

**BARBARA KUTKOWSKA, TOMASZ SZUK**

Wrocław University of Environmental and Life Sciences, Poland

## **COMPETITIVENESS ON THE GLOBAL CEREAL MARKET**

Key words: global market, cereals, production, export, competitiveness

**ABSTRACT.** The aim of the study was to assess competitiveness on the global cereal market in view of changes in production, export and import on the market in the years 1998-2017. As a source, data from the United Nations Food and Agriculture Organization (FAO) were used. The study assesses: trends involving changes in production, export and import, trends in the percentage share of the largest cereal producers, exporters and importers, and the evaluation of competitiveness of exporters. The top twenty cereal producers and exporters worldwide were analysed. In the period under examination, China, the United States and India remained the largest producers of cereals. In recent years, Russia and the Ukraine have significantly increased their share in production. Russia, the Ukraine and Brazil joined leading cereal exporters, next to the United States. The period in question is characterised by a strong concentration of countries producing and exporting cereal, and by an increase in export orientation among 20 largest cereal exporters on global markets. Poland, compared to other grain exporting countries, does not play a significant role, however, after the country's accession to the European Union, its gradually improving.

### **INTRODUCTION**

As an economic phenomenon, competitiveness can be considered from the following perspectives: global (world), regional (group of countries), macro (national economies), meso (sectors, industries, branches of the economy), micro (enterprises, households) and micro-micro (entrepreneurs, employees, consumers) [Gorynia, Łązniewska 2009, Esser et al. 1996]. Competitiveness is most frequently related to the international market, i.e. to an open economy participating in the international division of labour [Skawińska 2002], therefore, it has the nature of external competitiveness as opposed to internal competitiveness referring to the domestic market [Woś 2001]. Increasing globalisation intensifies trade in goods on world markets. This also applies to agri-food sector products. The global food crisis of 2007-2011 caused a sharp increase in prices of agricultural raw materials on international markets, which resulted in changes in countries' trade policies, especially export policy [Malchar-Michalska 2013, Headley, Fan 2010]. The aim of the study is to assess competitiveness on the global cereal market in view of changes in production, export and import on the market in 1998-2017.

## MATERIAL AND RESEARCH METHODS

Changes on the global cereal market were analysed on the basis of data collected by the United Nations Food and Agriculture Organization (FAO). A substantive scope of this work covers the following issues:

- trends involving changes in production, export and import,
- tendencies with regard to changes in the percentage share of the largest producers, exporters and importers,
- assessment of exporter competitiveness.

International competitiveness *ex-post* assessment was made using the following quantitative measures [Pawlak, Poczta 2011]:

1. Export Market Share (EMS):  $EMS = \frac{X_{ik}}{X_{iw}} \times 100\%$

where  $X_{ik}$  – export of the  $i$ -product from the  $k$ -country;  $X_{iw}$  – export of all  $i$ -products worldwide.

2. Export Orientation (OE):  $OE = \frac{X_{ik}}{P_{ik}} \times 100\%$

where  $P_{ik}$  – production of the  $i$ -product in the  $k$ -country.

3. Relative Export Orientation (REO):  $REO_k = \frac{X_{ik}}{X_{iw}} : \frac{X_{ik}}{P_{ik}}$

where  $P_{iw}$  – production of the  $i$ -product worldwide.

4. Hypothetical Exports (HE):  $HE_k = X_{ik} \times r_i$

where  $r_i$  – the global export growth rate between periods analysed.

5. Trade Coverage (TC):  $TC = \frac{X_{ik}}{M_{ik}} \times 100\%$

where  $M_{ik}$  – import of the  $i$ -product to the  $k$ -country.

6. Relative Trade Advantage (RTA):  $RTA = X_{ik} - M_{ik}$ .

The analyses were carried out for top twenty cereal producers and exporters worldwide in the period 1998-2017. The starting point for the analysis of production involved countries with the greatest cereal production in 2017, while for the analysis of exports the countries with the largest exports recorded in that year served as a reference. Graphic and tabular techniques were used to present numerical data.

## RESEARCH RESULTS

Cereals are one of the basic agricultural crops in the world. In 2017, their acreage amounted to 731.5 million ha, which constituted 51% [GUS 2018] of arable land. The average cereal yield, which stood at 4.1 t/ha, was highly diversified, and the countries with the highest yield include: the Netherlands (8.79 t/ha), Great Britain (8.28 t/ha) and Denmark (8.24 t/ha). Global cereal production in 2017 was just above 2,980 million tonnes

and over the past 20 years it has increased by 43%, with an average annual growth rate of 2.15% (Figure 1). Figure 2 presents the top twenty cereal producers in 1998 and 2017, using a percentage share of global production. In 2017, the largest cereal producers encompassed: China, with a 21% share in global production, followed by the United States (almost 15%) and India (10.5%). Countries in leading positions have not changed after 20 years; however, significant changes could be observed among other countries. This, in particular, applies to Russia, which increased its share in worldwide cereal production from 2.25% to 4.4%, placing it in fourth place (Figure 2 and Table 2). Furthermore, Brazil,

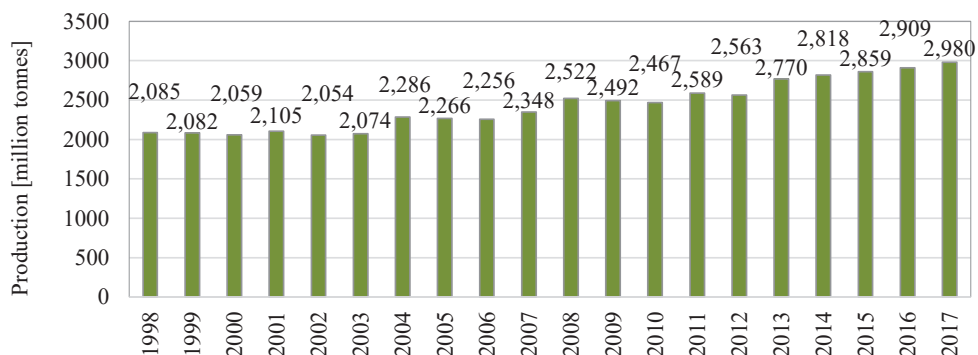


Figure 1. Global cereal production in 1998-2017

Source: own study based on FAOSTAT

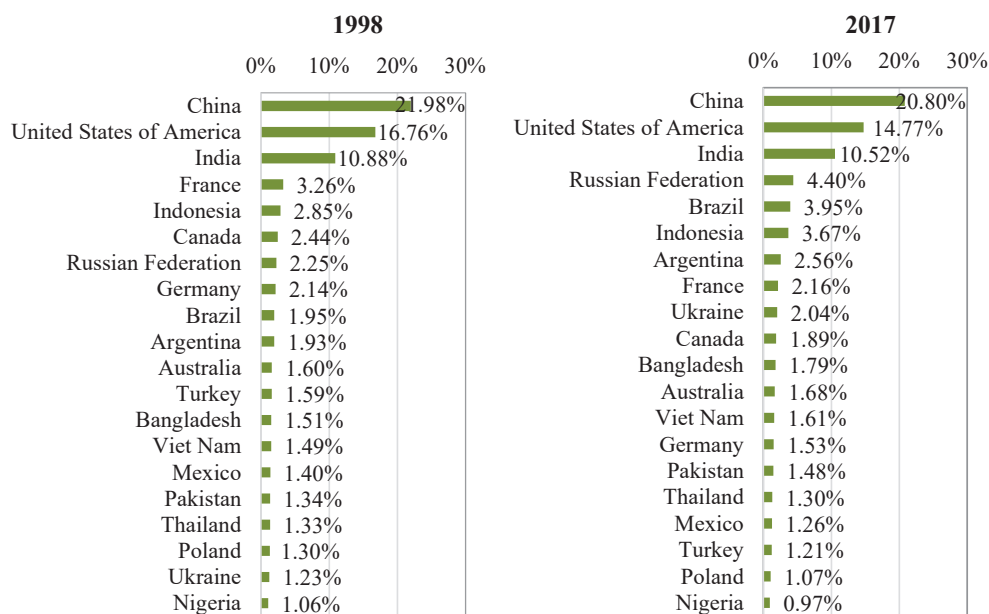


Figure 2. Top cereal producers in 1998 and 2017

Source: own study based on FAOSTAT

the Ukraine and Indonesia grew in importance as main cereal producers. On the other hand, the production share of France, Canada and Germany visibly decreased. With its 1.07% share, Poland is in 19th position, while in 1998 it ranked 18th, with a 1.3% share.

Cereal production is highly concentrated, and this situation has not changed significantly over a period of twenty years. The top five leading producers provide 55% of worldwide production, the top ten – 66%, the top fifteen – 75%, and the top twenty – as much as 81% of global cereal production (Figures 3 and 4).

In the analysed period, trade in cereal on global markets grew notably. This concerned both exports and imports (Figure 4). Exports went up by 86%, from 256 million tonnes to 476 million tonnes. Imports showed even greater growth dynamics (increase by 91%), from 243 million tonnes to 466 million tonnes. Like production, cereal exports are strongly concentrated among leading countries (Figure 5). The top twenty exporters account for 90% of global exports, while the top fifteen – for 85% and the top ten – for 75%. However, in recent years, the share of the top five cereal exporting countries decreased, from 68% in 1998 to just over 50% in 2017 (Figure 5 and 6). The largest cereal exporters involve countries with the highest Export Orientation (*OE*) index, pointing to the percentage share of exports in domestic cereal production (Table 1). In 1998, Argentina had the highest

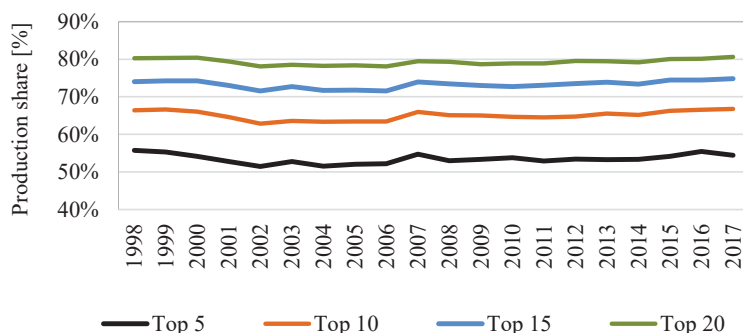


Figure 3. Share of top producers in global cereal production in 1998-2017

Source: own study based on FAOSTAT

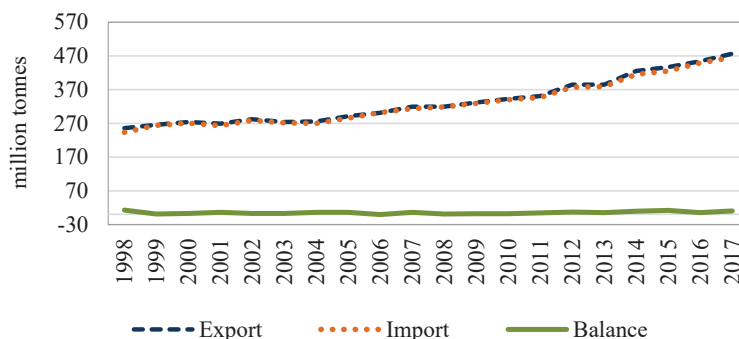


Figure 4. Foreign trade in cereals worldwide in 1998-2017

Source: own study based on FAOSTAT

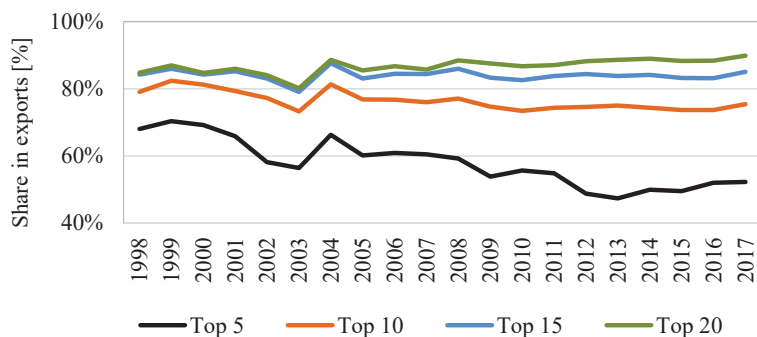


Figure 5. Share in global exports of the Top 5, Top 10, Top 15 and Top 20 in 1998-2017

Source: own study based on FAOSTAT

Table 1. Export Orientation in 1998 and 2017

No.	Country	Share [%]	Country	Share [%]
	1998		2017	
1.	Argentina	63.36	Ukraine	69.94
2.	Australia	59.91	Lithuania	67.99
3.	Kazakhstan	49.93	Australia	62.91
4.	France	42.33	Bulgaria	59.39
5.	Canada	41.22	Hungary	57.66
6.	Hungary	34.14	Argentina	54.01
7.	Thailand	24.05	Canada	49.53
8.	United States of America	22.54	Czech Republic	48.08
9.	Bulgaria	19.68	Kazakhstan	42.39
10.	Germany	18.13	Romania	40.80
11.	Ukraine	15.85	France	40.32
12.	Viet Nam	12.04	Russian Federation	33.18
13.	Turkey	9.45	Thailand	31.62
14.	Lithuania	7.40	Germany	27.66
15.	Romania	5.77	Brazil	25.90
16.	Russian Federation	4.51	United States of America	20.47
17.	Czech Republic	3.67	Poland	16.02
18.	India	2.20	Turkey	14.27
19.	Poland	0.10	Viet Nam	12.83
20.	Brazil	0.06	India	4.21

Source: own study based on FAOSTAT

OE ratio, with over 63% of domestic production exported, followed by Australia (60%), Kazakhstan (50%), France (42%) and Canada (41%). In 2017, the Ukraine was at the forefront, having multiplied its share from 16% in 1998 to 70% in 2017. The share of exports in production was also increased by Russia – from 4.5% to 33.2%, Brazil – from 0.06% to 26%, and Germany – from 18% to almost 28%. A dynamic rise in exports in relation to production was observed in the case of Poland as well. In 2017, 16% of domestic production was directed to foreign markets, compared to 0.1% in 1998, which was certainly a consequence of Poland’s accession to the common EU market.

Based on the Export Market Share (*EMS*) index, the top twenty cereal exporters in 1998 and 2017 were identified (Figure 6 and Table 2). In 1998, the largest cereal exporters were: the United States (31%), France (11%), Argentina (10%) and Canada (8%). Twenty years later, global leading cereal exporters changed. The United States, while remaining the leader, reduced its share to 19%. By contrast, France – with a share of 5.5% – and Canada (5.9%) were the eighth and seventh cereal exporting countries, respectively. Exporting 8.7% of global exports in 2017, Argentina was classified in fourth place. The competitive position of Russia and the Ukraine on the market visibly rose. The share of Russia augmented from 0.82% to 9.14%, while in the case of the Ukraine it went up from 1.59% to 8.91%. Over these years, Poland has increased its share from 0.01% to 1.07%, and ranked 18th among cereal exporters worldwide.

When assessing the competitiveness of individual countries in the global cereal market using the Relative Export Orientation (*REO*) index, the extent to which a country opens its economy, compared to the average opening of economies in the world, can be determined.

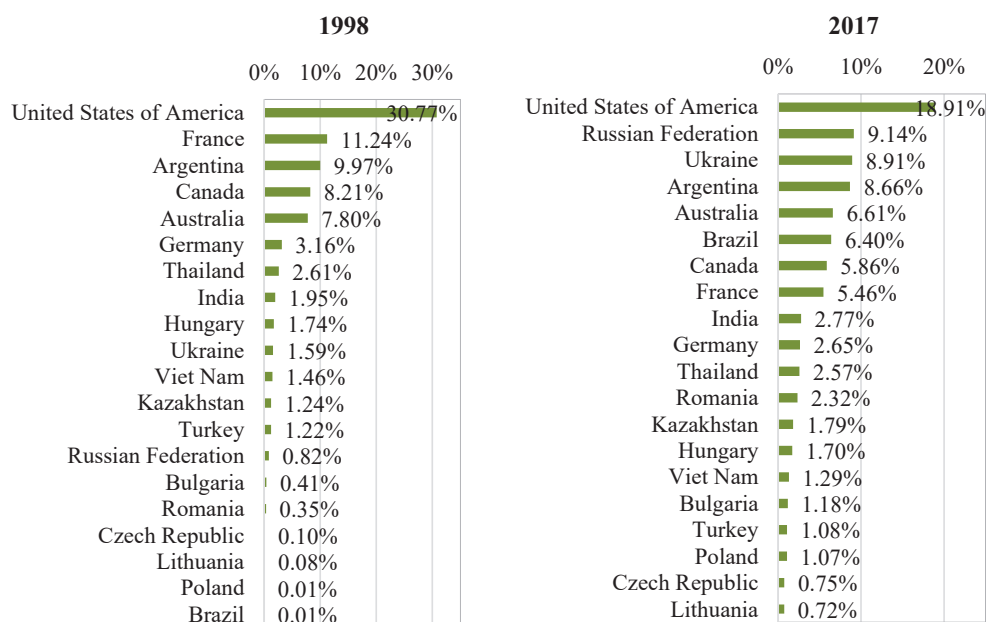


Figure 6. Main cereal exporters worldwide in 1998 and 2017

Source: own study based on FAOSTAT

Table 2. Competitiveness indicators on the global cereal market

Country	Export Market Share (EMS) [%]			Relative Export Orientation (REO)			Hypothetical Exports (HE) [%]			Trade Coverage (TC) [%]			Relative Trade Advantage (RTA) [million tonnes]		
	1998	2007	2017	1998	2007	2017	1998	2007	2017	1998	2007	2017	1998	2007	2017
Argentina	9.97	8.74	8.66	5.16	4.84	3.38	112.03	87.60	86.85	59,130.11	151,966.55	195,562.57	25,489	27,913	41,239
Australia	7.80	2.86	6.61	4.88	3.78	3.94	80.14	36.70	84.72	49,490.33	6,687.23	15,469.03	19,932	9,018	31,284
Brazil	0.01	3.59	6.40	0.00	1.21	1.62	5.87	40,891.95	72,999.60	0.22	119.37	324.99	-9.991	1.861	21,120
Bulgaria	0.41	0.21	1.18	1.60	1.26	3.72	828.22	50.19	285.77	1,936.68	223.78	1,193.36	1.004	0.367	5,156
Canada	8.21	7.13	5.86	3.36	3.49	3.10	85.76	86.82	71.33	1277.87	700.66	1,440.85	19,369	19,532	25,954
Czech Republic	0.10	0.44	0.75	0.30	1.44	3.01	435.73	459.57	787.19	74.59	378.19	812.03	-0.083	1.034	3,145
France	11.24	8.01	5.46	3.45	3.15	2.52	98.77	71.24	48.58	1990.82	1,120.32	982.96	27,319	23,307	23,357
Germany	3.16	3.03	2.65	1.48	1.75	1.73	105.88	95.99	83.82	302.32	143.15	127.59	5,407	2,920	2,725
Hungary	1.74	2.22	1.70	2.78	5.41	3.61	166.99	127.86	97.57	7288.03	2,659.71	1,963.78	4,390	6,841	7,670
India	1.95	3.04	2.77	0.18	0.27	0.26	198.09	156.29	142.33	273.53	361.51	231.01	3,160	7,033	7,482
Kazakhstan	1.24	2.78	1.79	4.07	3.26	2.65	79.34	223.74	143.96	15,130.42	10,265.91	12,943.55	3,165	8,815	8,468
Lithuania	0.08	0.23	0.72	0.60	1.80	4.25	108.59	293.60	919.17	289.92	376.94	1,152.04	0.132	0.543	3,151
Poland	0.01	0.24	1.07	0.01	0.21	1.00	16.15	2,384.24	10,596.96	1.85	31.09	257.90	-1,379	-1,711	3,131
Romania	0.35	0.21	2.32	0.47	0.62	2.55	108.62	59.64	667.24	413.15	46.14	433.55	0.676	-0,776	8,519
Russian Federation	0.82	5.30	9.14	0.37	1.55	2.08	104.29	642.41	1,107.61	104.69	1,534.67	5,449.53	0.095	15,835	42,714
Thailand	2.61	3.01	2.57	1.96	1.93	1.98	114.31	115.21	98.36	711.55	787.31	389.13	5,749	8,402	9,096
Turkey	1.22	0.62	1.08	0.77	0.50	0.89	174.82	50.41	88.38	105.52	55.58	65.44	0.164	-1,577	-2,722
Ukraine	1.59	1.37	8.91	1.29	1.11	4.38	234.27	86.38	559.97	5258.74	2,285.02	28,092.95	3,996	4,202	42,295
United States of America	30.77	31.27	18.91	1.84	1.77	1.28	98.46	101.65	61.47	1,466.69	1,625.19	1,213.06	73,386	93,829	82,654
Vietnam	1.46	1.43	1.29	0.98	0.83	0.80	99.39	97.73	88.37	559.57	239.45	49.01	3,067	2,655	-6,388
World	0.00	0.00	0.00	1.00	1.00	1.00	100.00	100.00	100.00	105.10	101.93	102.29	12,412	6,047	10,655

Source: own study based on FAOSTAT

If the coefficient is greater than 1, it indicates a pro-export orientation and, depending on the value of the indicator, smaller or greater competitiveness on the global market. If the *REO* is lower than 1, a country has no international competitive ability [Jagiello 2003]. The analysis shows that the countries with the highest share of exports in domestic production (Argentina, Australia, France and Canada) also record the highest *REO* values (Table 2), which points to high competitiveness on the global cereal market. However, in subsequent years, the *REO* ratio of these countries declined; and thus, their international competitive position decreased. On the other hand, the *REO* grew significantly in such countries as: the Ukraine (from 1.29 to 4.38), Lithuania (from 0.60 to 4.25), Bulgaria (from 1.6 to 3.72), the Czech Republic (0.3 to 3.01), Romania (0.47 to 2.55) and Russia for which the *REO* was 0.37 in 1998 and 2.08 in 2017. Hungary (3.61) and Kazakhstan (2.65) also recorded high *REO* values in 2017. The latter, however, with a downward trend (4.07 in 1998) (Table 2). As a participant on the global cereal market in 1998, 2007 and 2017, Poland displayed very low and low competitiveness, yet with an upward trend.

The Hypothetical Exports (*HE*) index shows what the volume of cereals a given country could deliver to international markets if it developed sales proportionally to the global one. The relation of actual exports to hypothetical exports expressed as a percentage determines how many times actual exports exceed hypothetical exports [Kraciński 2016]. Values above 100% point to an improvement in international competitiveness and allow for comparisons between countries in this aspect. This indicator was calculated by referring the volume of exports from 1998, 2007 and 2017 to the reference period, i.e. 1997 in this case. In the analysed term, special attention should be paid to the exponential rise of the ratio in Brazil, from approx. 6% in 1998 to 73,000% in 2017. This most probably results from a significant increase in the cereal cultivation area, from 15.8 million ha in 1998 to 22.6 million ha in 2017. Among the cereal species cultivated in this country, maize was the most important, with a 67% share in the structure of crops in 1998 and 77% in 2017. The two-fold increase in yield in this period – from 2.80 t/ha to 5.61 t/ha – played its role as well, which is also associated with the introduction of important changes in the agrotechnics of this species, consisting in shortening a cultivation cycle and introducing a second sowing during the year. This situation translated into a three-fold increase in the share of maize in the structure of cereals exported by Brazil, from 33.5% to 96%, gaining a leading position among global producers and exporters of corn, and a significant promotion among cereal exporters [Rosiak et al. 2011, FAOSTAT]. There was also a noticeable rise in exports in several countries of Central and Eastern Europe, significantly exceeding the global exports development trend. This could be observed in the case of Russia, the Ukraine, Poland, Lithuania, the Czech Republic and Romania. Predominantly, it was a result of mobilising the agricultural potential of Russia and the Ukraine through introduced reforms and decisions related to foreign investments in the agricultural sector of these countries. Other countries, following accession to the European Union, took advantage of the opportunities arising from the liberalisation of agricultural trade, and thanks to relatively low production costs and the unleashing of unused resources they significantly increased the volume and value of cereal exports [Cherevyk, Hamulczuk 2018]. The specific values of the relation of actual exports to hypothetical exports in the examined population are presented in Table 2.



The Trade Coverage (*TC*) index, when exceeding 100%, points to a country's export specialisation. It only indicates a relative advantage over other countries on the external market, since it is based solely on the export and import of a given country [Lubiński et al. 1995, Misala 2011]. In 1998, the highest *TC* values were recorded in Argentina and Australia as well as Kazakhstan and the Ukraine. In 2017, Russia joined those countries leading in cereal export specialisation (Table 2). The countries that considerably increased the *TC* ratio during the period under review encompass: Brazil, the Czech Republic, Lithuania, Poland, Russia and the Ukraine.

The last indicator used to assess competitiveness on the global cereal market in this analysis involves the balance of foreign trade in quantitative terms. A positive balance points to the competitiveness of a product and is usually the result of an increase in exchange efficiency caused by a higher competitiveness of domestic products [Kraciński 2016]. The United States achieved the highest *RTA* both in 1998 (73.4 million tonnes) and 2017 (82.6 million tonnes). They are followed by Russia, where the *RTA* went up from 0.09 million tonnes in 1998 to 42.7 million tonnes in 2017, and the Ukraine (an increase in *RTA* from 3.9 million tonnes to 42.3 million tonnes). The balance is also significant in Argentina (41.2 million tonnes in 2017 against 25.5 million tonnes in 1998), Australia (31.3 million tonnes in 2017 against 19.9 million tonnes in 1998), Canada (25.9 million tonnes in 2017 compared to 19.4 million tonnes in 1998) and Brazil (21.1 million tonnes in 2017 compared to -10 million tonnes in 1998). Despite a relatively high balance in 2017 (23.3 million tonnes), France fell slightly from 27.3 million (Table 2). With a balance of 3.1 million tonnes in 2017, Poland ranks 17th among the largest cereal exporters worldwide, yet the balance grew from -1.4 million tonnes. Similar upward trends are observed in the case of: Bulgaria, the Czech Republic, Hungary, Lithuania and Romania, i.e. the countries which joined the EU together with Poland.

## CONCLUSIONS

1. In 1998-2017 global cereal production was on the rise, with an average annual growth rate of 2.15%. In 2017, China, the United States and India remained leading cereal producers. Russia, the Ukraine and Indonesia significantly increased their share at the expense of countries such as France, Canada and Germany.
2. Over a period of twenty years, changes in terms of global leading cereal exporters could be observed. The United States, while remaining the leader, reduced its share from 31% to 19%. The competitive position of Russia, the Ukraine and Brazil on the market substantially rose. These countries were ranked second, third and sixth, respectively. The share of Russia went up to 9.1%, of the Ukraine – to 8.9%, and of Brazil – to 6.4% of global exports. Such a situation was the result of a significant increase in cereal production in these countries and the opening of international markets for them. This was confirmed by a relatively high level of the Export Orientation index, which, in 2017, stood for these countries at 33.2%, 69.9% and 25.9%, respectively.

3. Cereal production and exports are highly concentrated and this situation has not changed significantly over a period of twenty years. The top five producers provide 55%, and the top twenty producers provide 80% of worldwide cereal production. The top five exporters account for – just over 50%, and the top twenty exporters account for 90% of global exports.
4. In the period under review, a significant increase in export orientation could be observed among the 20 largest cereal exporters on world markets, as evidenced by a decline in the number of countries for which the calculated *REO* index does not exceed 1. At the same time, considerable rises in the value of this indicator were noted in countries such as: the Ukraine, Lithuania, Bulgaria, the Czech Republic, Romania and Russia.
5. The relation of actual exports to Hypothetical Exports is increasing for such countries as: Brazil, Russia, the Ukraine, Poland, Lithuania, the Czech Republic and Romania. This is mainly due to the increasingly better use of natural and economic potential by these countries, and the improvement of productivity, introduced changes in the agricultural technology of some species and favourable reforms and political decisions in the agricultural sector. Other factors contributing to such results involve seizing, by these countries, opportunities arising from the liberalisation of trade in agricultural goods, increased demand for cereals for the production of biofuels, and political conflicts, including the US-China one.
6. The highest level of competitiveness on the global cereal market in 2017, measured by trade surplus, was recorded by the United States, Russia and the Ukraine, as well as Argentina, Australia, Canada, France and Brazil. These countries also had a distinctive export specialisation, which is confirmed by the calculated Trade Coverage ratios.

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## KONKURENCYJNOŚĆ NA ŚWIATOWYM RYNKU ZBÓŻ

Słowa kluczowe: rynek światowy, zboża, produkcja, eksport, konkurencyjność

### ABSTRAKT

Celem opracowania jest ocena konkurencyjności na światowym rynku zbóż na tle zmian w produkcji, eksporcie i imporcie na tym rynku w latach 1998-2017. Źródłem materiałów były dane Organizacji Narodów Zjednoczonych ds. Wyżywienia i Rolnictwa (FAO). W pracy oceniono tendencje zmian w produkcji, eksporcie i imporcie, w procentowym udziale największych producentów zbóż, eksporterów i importerów, a także dokonano oceny konkurencyjności eksporterów. Analizie poddano 20 największych producentów i eksporterów zbóż na świecie. W badanym okresie największymi producentami zbóż były Chiny, Stany Zjednoczone oraz Indie. Natomiast w ostatnich latach udział w produkcji znacząco zwiększyły Rosja i Ukraina. Wśród czołowych eksporterów, obok Stanów Zjednoczonych, pojawiły się trzy kraje: Rosja, Ukraina i Brazylia. W badanym okresie nastąpiła silna koncentracja państw produkujących i eksportujących zboża oraz wzrost orientacji proeksportowej wśród 20 największych eksporterów zbóż na rynkach światowych. Polska nie odgrywa znaczącej roli na tle innych państw eksportujących zboża, jednak po przystąpieniu kraju do Unii Europejskiej, jej pozycja konkurencyjna stopniowo poprawia się.

### AUTHORS

TOMASZ SZUK, PHD  
ORCID: 0000-0001-7653-578X  
Wrocław University of Environmental  
and Life Sciences  
Institute of Economic Sciences Faculty  
of Life Sciences and Technology  
25 C.K. Norwida St., 50-375 Wrocław, Poland

BARBARA KUTKOWSKA, PROF. DR HAB.  
ORCID: 0000-0001-7581-746X  
Wrocław University of Environmental and Life Sciences  
Institute of Economic Sciences  
Faculty of Life Sciences and Technology  
25 C.K. Norwida St., 50-375 Wrocław, Poland