwiak 2008, p. 19].

CONCENTRATION OF CAPITAL

The level of concentration of capital for all EU countries is very similar to the concentration of agricultural area. It is moderate in both 2004 and 2016, but an increase of 0.10 indicates a progressive concentration of capital. In 2016, the following groups of countries can be distinguished by level of capital concentration:

– strong: Bulgaria, Estonia, the Czech Republic, Latvia, Hungary,
– moderate: Slovakia, Lithuania, Italy, Denmark,
– weak: Poland, Sweden, Finland, Spain, Romania, Portugal, Malta, Germany, the United Kingdom, Slovenia, Ireland, Cyprus, Belgium, France, Luxembourg, the Netherlands,
– very weak: Greece, Croatia and Austria.

From 2004 to 2016, capital concentration increased in 18 countries and decreased in 7.

The correlation coefficient between the concentration of capital measured by the Gini coefficient and its productivity is 0.65 (moderate relationship). In countries where the concentration of capital is high, high productivity is to be expected and vice versa. Farms from Slovakia, the Czech Republic, Bulgaria, France, Hungary, Latvia and Estonia have the highest capital productivity. With the exception of France and Slovakia, in all these countries, the concentration of capital is clearly higher than the average in Europe. Farms from Ireland, followed by Slovenia, Great Britain, Italy, Croatia, Poland and Denmark have the lowest capital productivity. In all these countries, the concentration of capital is lower than the European average.

The entrepreneur, by way of conducting economic activity, strives to obtain the greatest possible results from owned resources. However, when assessing this effectiveness, the type of business should also be taken into account. For example, whilst comparing efficiency in farms in the EU, it is observed that, in the case of countries where animal production prevails requiring more capital, efficiency does not always increase together with an increase in production capacity – in contrast to plant production, where such effects can be expected [Bear-Nawrocka, Markiewicz 2013, p. 15].

After joining the EU, the equipment of Polish farms with assets increased significantly (e.g. Roman Sass [2017, p. 17]). According to Roman Sass [2017, p. 28] what is worrying is that while the productivity of agricultural area and labor increased in Polish agriculture after joining the EU, the productivity of assets (capital) clearly decreased. Research carried out by Joanna Bereżnicka [2013, p. 98][7] on the financial efficiency of Polish farms

[7] Joanna Bereżnicka in this publication understands capital concentration to be an increase in its value on a farm – as opposed to the publication herein, where it is understood to be a distribution of resources in different farm groups.

has shown that a strong increase in farm capital is usually accompanied by lower rates of return. These phenomena are a cause for concern because they may point to an inappropriate investment strategy. Average total assets per Polish farm 2004 only constituted 25% of the EU average, while in 2016 already 49%. If a smaller area is to be considered, it can be said that Polish farms in terms of equipment have approximately reached the average level for EU countries. As capital productivity on Polish farms is low compared to the EU average (in 2016 it represents 75% of this level), it can be suspected that the organization of production and sale of products was not keeping pace with the increase in farm assets.

CONCENTRATION OF SUPPORT

The degree of concentration of support assessed by the Gini coefficient has a very strong relationship with the concentration of agricultural area, which results from the way of determining the size of support for the farm (the correlation coefficient is 0.93). The concentration level was moderate in both 2004 and 2016. Over the course of 12 years, it increased by 0.06, which indicates a progressive concentration of support in classes. In 2016, the following groups of countries can be distinguished by level of concentration of support:

– strong: Bulgaria, Hungary, the Czech Republic, Estonia,
– moderate: Romania, Slovakia, Croatia, Latvia, Italy, Cyprus, Sweden, Lithuania, Denmark, Poland,
– weak: Slovenia, Finland, Malta, Greece, Germany, Portugal, Spain, Luxembourg, the United Kingdom, Ireland, Austria,
– very weak: the Netherlands, France and Belgium.

Over the course of twelve years – from 2004 to 2016, the concentration of support increased in 16 countries and decreased in 9.

There are opinions voiced in literature that criticize how EU subsidies are allocated. More than 80% of EU subsidies go to 20% of farmers, while only 2% of farms receive 30% of subsidies [Agricultural Atlas 2019, p. 14 and 15, ETO 2018, p. 19]. The authors of the Agricultural Atlas 2019 claim that the subsidies are: "unfair because a large part of them goes to farms with incomes well above the average not only for agriculture but for the entire economy". Joanna Kisielińska [2018, p. 135] calculated the ratio between agricultural income per one full-time employee on the farm and average wages in the economy in 2015. In the case of very large farms (from class K6), in most post-communist countries, these ratios reach tens (which is not observed in Western Europe). It should be emphasized that farmers with a high income from economically strong farms is not a problem but the fact that they mainly come from European taxpayers' money, with incomes much lower than that. It remains to be hoped that the money transferred to this group of farms will serve development, and not only owners getting richer.

The correlation coefficient between support concentration measured by the Gini coefficient and its productivity is -0.34. The relationship between these values is slight, but it is worrying that the strong support of farms in individual countries is usually accompanied by low productivity and vice versa – higher productivity is accompanied by weaker support. Farms from the Netherlands, Malta, Denmark and Belgium have the highest productivity of support. Farms from Italy, Cyprus, Germany, Spain, France and Great Britain also have

a higher productivity of support level than the EU average. Farms in Finland, Lithuania, Latvia and Luxembourg have the lowest productivity of support, lower than half the EU average. In the rest of countries, the level is lower than the EU average, but higher than half the EU average. This group includes almost all post-communist countries as well as Greece, Ireland, Portugal, Austria and Sweden.

CONCLUSIONS

The level of concentration of all factors of production and support on EU farms increased over the period under study. This conclusion does not apply to all countries, but to most of them, including Poland. The concentration of capital and agricultural area increased the most, support slightly less, and work the least. In countries where the concentration of capital and labor was higher, productivity was usually higher. In the case of concentration of agricultural area and support, the opposite was true. Higher concentration was usually accompanied by lower productivity.

European agriculture in most countries is, therefore, moving towards a conventional model. It can be supposed that this is a response to progressive concentration processes in the surroundings of agriculture. The method of allocating EU subsidies, on the one hand, favors the concentration of production factors in economically strong entities that have the means to increase their resources. On the other hand, supporting small and weak farms somewhat inhibits the processes of crowding them out of the market, thus maintaining diversity in European agriculture.

BIBLIOGRAPHY

Atlas Rolny (Agricultural Atlas). 2019. *Dokąd zmierza europejska wspólna polityka rolna* (Where is the common, European agricultural policy heading). Warsaw: Fundacja im. Heinricha Bölla, Instytut na Rzecz Ekorozwoju.

Baer-Nawrocka Agnieszka, Natalia Markiewicz. 2013. Relacje między czynnikami produkcji a efektywność wytwarzania w rolnictwie Unii Europejskiej (The relations between factors of production and the effectiveness of production in EU agriculture). *Journal of Agrobusiness and Rural Development* 3 (39): 5-16.

Bereżnicka Joanna. 2015. Koncentracja kapitału a efektywność finansowa gospodarstw rodzinnych (The concentration of capital and the effectiveness of family farm finanses). *Zagadnienia Ekonomiki Rolnej* 3(344): 88-100.

Czyżewski Andrzej. 2015. Teoriopoznawcze przesłanki rozwoju rolnictwa rodzinnego. [W] *Ekonomiczne mechanizmy wspierania i ochrony rolnictwa rodzinnego w Polsce i innych państwach Unii Europejskiej* (Epistemic conditions of family farm development. [In] Economic mechanisms of support and protection of family agriculture in Poland and other EU countries), ed. Chlebicka Aleksandra, 11-32. Warsaw: Ministerstwo Rolnictwa i Rozwoju Wsi, Fundacja Programów Pomocy dla Rolnictwa FAPA.

Dzun Włodzimierz, Wojciech Józwiak. 2008. Gospodarstwa rolne w Polsce przed i po wejściu do UE. [W] *Dziś i jutro gospodarstw rolnych w krajach Centralnej i Wschodniej Europy* (Agricultural holdings in Poland pre- and post- EU accession. [In] Agricultural holdings today and tomorrow in Central and Eastern European countries), ed. T. Czekaj, Z. Mirkowska, J. Sobierajewska, 10-24. Warsaw: IERiGŻ-PIB.

ETO (Europejski Trybunał Obrachunkowy, Court of Auditors). 2018. *Przyszłość WPR. Dokument analityczny,* https://www.eca.europa.eu/pl/Pages/DocItem.aspx?did=45498, acces: 2019.04.13.

Goraj Lech, Dariusz Osuch, Bocian Monika, Cholewa Izabela, Malanowska Beata. 2012. *Plan wyboru próby gospodarstw rolnych Polskiego FADN od roku obrachunkowego 2013* (Farm sample selection plan of Polish FADN farms from the accounting year 2013). Warsaw: IERiGŻ-PIB.

IERiGŻ-PIB. 2018. *Wyniki Standardowe 2017 uzyskane przez gospodarstwa rolne uczestniczące w Polskim FADN* (Standard results 2017 attained by agricultural holdings participating in Polish FADN). Warsaw: IERiGŻ-PIB.

Józwiak Wojciech, Zofia Mirkowska, Wojciech Ziętara. 2018. Rola dużych gospodarstw rolnych we wzroście produktywności pracy rolnictwa polskiego na tle sytuacji w innych wybranych krajach unii europejskiej (The role of large farms in the increase in labor productivity of Polish agriculture against the background of the situation in other selected countries of the European Union). *Roczniki Naukowe Ekonomii Rolnictwa i Rozwoju Obszarów Wiejskich* 105 (1): 32-46.

Kacprzak Ewa. 2014. Analiza zmian dochodów gospodarstw rolnych oraz stopnia ich powiązania z rynkiem rolnym w latach 2002-2010. [W] *Zróżnicowanie przestrzenne rolnictwa. Powszechny spis rolny* (Analysis of changes in farm incomes and the degree of their links with the agricultural market in the years 2002-2010. [In] Spatial diversity of agriculture. National agricultural census). Warsaw: GUS.

Kisielińska Joanna. 2018. Dochody z gospodarstwa rolnego a wynagrodzenia z pracy najemnej w krajach UE (Farm income and wages from paid employment in EU countries). *Zeszyty Naukowe SGGW w Warszawie. Problemy Rolnictwa Światowego* 18 (2): 130-139.

Kisielińska Joanna. 2019. The level of investment in farms in EU countries. *Acta Scientiarum Polonorum. Oeconomia* 18 (2): 37-48.

Majchrzak Adam. 2014. Ewolucja Wspólnej Polityki Rolnej a zmiany zasobów i struktury ziemi rolniczej w państwach Unii Europejskiej (The Evolution of the Common Agricultural Policy and changes in the resources and structure of farm land in EU countries). Dissertation. Poznań University of Economics.

Sass Roman. 2017. Wpływ kierunku i skali inwestowania na efektywność i konkurencyjność gospodarstw w województwie kujawsko-pomorskim. Ocena ćwierćwiecza wspierania modernizacji gospodarstw w regionie (The influence of the direction and scale of investment on the effectiveness and competitiveness of farms in the Kujawsko-pomorskie Province. A 25-year assessment of modernization support in the region). Miników: Kujawsko-Pomorski Ośrodek Doradztwa Rolniczego w Minkowie.

Sobczyk Mieczysław. 2007. *Statystyka* (Statistics). Warsaw: PWN.

Sobczyński Tadeusz. 2017. Działania dostosowawcze gospodarstw rolniczych w województwie kujawsko-pomorskim na tle Polski i Unii Europejskiej (Adaptive undertakings of agricultural holdings in the Kujawsko-pomorskie Province in the context of Poland and the EU). Miników: Kujawsko-Pomorski Ośrodek Doradztwa Rolniczego w Minkowie.

Staniszewski Jakub. 2016. Zrównoważona intensyfikacja rolnictwa w państwach unii europejskiej o zróżnicowanej strukturze agrarnej (Balanced intensification of agriculture in EU countries with a differentiated agrarian structure). *Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu* XVIII (5): 238-243.

Ziętara Wojciech. 2014. Koncentracja i specjalizacja gospodarstw rolniczych w procesie integracji z Unią Europejską (The concentration and specialisation of agricultural holdings in the process of integration with the EU). *Zeszyty Naukowe SGGW w Warszawie. Problemy Rolnictwa Światowego* 14 (1): 157-169.

Zeliaś Aleksander. 2000. *Metody statystyczne* (Statistical methods). Warsaw: PWE.

***

KONCENTRACJA CZYNNIKÓW PRODUKCJI I WSPARCIA A ICH PRODUKTYWNOŚĆ W GOSPODARSTWACH ROLNICZYCH KRAJÓW UNII EUROPEJSKIEJ

Słowa kluczowe: koncentracja i produktywność, czynniki produkcji, gospodarstwa rolnicze UE, baza danych FADN, WPR

ABSTRAKT

Celem badań była ocena poziomu koncentracji czynników produkcji oraz wsparcia w klasach gospodarstw rolniczych wyróżnionych według wielkości ekonomicznej. Do oceny poziomu koncentracji wykorzystano współczynnik Giniego. Dokonano ponadto oceny siły związku pomiędzy koncentracją czynników produkcji i wsparcia a ich produktywnością, wykorzystując współczynnik korelacji Pearsona. Obiektem badawczym były gospodarstwa towarowe z krajów członkowskich UE. Z badań wynika, że poziom koncentracji wszystkich czynników produkcji i wsparcia w gospodarstwach UE zwiększał się, choć wniosek ten nie dotyczył wszystkich krajów. W krajach, gdzie większa jest koncentracja kapitału i pracy, większa jest także zwykle ich produktywność. W przypadku koncentracji ziemi i wsparcia jest odwrotnie. Wyższej koncentracji towarzyszy zwykle niższa produktywność. Zwrócono uwagę na ograniczone możliwości w zakresie stosowania testów statystycznych, w przypadku wykorzystywania danych zawartych w bazie FADN. Baza danych FADN jest próbą obejmującą gospodarstwa rolnicze, uzyskaną w wyniku losowania warstwowego, przy czym warstwami są państwa. Jeśli przedmiotem badań są państwa, to nie można mówić o próbie, lecz o całej populacji. Formułowanie hipotez statystycznych dotyczących populacji państw (czy sytuacji gospodarstw w tych państwach) nie ma w tym przypadku sensu.

AUTHOR

JOANNA KISIELIŃSKA, DR HAB.
ORCID: 0000-0003-3289-1525
Warsaw University of Life Sciences – SGGW, Poland
Institute of Economics and Finance
Department of Econometrics and Statistics
166 Nowoursynowska St., 02-787 Warsaw, Poland