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**AGRICULTURE AND FOOD ECONOMY
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Competitiveness of chief producers of plant raw materials in intra-EU trade

Abstract. The aim of the paper was to assess the competitive position of the most important producers of plant raw materials in the intra-EU trade in 2004 and 2008. The analysis covered such product groups as cereals, oil seeds, fruit and vegetable. The competitiveness was assessed with the use of a selected set of quantitative measures of international competitive position. Moreover, the shares of the studied countries in the EU trade were assessed as well as the relative intensity of plant raw materials export from each country.

Key words: competitiveness, comparative advantages, plant raw materials, export, import, the European Union, intra-EU trade

Introduction

Poland is one of the biggest producers of plant raw materials in the EU. It produced in 2008 about 27.7 million ton of cereals and 2.1 million tons of oil seeds respectively, which gave it a position of the third largest producer among the 27 countries of the Community. On the other hand, the crops of 2.8 million ton of fruit and 4.4 million ton of vegetable gave Poland the fourth place with respect to the volume of horticultural production [Eurostat... 2010]. It is worth noting that only the countries whose location and climatic conditions enable the production of citrus fruit and thermophilic vegetable (Italy, France, Spain) produced considerably more fruit and vegetable than Poland. In comparison with the countries of similar climate, e.g. Germany, the United Kingdom or the Netherlands, the volume of Polish horticultural production, especially fruit, is higher.

It must be stressed that 65% of the exports and 70% of the imports of unprocessed plant products from/to Poland was a part of the intra-EU trade. The establishment of a free trade zone and Polish inclusion in the Single European Market increased the openness of the exchange and the Polish agri-food sector began to face strong competitive pressure exerted both by other member states of the Community and the third countries. Thus the fundamental and necessary condition for Polish agricultural and processed food producers to compete effectively in the Single European Market is to meet all requirements of the highly competitive EU market. In this context and also considering the diversified structure of production in the countries of Central and Southern Europe, it is interesting to diagnose the competitiveness of those branches of the Polish agri-food sector which produce plant raw materials with regard to the other important producers of unprocessed plant products in the EU. Hence, the aim of this article is to determine the competitive position of the most important producers of plant raw materials in the intra-EU trade in 2004 and 2008.

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Research method

Data from the Statistical Office of the European Communities, especially from the ComExt database [ComExt... 2010], were used in the paper. The analysis covered the key groups of plant raw materials according to the Combined Nomenclature, i.e. cereals, oil seeds, fruit and vegetable. The objects of the study were the five largest producers (by production volume) of each of the listed groups of unprocessed plant products in the EU, i.e. France, Spain, the Netherlands, Germany, Poland, Portugal, Romania, Hungary, the United Kingdom and Italy.

The competitiveness was assessed by using a selected set of quantitative measures of international competitive position. The following indices were applied: Export Specialisation Index (SI), Import-Export Coverage Ratio (CR), revealed comparative advantage indices including Relative Revealed Comparative Export Advantage Index (XRCA), Relative Import Penetration Index (MRCA), Relative Trade Advantage Index (RTA) and Grubel-Lloyd Intra-Industry Trade Index (IIT)². Moreover, the shares of the studied countries in the EU trade were assessed as well as the relative intensity of export of plant raw materials from each country measured as the exports value per 1 hectare of agricultural area or per one full-time employee in the agricultural sector in reference to the EU average.

² The Export Specialisation Index (SI) compares the share of product i in the l country's exports with the share of the product in the world or regional exports: $SI_k = \frac{X_{ik}}{X_k} : \frac{X_{iw}}{X_w}$, where: X – exports, w – index denoting world.

High SI values are considered desirable. Otherwise, it is possible to conclude that the economy in question or its sector do not have satisfactory competitiveness [Jagiello 2003].

Similarly to the SI, the Export-Import Coverage Ratio (CR): $CR_k = \frac{X_k}{M_k} \cdot 100\%$ where: M – imports, enables a

calculation of export specialisation of a given country within the analysed sector, product or group of products. The coefficient values exceeding 100% specify the specialisation of the analysed country, which gives a possibility to claim that it has a relative advantage over partners [Lubiński, Michalski & Misala 1995].

The indexes of revealed comparative advantages were calculated on the basis of the following formulae:

$$XRCA_{ik} = \frac{X_{ik}}{X_{im}} : \frac{\sum_{j,j \neq i} X_{jk}}{\sum_{j,j \neq i} X_{jm}}, \quad MRCA_{ik} = \frac{M_{ik}}{M_{im}} : \frac{\sum_{j,j \neq i} M_{jk}}{\sum_{j,j \neq i} M_{jm}}, \quad RTA_{ik} = XRCA_{ik} - MRCA_{ik}, \quad \text{where: } X - \text{exports;}$$

M – imports; i, j – product groups; l, m – countries, and then they were generally evaluated with the use of relations between them. Positive RTA index values and XRCA index values larger than unity show high competitiveness (+), but when the RTA index is negative and the MRCA index is larger than unity, the country shows no competitiveness (-). In other cases the results of analysis are not definite (+/-) [Frohberg & Hartmann 1997].

$$\text{Grubel-Lloyd Index (IIT) [Cieslik 2000]: } IIT_k = \frac{(X_{ik} + M_{ik}) - |X_{ik} - M_{ik}|}{(X_{ik} + M_{ik})} \cdot 100\%, \quad \text{where: } k - \text{index}$$

denoting country, was applied to specify the importance of intra-industry trade. High values of the index, which are close to 100%, show the presence of intra-industry exchange, i.e. the exchange with a high degree of overlapping streams of export and import of products from the same branch. However, the IIT index assuming the value close to zero indicates the presence of inter-industry trade. For more information about the methods of international competitiveness measurement see [Pawlak & Poczta 2008].

The competitive situation in the intra-EU trade in plant raw materials

As it results from the study, from 2004 to 2008 oil seeds were the most competitive group of plant raw materials in the intra-EU trade (Table 1). The analysis of revealed comparative advantages proved that the new member states of the EU, such as Romania and Hungary, were characterised by the strongest competitive position in this assortment group (in 2008 RTA = 9.9 for Romania and RTA = 3.1 for Hungary). The highest level of realised export specialisation, measured with the value of SI index, was observed in those countries. The share of oil seeds in the total agri-food exports was from nearly 4 to almost 9 times higher in those countries than in the other countries of the Community. However, it must be noted that the share of those countries in the total trade in the EU was small and fluctuated around 6% for export and only 1% for import (Table 2). Besides, the analysis of a relative export intensity proved that although the value of oil seeds exports per 1 hectare of agricultural area and 1 full-time employee working in agriculture in Hungary was higher than the average in the EU countries by about 80% and 4 times respectively, in Romania it reached the level of slightly more than 70% and nearly 25% of the corresponding average values for the EU (Table 3).

Table 1. Competitiveness of chief producers of oil seeds in the intra-EU trade in 2004-2008

Index	Year	Country				
		France	Poland	Romania	Hungary	United Kingdom
SI	2004	1.25	1.07	6.77	3.74	0.36
	2008	1.25	0.69	8.87	3.53	0.49
CR, %	2004	180.39	93.47	142.50	375.37	19.95
	2008	165.51	55.34	232.09	420.59	26.76
XRCA	2004	1.26	1.07	7.66	3.96	0.35
	2008	1.26	0.69	11.04	3.77	0.48
MRCA	2004	0.47	0.75	0.90	0.85	0.45
	2008	0.53	0.82	1.11	0.72	0.44
RTA	2004	0.78	0.32	6.76	3.11	-0.10
	2008	0.73	-0.13	9.93	3.05	0.04
General evaluation	2004	+	+	+	+	+/-
	2008	+	+/-	+	+	+/-
IIT, %	2004	71.33	96.63	82.48	42.07	33.27
	2008	75.33	71.25	60.22	38.42	42.22

Source: [ComExt... 2010] and own calculations.

On the other hand, France, which generated smaller comparative advantages in the intra-EU trade (RTA = 0.7 both in 2004 and 2008) and realised a lower level of export specialisation (SI = 1.3), was an active participant of the Single European Market. It marketed nearly 20% of the total EU exports of this group of products (Table 2) and generated the exports value per one full-time employee working in the agricultural sector about 2.5 times higher than in the other EU countries (Table 3). In all of the three countries mentioned above, a favourable competitive situation was proved by a surplus in the balance of trade. The highest values were noted in Hungary (CR=375% in 2004 and CR=421% in

2008) (Table 1). Poland and the United Kingdom were characterised by an average level of comparative advantages in the intra-EU trade in oil seeds, but between 2004 and 2008 the competitive position of Poland became worse, whereas the position of the United Kingdom became slightly better.

Table 2. Foreign trade by chief producers of plant raw materials and its role in the European Union trade in 2004-2008

Country	Exports, year				Imports, year			
	2004		2008		2004		2008	
	million euro	%	million euro	%	million euro	%	million euro	%
Cereals								
France	3 993.0	48.7	6 523.5	38.1	478.5	5.2	781.0	4.5
Spain	308.1	3.8	497.0	2.9	1 345.5	14.6	2 565.2	14.8
Germany	1 159.5	14.1	2 568.5	15.0	803.4	8.7	2 071.8	11.9
Poland	36.6	0.4	126.9	0.7	181.9	2.0	566.9	3.3
United Kingdom	455.6	5.6	684.6	4.0	634.9	6.9	1 135.6	6.5
EU-27	8 205.2	100.0	17 121.6	100.0	9 198.4	100.0	17 364.2	100.0
Oil seeds								
France	959.3	19.2	1 524.7	17.8	531.8	5.7	921.2	6.0
Poland	112.1	2.2	196.7	2.3	119.9	1.3	355.5	2.3
Romania	78.8	1.6	467.9	5.5	55.3	0.6	201.6	1.3
Hungary	230.1	4.6	500.5	5.8	61.3	0.7	119.0	0.8
United Kingdom	113.5	2.3	215.2	2.5	568.8	6.1	804.2	5.2
EU-27	4 996.5	100.0	8 562.1	100.0	9 379.4	100.0	15 418.2	100.0
Fruit								
France	1 410.0	9.8	1 473.0	7.4	2 844.1	12.4	3 375.6	11.1
Spain	4 277.0	29.6	5 105.5	25.8	1 208.7	5.2	1 536.1	5.1
Poland	439.2	3.0	705.3	3.6	564.1	2.4	1 032.0	3.4
Portugal	112.2	0.8	187.9	0.9	380.3	1.7	486.5	1.6
Italy	2 011.4	13.9	2 933.4	14.8	1 717.2	7.5	1 958.6	6.4
EU-27	14 430.9	100.0	19 804.7	100.0	23 026.2	100.0	30 398.4	100.0
Vegetables								
France	1 411.2	10.7	1 696.3	10.0	1 815.4	12.5	2 246.6	12.1
Spain	3 348.7	25.4	3 797.9	22.5	833.4	5.7	916.3	4.9
Netherlands	3 994.0	30.3	5 267.1	31.1	1 466.6	10.1	1 831.5	9.8
Poland	431.9	3.3	745.4	4.4	158.4	1.1	413.3	2.2
Romania	39.2	0.3	41.7	0.2	41.0	0.3	155.1	0.8
EU-27	13 174.0	100.0	16 911.8	100.0	14 546.6	100.0	18 624.0	100.0

Source: [ComExt... 2010] and own calculations.

It is worth noting that the oil seeds trade had an intra-industry character, which was strongest in Poland and Romania ($60\% < IIT < 97\%$). The high extent of overlapping streams of exports and imports in this commodity group can be justified by a complementary character of production structures and, in consequence, trade between the abovementioned countries and the countries being their trade partners. In Poland and Romania it is almost but the oilseed rape that is grown on a large scale, whereas the demand for other seeds is traditionally satisfied by the supply from imports.

Fruit and vegetable producers were characterised by a lower level of competitiveness in the Single European Market in comparison with oil seeds producers (Tables 4 and 5). Spain gained the highest profit from the intra-EU trade in horticultural products; it was the second producer and the first exporter of those products among the EU countries. Spain produced 11.2 million ton of fruit in 2008 and 8.9 million ton of vegetable [Eurostat... 2010] and about 25-30% of the total exports in those assortment groups in the EU came from that country (Table 2). Spain's strong competitive position was proved both by the results of summary evaluation of the indices of revealed comparative advantages ($XRCA > 3$ and $2 < RTA < 3$) and the value of the generated turnover surplus (Tables 4 and 5). The income from vegetable exported from Spain exceeded the import expenses for the same commodity group by 4 times ($CR = 402\%$ in 2004 and $CR = 414\%$ in 2008) and the value of fruit exports was more than 3 times higher than the corresponding imports value ($CR = 402\%$ in 2004 and $CR = 414\%$ in 2008). Also, Spain realised the highest degree of export specialisation among the analysed countries ($2.8 < SI < 3.4$), but simultaneously, due to the diversified structure of its own production it had the least intense intra-industry trade (on average $IIT = 39\%$ for vegetables and $IIT = 45\%$ for fruit). It is necessary to add that the value of exports of horticultural products per 1 hectare of agricultural area in Spain was nearly 2 times higher than the average value in the EU. As far as the number of full-time employees working in agriculture is concerned, the value of exports from that country exceeded the average value in the other countries of the Community by 2.5 to 3.5 times (Table 3).

The Netherlands and Poland were characterised by a similar level of comparative advantages ($XRCA$, $MRCA$, RTA), degree of export specialisation (SI) and surplus in the balance of trade (CR) in vegetable turnover (Table 4). However, the share of the Netherlands in the EU trade in this group of products was about 10 times higher than the share of Poland (Table 2), whereas the intensity of exports per 1 hectare of agricultural area and per one full-time employee in 2008 was respectively nearly 60 and 70 times higher than in Poland and about 25 times and 30 times higher than in the EU (Table 3)³. Romania and France were distinguished by the weakest competitive position and turnover deficit (Tables 2 and 4). Romania was additionally marked by its marginal role in the intra-EU vegetable trade⁴. The surplus of import expenses over the income from exports of vegetable in those countries can be explained by a very high share of intra-industry trade in the total turnover (e.g. in 2004 in France $IIT = 87\%$ and in Romania $IIT = 98\%$).

³ However, it must be stressed that the high values of indices of relative export intensity for the Netherlands are largely determined by a considerable re-exportation which results from the profile of Dutch agriculture. It is geared towards the greenhouse growing of vegetable and flowers, production of flower bulbs and plant nursery production [Rowiński 2009].

⁴ In 2004 and 2008, the Romania's share in the total EU exports of vegetable did not exceed 0.5% and in the imports it did not exceed 1% (Table 2). However, the exports value per 1 hectare of agricultural area was about 3% of the EU average and the value per one full-time employee working in agriculture reached only 1% (Table 3).

Table 3. Relative intensity of exports (I – as the exports value per 1 hectare of UAA, II – as the exports value per one full-time employee) of plant raw materials in the studied countries in 2004 and 2008

Country	Relative intensity of exports I, year (EU=100)		Relative intensity of exports II, year (EU=100)	
	2004	2008	2004	2008
Cereals				
France	2.67	2.32	4.87	5.71
Spain	0.24	0.20	0.37	0.39
Germany	1.35	1.58	1.63	2.03
Poland	0.04	0.08	0.02	0.04
United Kingdom	0.53	0.47	1.51	1.14
EU-27	1.00	1.00	1.00	1.00
Oil seeds				
France	1.05	1.08	1.92	2.67
Poland	0.22	0.26	0.09	0.12
Romania	0.18	0.71	0.05	0.24
Hungary	1.28	1.81	2.17	4.00
United Kingdom	0.22	0.29	0.62	0.72
EU-27	1.00	1.00	1.00	1.00
Fruit				
France	0.54	0.45	0.98	1.11
Spain	1.91	1.80	2.92	3.47
Poland	0.30	0.41	0.12	0.19
Portugal	0.33	0.45	0.12	0.19
Italy	1.72	1.99	1.43	1.96
EU-27	1.00	1.00	1.00	1.00
Vegetable				
France	0.59	0.61	1.07	1.50
Spain	1.63	1.57	2.51	3.03
Netherlands	25.55	28.81	11.43	16.40
Poland	0.33	0.50	0.13	0.24
Romania	0.03	0.03	0.01	0.01
EU-27	1.00	1.00	1.00	1.00

Source: [ComExt... 2010; Agriculture... 2006; Agriculture... 2010] and own calculations.

Besides Spain, Italy also reached a significant comparative competitiveness in the fruit trade in the Single European Market (Table 5). It produced in 2008 nearly 21 million ton of fruit [Eurostat... 2010], supplied nearly 15% of exports in this group of products in the EU (Table 2) and it reached about 2 times higher exports intensity than its average in the EU (Table 3). However, Italy's indices of export specialisation (SI), import/export coverage ratio (CR) and relative trade advantage (RTA) were about 2 times lower than for Spain (Table 5). On the other hand, the scale of intra-industry trade in that country was much

larger. In 2004 the Grubel-Lloyd Index (IIT) fluctuated around 90% and in 2008 it was lower by 10 percentage points.

Table 4. Competitiveness of chief producers of vegetable in the intra-EU trade in 2004 and 2008

Index	Year	Country				
		France	Spain	the Netherlands	Poland	Romania
SI	2004	0.70	2.91	1.54	1.56	1.28
	2008	0.71	2.77	1.66	1.33	0.40
CR (%)	2004	77.73	401.81	272.33	272.59	95.61
	2008	75.51	414.48	287.58	180.33	26.89
XRCA	2004	0.69	3.25	1.59	1.61	1.30
	2008	0.70	3.04	1.71	1.35	0.39
MRCA	2004	1.07	0.73	0.93	0.63	0.42
	2008	1.10	0.66	0.86	0.79	0.69
RTA	2004	-0.38	2.52	0.67	0.98	0.88
	2008	-0.41	2.39	0.86	0.56	-0.31
General evaluation	2004	-	+	+	+	+
	2008	-	+	+	+	+/-
IIT (%)	2004	87.47	39.86	53.72	53.68	97.76
	2008	86.04	38.87	51.60	71.34	42.38

Source: [ComExt... 2010] and own calculations.

Of the southern countries, the least importance and average competitive advantages in the intra-Community fruit trade were noticed for Portugal. France, which generated 7-10% of the export supply and more than 10% of the demand for imported products, was void of those advantages (Tables 2 and 5). In both countries a turnover deficit was noted (CR<100%) and they did not achieve an export specialisation in this commodity group. The share of revenue from the exports of fruit in the total revenue from exports of agri-food products in Portugal was lower by about 15% (SI=0.87 in 2004 and SI=0.83 in 2008), whereas in France it was as much as 50% lower (SI=0.52 in 2008) than in the other EU countries. In view of the analysis, Poland was marked by a slightly better competitive position than France, but still it could be evaluated as low. It is worth noting that in Poland and Romania in the post-accession period lower comparative advantages appeared in the trade in horticultural products in the Single European Market. After 2004 in consequence of the introduction of rules of Common Agricultural Policy (CAP) in the new member states, the prices of fruit and vegetable increased and the relative price change caused the weakening of competitive position of horticultural products from those countries [Pawlak et al. 2010], which resulted in decreasing values of SI, CR, XRCA and RTA indices.

In cereal trade, only France achieved a high level of competitive advantages in the Single European Market. It was the chief cereal producer (70 million ton in 2008) and exporter among the EU countries [Eurostat... 2010]. The share of France in the total exports of cereals from the EU was nearly 50% in 2004 and 40% in 2008 (Table 2), which was also reflected by the values of export specialisation index, indicating that the revenues gained in the exports of cereal grains in France were more than one tenth of the total EU

agri-food exports value. This share was about 3 times higher than in the other member states of the Community (SI=3.2 in 2004 and SI=2.7 in 2008) (Table 6).

Table 5. Competitiveness of chief fruit producers in the intra-EU trade in 2004 and 2008

Index	Year	Country				
		France	Spain	Poland	Portugal	Italy
SI	2004	0.64	3.39	1.45	0.87	1.77
	2008	0.52	3.18	1.07	0.83	1.94
CR (%)	2004	49.58	353.85	77.87	29.50	117.13
	2008	43.64	332.37	68.35	38.62	149.77
XRCA	2004	0.62	3.97	1.49	0.86	1.86
	2008	0.51	3.66	1.08	0.82	2.06
MRCA	2004	1.06	0.66	1.51	0.77	0.69
	2008	1.01	0.67	1.24	0.72	0.67
RTA	2004	-0.44	3.31	-0.02	0.09	1.17
	2008	-0.50	2.99	-0.17	0.10	1.38
General evaluation	2004	-	+	-	+/-	+
	2008	-	+	-	+/-	+
IIT (%)	2004	66.29	44.07	87.56	45.56	92.11
	2008	60.76	46.26	81.20	55.72	80.07

Source: [ComExt... 2010] and own calculations.

Table 6. Competitiveness of chief cereals producers in the intra-EU trade in 2004 and 2008

Index	Year	Country				
		France	Spain	Germany	Poland	United Kingdom
SI	2004	3.17	0.43	1.05	0.21	0.87
	2008	2.69	0.36	0.99	0.22	0.77
CR (%)	2004	834.48	22.90	144.32	20.14	71.76
	2008	835.28	19.37	123.97	22.39	60.29
XRCA	2004	3.41	0.42	1.05	0.21	0.86
	2008	2.94	0.35	0.99	0.21	0.76
MRCA	2004	0.43	1.96	0.50	1.17	0.51
	2008	0.40	2.11	0.67	1.18	0.56
RTA	2004	2.98	-1.54	0.56	-0.97	0.36
	2008	2.54	-1.76	0.32	-0.97	0.21
General evaluation	2004	+	-	+	-	+/-
	2008	+	-	+/-	-	+/-
IIT (%)	2004	21.40	37.26	81.86	33.53	83.56
	2008	21.38	32.46	89.30	36.59	75.22

Source: [ComExt... 2010] and own calculations.

The intensity of exports measured by its value per 1 hectare of agricultural area was more than 2 times higher than in the EU the value per 1 full-time employee even more than

5 times higher (Table 3). France's favourable competitive position in cereal trade was also confirmed by the result of balance of trade, which showed that the exports were 8 times higher than the imports of that group of products (CR=835%) (Table 6). It is necessary to note that in contrast to the other countries subjected to this analysis, France had a clearly inter-industry trade in cereal grains (IIT=21%), determined by the highest level of food self-sufficiency in cereals of all the EU countries (186% in the economic year 2007/2008) [Agriculture... 2010]. Spain and Poland were characterised by a higher (but under 40%) intensity of intra-industry trade (IIT), an absence of revealed comparative advantages (MRCA>1 and RTA<0) and export specialisation (SI) and a turnover deficit (CR) (Table 6). Poland was also distinguished by the lowest relative export intensity of all of the analysed countries (Table 3). Because of a relatively low volume of cereal grain imports to Poland (Table 2) it is possible to think that the high production potential (28 million ton in 2008) causes the cereal imports to be only a supplement to the domestic production in the years of poor harvest or, that due to climatic limitations, it is inevitable (durum wheat) [Pawlak 2009]. The highest share of intra-industry trade in the total turnover of cereals (75%<IIT<89%) with a simultaneous average level of competitive advantages was noted in Germany and the United Kingdom (Table 6).

Concluding remarks

On the basis of the conducted analyses it is possible to conclude that among all of the studied groups of products the oil seeds were marked by the highest competitive advantages in the intra-EU trade. Hungary gained the strongest competitive position in the trade in this group of products, in cereal trade it was France and in the turnover of horticultural products Spain achieved the highest comparative surplus. All of those countries had constant advantages resulting from the scale of production and/or natural conditions (nature and climate rent) affecting the profitability of production of plant raw materials. Apart from cereals, Poland was characterised by a relatively strong competitive position in the Single European Market. However, it is necessary to pay attention to its minor significance in the structure of total agri-food trade in the EU and its low export intensity, usually reaching at most 30-40% of the average value for all the countries of the Community.

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