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# **PROBLEMS OF WORLD AGRICULTURE**

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## **Are Polish Agri-food Products Competitive on the EU Market?**

**Abstract.** The study contains an analysis of agri-food trade between Poland and the European Union in the years 2004-2014. The aim of the study was to investigate the status, structure and intensity of trade in agri-food between Poland and the European Union and the assessment of the competitiveness of the Polish agri-food sector in the EU market. The paper analyzes the export and import of the agri-food sector with the European Union, points to changes in the dynamics of turnover and calculates indicators of comparative advantage (RCA) and indicators of specialization: B. Balassa and HG Grubnela and PJ Lloyd. Polish agri-food products in the analyzed period showed a competitive advantage in the European market, mainly processed products of animal and vegetable origin.

**Keywords:** agri-food trade, the European Union, competitiveness, RCA indicator, Poland

### **Introduction**

Ability to compete in the EU market is a big challenge for Polish agri-food producers. The competitiveness of the agri-food sector is a complex problem and at the same time an extremely important issue for the Polish economy. The rising potential of the Polish economy, which is the result of EU requirements in the field of agriculture and the agri-food industry has improved our ability to compete. The increasing agri-food export confirms that Polish producers can compete on the EU market. However, it is also the result of the abolition of trade barriers, liberalization of trade turnover, the occurrence of creation effects and trade diversion. Thus, analyzing the results of the agri-food trade sector, attention should be paid to various factors both internal and external affecting their ability to compete. In this study, applied measures of international competitiveness of the agri-food sector in the European Union are quantitative indicators, i.e. ex-post, shares in international transactions, trade balance, the indicators of revealed comparative advantages or intra-industry trade indicators. In the structure of trade between Poland and the European Union there are the same groups of goods from one branch. This also applies to trade in agri-food products. It is therefore important to know the structure of intra-industry trade and determine the competitive position of Polish products on the EU market [Kacperska 2014].

The aim of the study was to investigate the status, structure and intensity of trade in agri-food between Poland and the European Union and the assessment of the competitiveness of the Polish agri-food sector in the EU market. The analysis of foreign trade covered 2004-2014. The study used statistical data from the Centre for Foreign Trade Team provided by the Foreign Agricultural Markets Monitoring in the annual publication of reports on agri-food trade. Due to the requirements for publication the paper contains a collective statement for all product groups. Analysis of trade since 2004 consisted of 25 countries belonging to the EU and from 2007 – 28 countries.

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## Polish foreign trade in agri-food products

The share of Polish foreign trade in global trade since 2007 has an average of 1.1% in exports and 1.2% in imports. In the analyzed period Polish turnover increased significantly, with dynamics growth at the same time. Visible collapse of the world economy in 2009 affected the collapse of commodity exports in Poland, maintaining the same trend in export/import [Roczniki 2006-2014].

Polish foreign trade in agri-food products in the years 2004 - 2014 pointed to the increasing trend in exports and imports. Exports in the analyzed period rose more than four times to € 21.3 billion in 2014. The trade balance in the reporting period was positive. Increases in exports analyzed year on year showed high volatility, especially with the decrease in growth taking place in 2009. This was caused by the global financial crisis. In the following years exports increased.

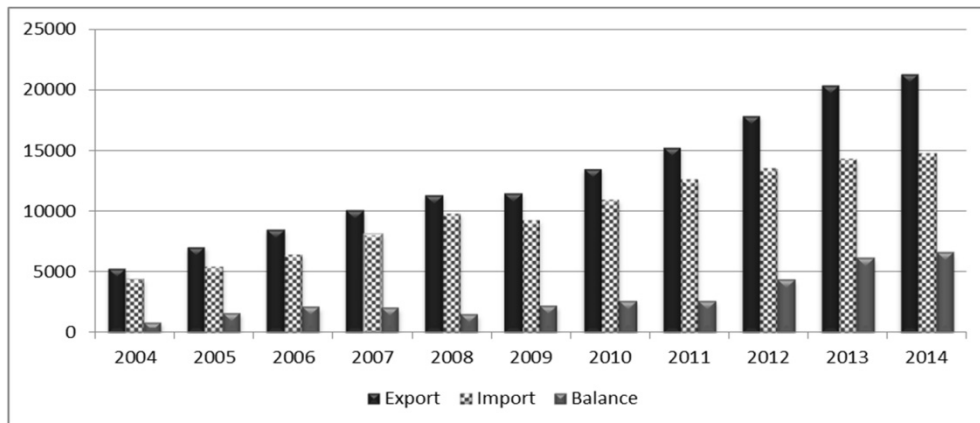


Fig. 1. Polish foreign trade in agri-food products in the years 2004-2014 (billion EURs)

Source: author's own study based on data from Table 2.

A similar tendency was observed in imports. In 2009 there was a decline in the value of imports, but in the following years there was a rapid growth. In the analyzed period the trade balance was positive (Figure 1). The share of trade in agri-food products in total Polish foreign trade has remained at an average of 10.9% in exports and 7.7% in imports.

## Trade turnover in agri-food products with the European Union in the period 2004-2014

Polish trade in agri-food products from the EU is characterized by a growing trend both in exports and imports. In 2014, Poland exported agri-food products for EUR 16.8 billion and imported agri-food products for EUR 10.2 billion.

The analysis of the data of the Polish trade in agri-food products for the years 2004 - 2014 shows that the largest share in the trade structure was with the European Union. Its share ranged between 72-80% in exports and 62-68% in imports. In 2014 agri-food products for a total of EUR 16.8 billion were exported to the countries of the European

Union. In the analyzed period, the value of exports increased almost 4.5 times, showing an upward trend. Similarly, agri-food imports in the analyzed period showed a rising trend with a slight slump in 2009, which was the result of the global financial crisis. In 2014 Poland spent over 10.2 billion euros on agri-food products in the European Union. In the analyzed period, the value of imports from EU countries increased by 7.4 billion euros. The balance of agri-food exchange between Poland and the European Union was positive in the years 2004-2014, where trade balance rose by more than 5.6 billion euros (Table 2 and Figure 2).

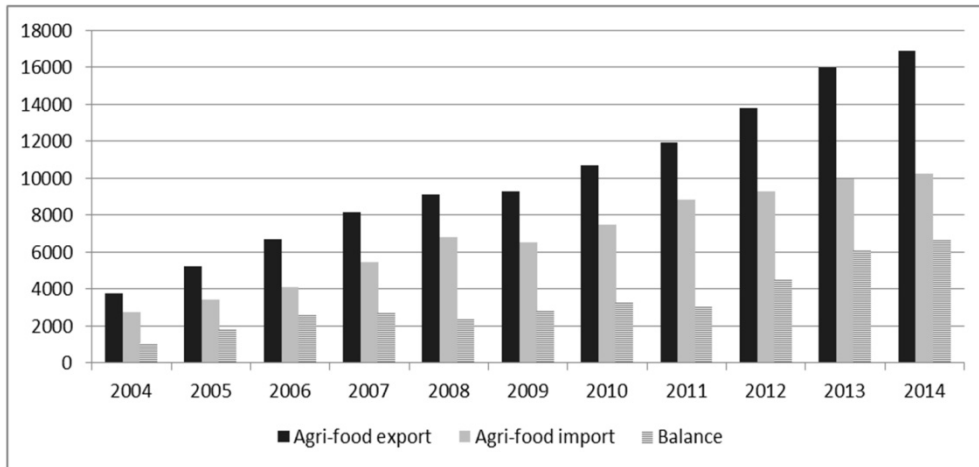


Fig. 2. Polish foreign trade in agri-food products with the countries of the European Union in the period 2004-2012 (billion EURs)

Source: author’s own study based on data from Table 2.

In the years 2004-2014 the growth rate of agri-food exports with the European Union stood at 346%, and the rate of change in total exports was higher than 39 percentage points. The average annual growth rate of exports indicates such a trend, which now stands at 16% (in 2003-2008 it amounted to 29%) for the European Union. At that time, the growth rate of imports was lower than the rate of exports by 1 percentage point and indicated the same trend for average growth rate of imports (Table 1).

Table 1. Rates of change in trade of agri-food products in the years 2004 - 2014 and average annual growth rates of trade in agri-food products for Poland and in trade with the European Union (in %)

Item	Agri-food export		Agri-food import	
	Total	with UE	Total	with UE
Rates of change (%)	307	346	236	269
The average annual growth rate (%)	15	16	13	14

Source: author’s own data.

The analysis of the data included in Table 1 shows that the average annual growth rates of exports and imports from the EU were higher than an adequate rate of the

recognized total. The high increases of exports were the result of Polish accession to the European Union and the full liberalization of trade.

Table 2. The value and dynamics of Polish agri-food trade with the European Union in the period 2004-2014

Item	Year										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
The value of agri-food trade between the Poland and the European Union in EUR million											
Export	3781.8	5238.0	6692.6	8135.6	9101.7	9283.6	10705.7	11906.5	13763.8	15979.2	16876.7
Import	2763.8	3442.1	4079.3	5438.3	6791.3	6486.9	7481.9	8813.3	9284.3	9944.4	10219.7
Balance	1018.0	1795.9	2613.3	2697.3	2310.4	2796.7	3223.8	3093.2	4479.5	6034.8	6657.0
The dynamics of agri-food articles turnover (year on year)											
in export	100	138.5	127.8	121.6	111.9	102.0	115.3	111.2	115.6	116.1	105.6
in import	100	124.5	118.5	133.3	124.9	95.5	115.3	117.8	105.3	107.1	102.8
The dynamics of agri-food articles turnover (2004 = 100)											
in export	100	138.5	177.0	215.1	240.7	245.5	283.1	314.8	363.9	422.5	446.3
in import	100	124.5	147.6	196.8	245.7	234.7	270.7	318.9	335.9	359.8	369.8
The share of agri-food trade to the European Union in the structure of trade Polish agri-food trade (in %)											
Share in export	72.1	74.1	78.5	80.6	80.4	80.7	79.3	78.2	76.9	78.2	79.1
Share in import	62.7	63.2	63.4	67.4	69.1	69.8	68.5	69.8	68.5	69.5	69.1

Source: author's own study based on data CIHZ.

A similar situation can be observed in imports, where the average annual growth rate of imports to the European Union was 1 percentage point higher than the growth rate in total (Tables 1 and 2).

## The geographical structure of agri-food trade with the European Union

Traditionally, Germany is the largest importer of Polish agri-food products from the European Union. In the analyzed period, the share of Germany in Polish exports was over 22%. In 2014 agri-food products for EUR 4.8 billion were exported to Germany. In the period 2004 to 2014 the value of exported agri-food products increased almost 2.5 times. The United Kingdom was in second place for Polish exports, involving nearly 8% recognized as one United Kingdom, however, the value of items sold on the island accounted for only 1/3 of the value of exports to Germany. It is followed by France, the Czech Republic, Italy and the Netherlands. The total share of the five main recipients reached 53.5% in 2014 and increased by 5.7 percentage points in respect of 2004 (Table 3).

### MICE structure of agri-food trade with the European Union

Herbal preparations are the largest group in agri-food exports to the European Union. In the analyzed period, export of herbal preparations was characterized by a growing trend. In 2004 herbal preparations for a total amount of EUR 1.5 billion were exported to the European Union, whereas in 2014 this amount reached more than EUR 5 billion. The largest share of this group was in confectionery and processed fruits. The second group of dynamic growth figures were animal products, where the value of exports increased from 1.02 billion euros in 2004 to 4.8 billion euros in 2014. The biggest sales in this group were in red meat, poultry meat, and milk, sour cream and ice cream. The third large group in exports was stimulants and beverages; their share in exports in the period increased 10 times. In 2014 the value of exported drugs and beverages amounted to EUR 3.4 billion versus EUR 322 million in 2004. The largest increase in exports of manufactured tobacco was recorded in this group (53.8 million in 2004. 1.7 billion 2014). Noteworthy is the growing export of fish and fish products. The value of exported fish and their products increased rapidly to EUR 1.3 billion in 2014 in the analyzed period (Figure 3).

Table 3. The biggest recipients of Polish agri-food products from the European Union comparative analysis of the 2004-2014 year

Countries	2004			2014			Change in the period 2004-2014	
	Rank	Value in EUR million	Share (in %)	Rank	Value in EUR million	Share (in%)	Value in EUR million	in %
Germany	1	1343.6	25.6	1	4812.5	22.5	3468.9	258.2
UK	3	303.3	5.8	2	1635.3	7.7	1332.0	439.2
France	6	175.9	3.3	3	1463.2	6.9	1287.3	731.8
Czech Republic	4	280.0	5.3	4	1302.2	6.1	1022.2	365.1
Italy	5	273.8	5.2	5	1152.7	5.4	878.9	321.0
Netherlands	2	313.2	5.9	6	1053.8	4.9	740.6	236.5
Total	1-5	2513.9	47.8	1-5	11419.7	53.5	8905.8	354.3

Source: author’s own analysis.

In the MICE structure of agri-food trade with the European Union, vegetable products dominate over animal products, and in the processing category raw materials dominate processed products (Figures 3 and 5). In 2014, there were changes in the MICE structure of exported goods to the European Union in relation to 2004. The share of drugs and soft drinks increased from 8% in 2004 to 21% in 2014, and exports of processed products of animal origin (an increase of 3 percentage points). The largest decline in exports was recorded in the group of processed vegetable products (10 percentage points) (Figure 4).

Products processed from plants and animals dominated (as in exports) in imports of agri-food products to Poland (Fig. 5). Poland in 2014 purchased vegetable products for a total amount of EUR 4.9 billion from the European Union, increasing the value of these products by EUR 3.5 billion in the period 2004-2014. Animal products had a total amount

of EUR 3.5 billion in 2014, increasing the value of purchases in the analyzed period more than 12 times.

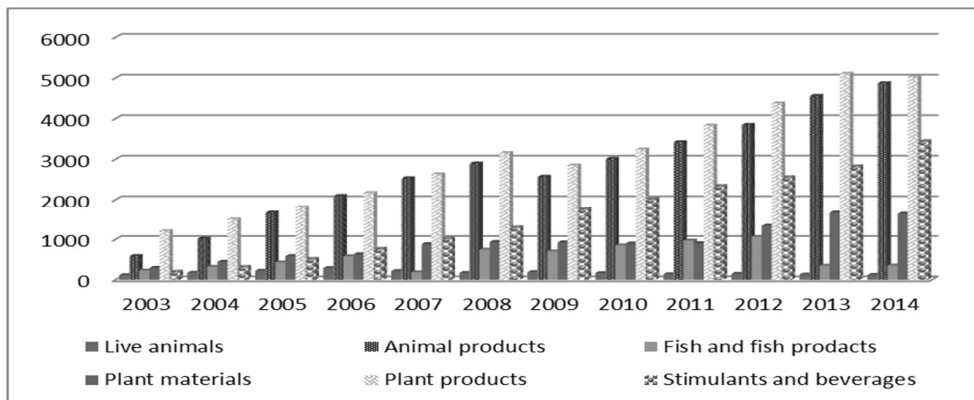


Fig. 3. Structure of MICE exports of agri-food products to the European Union in the years 2003-2014 in EUR million

Source: author's own analysis.

Herbal preparations were characterized by the most dynamic in imports in the group of plant products (increase in imports in the analyzed period by EUR 3.2 billion) and plant materials (increase of imports in the analyzed period by more than EUR 1 billion). Among animal products, preparations of red meat were characterized by the highest rate of dynamics (Figure 5).

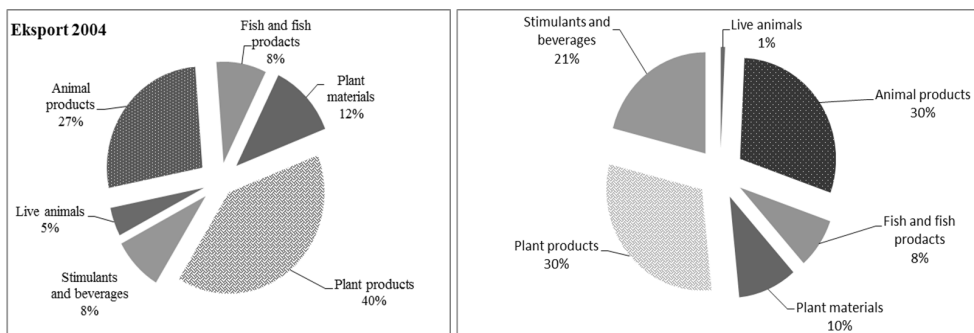


Fig. 4. MICE structure of agri-food exports to the European Union in 2004 and 2014

Source: author's own analysis.

In the years 2004-2014 there were many changes in the structure of exports and imports. These changes occurred in the last few years, changing the current growth trends emerging in the post integration with the European Union to slow growth in recent years. In the analyzed period, stimulants and beverages showed the highest growth rate in exports - 782.1% and animal preserves - 364.8%. The biggest increase in imports - 686.5% was recorded for live animals and animal preserves - 572.1%. In the analyzed period, the change



in shares were declining in exports except for animal drugs and milk, while imports for animal products were positive and plant products showed a decreasing trend (Table 4).

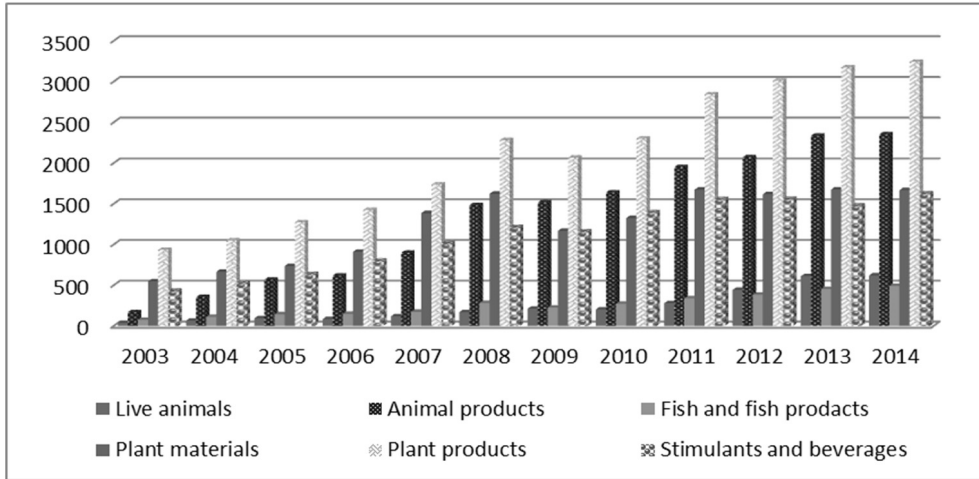


Fig. 5. Structure of MICE imports of agri-food products to the European Union in the years 2003 -2014 in EUR million

Source: author’s own analysis.

Net exports ratio is calculated as the ratio of net exports to the total value of imports and exports. The value of this ratio is in the range -1, 1, wherein -1 means that there is only import and one where there is only export [Carraresi, Banterle 2007].

$$NEI = \frac{X-M}{X+M}$$

where:

X - is the value of exports,

M - is the value of imports.

Table 4. Changes in the MICE structure of Polish agri-food exports in the years 2004-2014

Product groups	Growth rate (in %)		Changes in shares (in % pts.)	
	Export	Import	Export	Import
Animal products:				
Live animals	68.8	981.7	1.6	3.9
Processed animal products	477.3	665.5	-3.5	10.8
Fish and fish products	411.1	446.8	-3.6	-7.3
Plant products:				
Plant materials	369.0	250.9	4.9	-7.3
Processed plant products	334.7	309.4	-7.2	-5.4
Stimulants and beverages	1069.2	307.9	7.8	-2.8

Source: own.

Table 5. Indicators of net exports in the agri-food trade to the European Union in the period 2004-2014

Product groups	Years										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
	Animal products:										
Live animals	0.47	0.41	0.56	0.30	0.00	-0.05	-0.10	-0.34	-0.50	-0.65	-0.68
Processed animal products	0.49	0.49	0.55	0.48	0.32	0.26	0.30	0.27	0.30	0.32	0.35
Fish and fish products	0.49	0.51	0.60	0.04	0.46	0.52	0.52	0.48	0.47	0.47	0.46
	Plant products:										
Plant materials	-0.20	-0.11	-0.18	-0.22	-0.27	-0.11	-0.19	-0.30	-0.09	0.00	-0.01
Processed plant products	0.18	0.17	0.21	0.21	0.16	0.16	0.17	0.15	0.18	0.23	0.22
Stimulants and beverages	-0.24	-0.10	-0.02	0.00	0.04	0.21	0.18	0.20	0.24	0.31	0.36

Source: author's own analysis.

The analysis in Table 5 shows that most commodity groups throughout the analyzed period showed a positive rate of net exports, which means the dominance of exports over imports. Negative values were observed since 2009 for the live animal group, and in some years for a group of plant materials (Table 5).

### The system of revealed comparative advantages in the MICE structure of agri-food trade between Poland and the European Union

For the analysis of trade in agri-food products, the indicator of revealed comparative advantage RCA (Revealed Comparative Advantage) was used and calculated according to the formula:

$$RCA = \ln \left( \frac{x_{ij}^K}{m_{ij}^K} \div \frac{X_{ij}^K}{M_{ij}^K} \right)$$

where:

$x_{ij}^K$  – the value of exports "i" from the country "K" to the group of countries "j";

$m_{ij}^K$  – the value of imports group "i" to the home "K" from the group of countries "j";

$X_{ij}^K$  – the value of global exports of the country "K" to the country or group of countries 'j';

$M_{ij}^K$  – the value of total imports of the country "K" from the country or group of countries 'j';

i - department / agri-food products by PCN;

K - analyzed country (Poland);

j - other countries (EU countries).

Table 6. Indicators of revealed comparative advantage in the agri-food trade to the European Union in the period 2004-2014

Product groups	Years										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Animal products											
Live animals	0.70	0.46	0.76	0.27	-0.27	-0.46	-0.55	-1.00	-1.48	-1.95	-2.08
Processed animal products	0.75	0.66	0.73	0.70	0.40	0.18	0.25	0.27	0.24	0.26	0.29
Fish and fish products	0.76	0.70	0.87	-0.25	0.71	0.80	0.79	0.76	0.64	0.55	0.50
Plant products											
Plant	-0.72	-0.64	-0.86	-0.79	-0.82	-0.58	-0.74	-0.91	-0.57	-0.41	-0.45
Processed plant products	0.05	-0.07	-0.08	0.08	0.06	-0.03	-0.01	0.00	-0.01	0.07	0.00
Stimulants and beverages	-0.81	-0.63	-0.54	-0.33	-0.20	0.07	0.01	0.11	0.11	0.24	0.31

Source: author's own analysis.

An RCA indicator greater than zero indicates the presence of revealed comparative advantage, and its value indicates the intensity of this advantage. Values less than zero indicate no advantage [Misala 2007]. Analyzing the RCA index values determined for turnover in agri-food products in the years 2004 -2014, it can be noted that in many groups Poland has comparative advantages. The high rates for dairy animals and fish and their products are especially noteworthy. In the group of plants, the RCA ratio was less than zero. Since 2009 products from drugs and drinks, including the biggest for tobacco and its products, have comparative advantage (Table 6).

### Intra-industry trade between Poland and the European Union

Intra-industry trade is "the phenomenon of parallel imports and exports by individual countries within the same branch" [Misala et. al 2000]. It develops between countries with similar productive structures giving consumers the opportunity to diversify differentiated products. As part of the changeover there is a complementary of economic structures with the specialization of production of each country and assurance of benefit sharing. There are many methods for measuring intra-industry trade, but the most commonly used is index B. Balassa and specialization index Grubel-Lloyd. To determine the degree of Poland's specialization trade with the European Union in the field of agri-food, the B. Balassa index (IBalassy) was used and it was calculated by the following formula:

$$I_{Balassy} = \frac{|x_{ij}^K - m_{ij}^K|}{x_{ij}^K + m_{ij}^K}$$

(The meaning as in Formula 1.)

B. Balassa index determines the share of intra-industry trade in all the audited turnover of the product under consideration made by a particular country. This ratio has a value in the range of  $<0.1>$ , where the rate is closer to zero, the greater intra-industry specialization and the closer unity of the greater specialization of intermodal [Czarny 2002].

Intra-industry trade prevails in Polish agri-food trade. The analysis of specialization B. Balassa index shows that intra-industry specialization exists in the group of plant materials, where in the analyzed period ranged 0 - 0.2 and herbal preparations fluctuation rate range is 0.15 - 0.22. In the group of animal products the intra-industry trade concerned processed meat and fish and their products. Increasing the intensity of intra-industry trade in the Polish agri-food trade helps to strengthen the competitive position in the European Union market. A good competitive position of the sector is a result of entry into the single market, which abolished barriers to agri-food trade sector.

Inter-industry replacement took place mainly in the group of live animals (Table 7).

Table 7. Indicators of specialization (IBalassy) to trade in agri-food between Poland and the European Union in the years 2004 -2014

Product groups	Years										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Animal products											
Live animals	0.47	0.41	0.56	0.30	0.00	0.05	0.10	0.34	0.50	0.65	0.68
Processed animal products	0.49	0.49	0.55	0.48	0.32	0.26	0.30	0.27	0.30	0.32	0.35
Fish and fish products	0.49	0.51	0.60	0.04	0.46	0.52	0.52	0.48	0.47	0.06	0.07
Plant products											
Plant materials	0.20	0.11	0.18	0.22	0.27	0.11	0.19	0.30	0.09	0.00	0.01
Processed plant products	0.18	0.17	0.21	0.21	0.16	0.16	0.17	0.15	0.18	0.23	0.22
Stimulants and beverages	0.24	0.10	0.02	0.00	0.04	0.21	0.18	0.20	0.24	0.31	0.36

Source: author's own analysis.

To determine the intensity and structure of trade in agri-food, the HG Grubnela and PJ Lloyd (IG-L) specialization index was used and calculated according to the formula:

$$I_{G-L} = \frac{(x_{ij}^K + m_{ij}^K) - |x_{ij}^K - m_{ij}^K|}{x_{ij}^K + m_{ij}^K} = 1 - I_{Balassy}$$

(The meaning as in Formula 1.)

For comparability of data in various branches/departments of agri-food intra-industry trade was expressed against the total value of foreign trade of the branch/department. This ratio has a value in the range of  $<0.1>$ , where if the  $IG-L = 1$  this trade is intra and if the  $IG-L = 0$  then there is inter-industry trade [Budzowski 2003]. The literature identifies four groups of trade intensity measured in the  $IG-L$ :

- 1)  $0.00 < IG-L \leq 0.25$  - a strong inter-industry trade,
- 2)  $0.25 < IG-L \leq 0.50$  - weak inter-industry trade,
- 3)  $0.50 < IG-L \leq 0.75$  - weak intra-industry trade,
- 4)  $0.75 < IG-L \leq 1.00$  - a strong intra-industry trade [Pawlak 2013].

Table 8. Indicators of intra-industry trade intensity ( $IG-L$ ) in total agri-food turnover between Poland and the European Union in the years 2004 -2014

Product groups	Year										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
<b>Animal products:</b>											
Live animals	0.53	0.59	0.44	0.70	1.00	0.95	0.90	0.66	0.50	0.35	0.32
Processed animal products	0.51	0.51	0.45	0.52	0.68	0.74	0.70	0.73	0.70	0.68	0.65
Fish and fish products	0.51	0.49	0.40	0.96	0.54	0.48	0.48	0.52	0.53	0.94	0.93
<b>Plant products:</b>											
Plant materials	0.80	0.89	0.82	0.78	0.73	0.89	0.81	0.70	0.91	1.00	0.99
Processed plant products	0.82	0.83	0.79	0.79	0.84	0.84	0.83	0.85	0.82	0.77	0.78
Stimulants and beverages	0.76	0.90	0.98	1.00	0.96	0.79	0.82	0.80	0.76	0.69	0.64

Source: author’s own analysis.

Exchange intensity ratio  $IG-L$  confirms the existence of intra-industry trade turnover between Poland and the European Union. The closest unity, which is the most intense intra-industry trade in 2014, referred to the trade in raw plant materials index  $IG-L = 0.99$ , fish and fish products  $IG-L = 0.93$  and vegetable preserves the  $IG-L = 0.78$ . In the period 2004-2014 rates for these groups were changing, however, they were characterized by strong intra-industry trade. Strong intra-industry trade concerned live animals in 2008-2010 and condiments and beverages in 2005-2008. Indicators next to zero, which is strong inter-industry trade, was shown in live animals  $IG-L = 0.32$  in the last two years (Table 8).

## Summary

In 2014 the value of Polish agricultural exports and food amounted to 21.5 billion euros, Polish imports amounted to PLN 14.8 billion and the balance was positive at 6.6 billion euros. In trade with the EU, Polish agri-food products in 2014 reached a value of 16.8 billion euros to 15.9 billion euros in 2013 and 3.7 billion euros in 2004. It should be

recognized that over the last 10 years Polish agri-food products have gained recognition on the European Union market. However, the last year pointed to an inhibition of the growth trend of plant materials and animal and vegetable processed products. Polish agri-food products in the period showed a competitive advantage on the EU market. Processed products of animal and vegetable origin dominated in this regard. In 2014 high rates were for sheep, poultry meat and offal, processed meat and cheese and curd group, processed fruits.

Analysis of the Balassa specialization index pointed to a specialization in the group of plant and animal products. The importance of intra-industry trade in agri-food products in Poland increases. The intensity ratio of intra-HG Grubnela and PJ Lloyd confirmed intra-industry trade specialization in the group of plant and processed animals. Among the factors influencing the growth of turnover in agri-food products is the liberalization of trade in the agri-food industry and increased export but also import growth through an increase in the propensity to acquire a variety of new products (Italian cuisine, Spanish, Chinese), which is the result of slow income growth of Poles.

Among the reasons of advantages are modernized agriculture and agri-food industry, modern technologies in manufacturing, high quality raw materials and products and lower production costs. But further innovative measures are necessary to support the competitiveness of Polish food products.

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