

Changes in Foreign Trade in Agricultural Products between China and Poland

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Abstract: The purpose of this paper is to determine the changes in bilateral trade in agricultural products between China and Poland and to assess the comparative advantages of the major agricultural product groups in 2010-2017. The paper is based on data retrieved from the UN Comtrade database. The analysis covers the value and commodity structure of agricultural trade between China and Poland. The level of comparative advantages of the main product groups (XRCA, MRCA, RTA), coverage ratio (CR), and intra-industry trade index (IIT) was also shown. It turns out that the bilateral trade in agricultural products between China and Poland increased significantly between 2010 and 2017 due to “Go China” project and 16+1 platform China-Poland. The main feature of trade relations between China and Poland is substantial trade asymmetry.

1. INTRODUCTION

China and Europe are far apart, but they have a long history and a traditional friendly relationship. Since the beginning of the 21st century, bilateral agricultural trade has developed rapidly, and the trade volume has reached a record high. Bilateral trade in agri-food products has grown particularly rapidly since the global financial crisis in 2008, and the Chinese Ministry of Agriculture officially proposed for the first time a foreign agricultural investment strategy in 2008, encouraging foreign investment by agricultural enterprises.

China is Poland's largest trading partner in Asia. According to UN Comtrade data, in 2017 the value of total commodity export from China to Poland reached 17.9 billion USD and it was nearly 50% more than in 1992. Agricultural trade between China and Poland also increased. The export value rose from nearly \$297 in 2010 to \$356 million in 2017. At the same time, 3-fold increase in import value of agricultural products from Poland was noticed, from around \$39 million to \$118 million. Economic and trade cooperation between China and Poland is essential for both countries.

Poland located in the center of Europe it is a bridge connecting Europe and Asia. It has a superior geographical position, radiating Western Europe and Eastern Europe, and is the geographic core of the “Belt and Road.” Poland occupies unique geographical advantages. So far, there are many routes between China and Europe through Poland.

In December 2011, Poland emphasized the trade relationship between the two countries and formally signed a joint statement on the establishment of a strategic partnership between China and Poland [1]. In 2012, Poland proposed the establishment of the “Go China” project, which was

officially launched in the same year, and the Chinese translation of this project is called "Towards China". The main contents of this project are the expansion of import-export trade between China and Poland, the strengthening of deep level cooperation between SMEs in both countries, the attraction of China's investment in Ningbo, specific areas such as information technology and mining. Development of cooperation in Then, 16 Central and Eastern European countries held the first China Middle East Eastern Summit in Warsaw. This is a 16 + 1 platform. Since "16 + 1" cooperation began, China's economic and trade mutual trust with 16 countries in the Middle East and Eastern Europe has been significantly strengthened, and business, investment, infrastructure, regional exchanges, transport and logistics, energy and other fields established good cooperation and achieved excellence. The result is a broad economic and trade cooperation between China and Eastern European countries. These projects also provided new vitality to Poland's economic development and reduced social problems such as unemployment. According to media reports, Chinese companies have created about 15,000 jobs in Poland, with Poles accounting for 80% of all employees [2].

2. RESEARCH MATERIALS AND METHODS

The range of agricultural products in this article includes all products from Chapters 1 to 24 based on UN Comtrade and all products from Chapters 50 to 53 (see Table 1). This article is based on the HS2002 Commodity Classification. The research data is from UN Comtrade; the data range is 2010-2017. The analysis covered the trade balance, shares in total trade and commodity structure of bilateral trade in agricultural products between China and Poland in 2010-2017. The following indices were calculated: selected revealed comparative advantage indices (XRCA, MRCA, RTA), the coverage ratio (CR), the Grubel-Lloyd intra-industry trade index (IIT).

The following formula were used to calculate the comparative advantage indexes: $XRCA_{ik} = \frac{X_{ik}}{X_{im}} \cdot \frac{\sum_{j,j \neq i} X_{jk}}{\sum_{j,j \neq i} X_{jm}}$, $MRCA_{ik} = \frac{M_{ik}}{M_{im}} \cdot \frac{\sum_{j,j \neq i} M_{jk}}{\sum_{j,j \neq i} M_{jm}}$, $RTA_{ik} = XRCA_{ik} - MRCA_{ik}$, where: X - export; M –import; i, j - product categories; k, m – countries. The indices were generally evaluated with the use of relations between them. A positive value of RTA index with XRCA above unity indicate high competitiveness (+), whereas a negative RTA value and MRCA greater than 1 indicates that the country is not competitive (-). In the other cases, the results of the analysis are not definite (+/-). Export specialisation in a specific group of products was determined using the Export-Import Coverage Ratio (CR): $CR_k = \frac{X_{ik}}{M_{ik}} * 100\%$. The intra-industry trade intensity was determined by means of the Grubel-Lloyd index (IIT): $IIT_k = \frac{(X_{ik}+M_{ik})-|X_{ik}-M_{ik}|}{(X_{ik}+M_{ik})} * 100\%$. The existence of intra-industry trade, i.e. exchange in which the lines of exports and imports of products of the same industry overlap to a large extent, is indicated by values close to 100%. In contrast, an IIT index close to zero points to the existence of inter-industry trade [3].

Table 1: HS Agricultural Product Code Classification

HS	Agricultural Product	HS	Agricultural Product
01	Live animals	15	Animal and vegetable oils and fats; refined edible oils and fats
02	Meat and edible chop	16	Meat, fish and other aquatic invertebrate products
03	Fish and other aquatic invertebrates	17	Sugar and confectionery
04	Milk; eggs; honey; other edible animal products	18	Cocoa and cocoa products
05	Other animal products	19	Cereal flour, starch, etc. or dairy products; cakes
06	living plants; stems, roots; flower arrangements, tufted leaves	20	Products of vegetables, fruits or other parts of plants
07	Edible vegetables, roots and tubers	21	Miscellaneous food
08	Edible fruits and nuts; fruit peels such as melon	22	Beverages, wine and vinegar
09	Coffee, tea, mate and spices	23	Food industry residues and waste; formulated feed
10	Grains	24	Tobacco, tobacco and tobacco substitute products
11	Milling products; malt; starch, etc.; gluten	50	Silk
12	Oilseeds; kernels; industrial medicinal plants; feed	51	Wool and other animal hair
13	Shellac; gum, fat and other plant liquids, juice	52	Cotton
14	Planting materials for planting; other plant products	53	Other plant fibers

Data source: According to the UN Comtrade database.

3. THE VALUE AND BALANCE OF BILATERAL TRADE IN AGRICULTURAL PRODUCTS BETWEEN CHINA AND POLAND

Table 2 summarizes GDP growth rates in China and Poland from 2010 to 2017. It is shown that the GDP growth rate in China and Poland was steadily increasing over this period. Foreign trade is an important factor affecting the economic development in both countries. One reason for supporting the trade between China and Poland was the establishment of the "Go China" project which was officially launched in 2012. In 2013 China's President Xi Jinping proposed "The Silk Road Economic Belt and the 21st-century Maritime Silk Road". Subsequently, 16 Central and Eastern

European countries held the first Central and Central Eastern Europe Summit in Warsaw. This policy is called the “16+1” platform, and under these policies, China-Poland economic relations were improved.

The primary objective of the “Go China” project was to strengthen trade with China, deepen economic and business relations between the two countries, increase Chinese investment in Poland and expand cooperation in both countries [4]. Agricultural products are one of the important product groups traded between China and Poland. Table 3 shows agricultural trade between China and Poland from 2010 to 2017. As indicated in Table 3, the value of agricultural trade between China and Poland increased. Imports from Poland to China has grown more dynamically than exports from China to Poland, however the trade balance was constantly positive for China. The main feature of trade relations between China and Poland is that the trade asymmetry is substantial. In 2017, the difference between Polish imports of Chinese products and Chinese imports of Polish products was about 5 times. In agricultural trade this imbalance was lower and equaled to around 3 times, while in 2010 it amounted to 7.5 times. Trade imbalance was gradually decreasing, however demonstrating that there still exists a substantial trade possibility between China and Poland.

Table 2: GDP growth rate in China and Poland in 2010-2017 (%)

	2010	2011	2012	2013	2014	2015	2016	2017
China	10.64	9.54	7.86	7.76	7.3	6.9	6.7	6.9
Poland	3.61	5.02	1.61	1.39	3.28	3.84	2.86	4.55

Source: World Bank data.

Table 3: Foreign trade between China and Poland in 2010–2017

Specification	2010	2011	2012	2013	2014	2015	2016	2017
million USD								
Trade in total products								
Import	1,696.6	2,047.9	1,997.7	2,231.7	2,934.7	2,741.9	2,537.7	3,353.5
Export	9,438.3	10,939.5	12,386.7	12,574.9	14,256.8	14,344.9	15,094.1	17,873.1
Balance	7,741.7	8,891.6	10,389.0	10,343.2	11,322.1	11,603.0	12,556.4	14,519.6
Trade in agricultural products								
Import	38.8	51.8	75.8	207.7	240.9	170.0	131.4	118.3
Export	296.7	341.6	308.5	327.5	320.7	319.0	299.3	355.7
Balance	257.9	289.8	232.7	119.8	79.8	149.0	167.9	237.4
Share of agricultural products in total products (%)								
Import	2.29	2.53	3.79	9.31	8.21	6.20	5.18	3.53
Export	3.14	3.12	2.49	2.60	2.25	2.22	1.98	1.99

Data source: According to the UN Comtrade database.

4. THE COMMODITY STRUCTURE OF EXCHANGE AND COMPARATIVE ADVANTAGES IN AGRICULTURAL TRADE BETWEEN CHINA AND POLAND

As can be seen from Table 4, in 2017 the most important products imported from Poland to China were: milk, eggs, honey and other edible animal products (chapter 04); preparations of cereals, flour, starch or milk; pastrycooks' products (chapter 19); sugar and confectionery (chapter 17); cocoa and cocoa products (chapter 18); beverages, wine and vinegar (chapter 22). These product groups amounted to over 70% of total value of agri-food import from Poland to China. Around \$83.5

million were spent on them in 2017 and this value was 5-fold higher than in 2010. Only dairy products accounted for nearly 50% of total imports value. The main reason for this is that China's milk production is minimal, which makes China to import dairy products from abroad, among others from Australia and Poland [5]. China has not yet achieved self-sufficiency in many agricultural products including milk and is still dependent on world soil and water resources. This way, China imports essential goods and food products that meet strict food safety standards. The increase in dairy imports to China depends not only on production volume, structural and economic factors but also on programs promoting milk consumption at schools. Importantly, the structure of agri-food export from Poland to China reflects the distribution of the competitive advantages that Polish exporters have gained in the Chinese market. Compared with the other European Union countries, Poland's sugar production is relatively high and Polish sugar industry has relatively high export potential. Due to this fact, sugar and confectionery exported from Poland to China accounted for around 7% of total agricultural exports [6].

As far as export from China to Poland is concerned, in 2017 the major product items were: fish and crustaceans, molluscs and other aquatic invertebrates (chapter 03); animal originated products; not elsewhere specified or included (chapter 05); preparations of vegetables, fruits, nuts or other parts of plants (chapter 20); and cotton (chapter 52). The value of those products exported from China reached more than \$200 million in 2010 and 2017 and it was amounted to nearly 60% of total Chinese exports to Poland.

According to United States Department of Agriculture, in 2017 the estimated total fish and seafood catch of Poland was 196,900 metric tons (MT), including Baltic Sea fish and deep-sea long-distance fishing. Despite the increase in catches in deep waters, the total catches of Poland in 2017 decreased by 1% compared to 2016, due to a lower catch of the Baltic Sea. The Polish fish processing industry is the fourth largest in Europe, with 263 processing units, which transport products throughout the EU. Several hundred smaller, often family-owned companies also sell products only within the immediate region. Fish and shellfish imports in 2016 exceeded \$2 billion. Poland mainly imports raw fish for further processing by the local processing industry [7]. In 2017 Poland imported from China fish and crustaceans, molluscs and other aquatic invertebrates (chapter 03) worth \$86.5 million (Table 4).

As can be seen from Table 5, in 2017 the competitive products exported from China to Poland were: fish and crustaceans, molluscs and other aquatic invertebrates (chapter 03); animal originated products; not elsewhere specified or included (chapter 05); edible vegetables, roots and tubers (chapter 07); vegetable plaiting materials (chapter 14); animal and vegetable oils and fats; refined edible oils and fats (chapter 15); preparations of vegetables, fruits, nuts or other parts of plants (chapter 20); food industry residues and waste; prepared animal fodder (chapter 23); tobacco, tobacco and tobacco substitute products (chapter 24); wool, fine and coarse animal hair (chapter 51); cotton (chapter 52); and other plant fibers (chapter 53). It is worth noting that product groups having the biggest share in the total exports from China had the favourable competitive position on Poland's market. It is also important that trade in all the highly competitive commodities were characterized by positive trade balance expressed by the Coverage Ratio index larger than 100%. Top 3 competitive chapters with positive Coverage Ratio exported from China to Poland were: cotton (chapter 52); other plant fibers (chapter 53); and wool, fine and coarse animal hair (chapter 51). In 2017 the value of trade surplus in these chapters amounted to \$24 million; \$13 million; and \$15 million respectively.

The competitive products exported from Poland to China were: live animals (chapter 01); milk, eggs, honey and other edible animal products (chapter 04); trees and other plants, live (chapter 06); sugar and confectionery (chapter 17); cocoa and cocoa products (chapter 18); preparations of cereals, flour, starch or milk; pastrycooks' products (chapter 19); beverages, wine and vinegar

(chapter 22). We can also notice that major products exported from Poland to China were competitive on this Asian market, while the value of trade balance was positive in 2017. The highest Coverage Ratio was observed in trade in live animals (chapter 01); cocoa and cocoa products (chapter 18); and preparations of cereals, flour, starch or milk; pastrycooks' products (chapter 19).

When having both the high level of comparative advantages and relatively big share in the export value it can be concluded about the strong competitive position in particular products on the analysed market. The top 5 strongly competitive chapters in mutual trade between China and Poland are presented in Table 6.

As demonstrated in Table 7, indices of intra-industry trade in agricultural products between China and Poland shown that trade in edible fruit and nuts (chapter 08); sugar and confectionery (chapter 17); beverages, wine and vinegar (chapter 22) was of an intra-industry nature. It means that both countries plays a role of exporter and importer in mutual trade at the same time, and their products are competitive on destination markets.

Table 4: Commodity structure of agricultural trade between China and Poland in 2010-2017

H S	Import						Export						Balance	
	2010			2017			2010			2017			2010	2017
	(USD)	(%)	(USD)	(%)	year chan ge (%)		(USD)	(%)	(USD)	(%)	year chan ge (%)		(USD)	
1	0	0	852,877	0.72	x		0	0	108	0	x		0	-852,769
2	0	0	3,638,771	3.08	x		0	0	0	0	x		0	-3,638,771
3	1,043,405	2.69	1,761,673	1.49	-0.45		102,284,305	34.47	86,490,458	24.32	-0.29		101,240,900	84,728,785
4	11,497,755	29.65	54,928,093	46.43	0.57		5,575,182	1.88	17,603,771	4.95	1.63		-5,922,573	-37,324,322
5	15,119,416	38.98	3,069,855	2.59	-0.93		64,631,512	21.78	67,820,877	19.07	-0.12		49,512,096	64,751,022
6	37,413	0.1	742,813	0.63	5.51		127,468	0.04	148,230	0.04	-0.03		90,055	-594,583
7	11,537	0.03	482,911	0.41	12.72		22,052,399	7.43	16,731,471	4.7	-0.37		22,040,862	16,248,560
8	4,034,947	10.4	3,817,865	3.23	-0.69		8,755,437	2.95	8,810,864	2.48	-0.16		4,720,490	4,992,999
9	25,021	0.06	2,979,828	2.52	38.04		3,272,989	1.1	8,027,027	2.26	1.05		3,247,968	5,047,199
10	0	0	0	0	x		233,500	0.08	0	0	-1		233,500	0
11	1,330,404	3.43	1,462,320	1.24	-0.64		40,540	0.01	0	0	-1		-1,289,864	-1,462,320
12	260,854	0.67	2,281,279	1.93	1.87		10,963,333	3.7	11,237,596	3.16	-0.14		10,702,479	8,956,317
13	160	0	0	0	-1		1,686,916	0.57	11,884,783	3.34	4.88		1,686,756	11,884,783
14	0	0	36,856	0.03	x		1,024,330	0.35	3,787,061	1.06	2.08		1,024,330	3,750,205
15	69,878	0.18	131,446	0.11	-0.38		798,014	0.27	1,701,289	0.48	0.78		728,136	1,569,843
16	3,134	0.01	199,638	0.17	19.88		1,101,156	0.37	829,724	0.23	-0.37		1,098,022	630,086
17	2,595,728	6.69	8,547,027	7.22	0.08		1,725,520	0.58	4,234,315	1.19	1.05		-870,208	-4,312,712

18	346,574	0.89	7,137,537	6.03	5.75	1,583,583	0.53	38,701	0.01	-0.98	1,237,009	-7,098,836
19	570,087	1.47	15,733,055	13.3	8.05	1,261,378	0.43	785,410	0.22	-0.48	691,291	-14,947,645
20	342,209	0.88	2,293,852	1.94	1.2	36,685,983	12.36	25,636,739	7.21	-0.42	36,343,774	23,342,887
21	167,685	0.43	2,823,184	2.39	4.52	2,200,989	0.74	9,725,424	2.73	2.69	2,033,304	6,902,240
22	895,452	2.31	4,262,840	3.6	0.56	175,025	0.06	2,241,128	0.63	9.68	-720,427	-2,021,712
23	0	0	229,859	0.19	x	2,838,696	0.96	8,039,170	2.26	1.36	2,838,696	7,809,311
24	2,239	0.01	749,007	0.63	108.67	15,015,867	5.06	16,543,520	4.65	-0.08	15,013,628	15,794,513
50	0	0	0	0	x	506,261	0.17	1,008,977	0.28	0.66	506,261	1,008,977
51	398,450	1.03	37,415	0.03	-0.97	4,110,422	1.39	14,978,919	4.21	2.04	3,711,972	14,941,504
52	32,218	0.08	7,152	0.01	-0.93	7,784,293	2.62	24,251,184	6.82	1.6	7,752,075	24,244,032
53	0	0	98,607	0.08	x	266,538	0.09	13,139,830	3.69	40.12	266,538	13,041,223

Data source: own calculations based on UN Comtrade database.

Table 5: Competitiveness of China and Poland in bilateral trade in a agricultural products in 2017

Competitive advantage of China on Polish market						Competitive advantage of Poland on Chinese market				
H S	CR(%)	XRCA	MRCA	RTA	General evaluation	CR(%)	XRCA	MRCA	RTA	General evaluation
0100	0.01	0	23915.45	-23915.45	-	789700.93	23915.45	0	23915.45	+
0200	0	0	x	x		x	x	0	x	
0300	4909.56	21.25	0.05	21.21	+	2.04	0.05	21.25	-21.21	-
0400	32.05	0.06	16.65	-16.59	-	312.02	16.65	0.06	16.59	+
0500	2209.25	8.84	0.11	8.73	+	4.53	0.11	8.84	-8.73	-
0600	19.96	0.07	15.16	-15.09	-	501.12	15.16	0.07	15.09	+
0700	3464.71	12.04	0.08	11.96	+	2.89	0.08	12.04	-11.96	-
0800	230.78	0.76	1.31	-0.55	-	43.33	1.31	0.76	0.55	+
0900	269.38	0.89	1.12	-0.23	-	37.12	1.12	0.89	0.23	+
1000	x	x	x	x		x	x	x	x	
1100	0	0	x	x		x	x	0	x	
1200	492.6	1.66	0.6	1.06	+	20.3	0.6	1.66	-1.06	-

1										
3	x	x	0	x		0	0	x	x	
1	10275.29	34.53	0.03	34.5	+	0.97	0.03	34.53	-34.5	-
4										
1	1294.29	4.32	0.23	4.09	+	7.73	0.23	4.32	-4.09	-
5										
1	415.61	1.38	0.72	0.66	+	24.06	0.72	1.38	-0.66	-
6										
1	49.54	0.15	6.46	-6.31	-	201.85	6.46	0.15	6.31	+
7										
1	0.54	0	590.04	-590.03	-	18442.77	590.04	0	590.03	+
8										
1	4.99	0.01	69.31	-69.3	-	2003.16	69.31	0.01	69.3	+
9										
2	1117.63	3.93	0.25	3.67	+	8.95	0.25	3.93	-3.67	-
0										
2	344.48	1.15	0.87	0.28	+	29.03	0.87	1.15	-0.28	-
1										
2	52.57	0.17	5.9	-5.73	-	190.21	5.9	0.17	5.73	+
2										
3	3497.44	11.88	0.08	11.79	+	2.86	0.08	11.88	-11.79	-
2										
4	2208.73	7.66	0.13	7.53	+	4.53	0.13	7.66	-7.53	-
5										
0	x	x	0	x		0	0	x	x	
5										
1	40034.53	138.97	0.01	138.96	+	0.25	0.01	138.97	-138.96	-
5	339082.5	1210.2	0	1210.24	+	0.03	0	1210.2	-1210.2	-
2	5	4						4	4	-
5										
3	13325.45	45.98	0.02	45.96	+	0.75	0.02	45.98	-45.96	-

Data source: own calculations based on UN Comtrade database.

Table 6: The top 5 chapters of agricultural products in trade between China and Poland in 2017

Import			Export		
HS Code	thous. USD	Percentage of total agricultural import (%)	HS Code	thous. USD	Percentage of total agricultural export (%)
04	54,928.10	46.43	03	86,490.50	24.32
19	15,733.10	13.3	05	67,820.90	19.07
17	8,547.00	7.22	20	25,636.70	7.21
18	7,137.50	6.03	52	24,251.20	6.82
22	4,262.80	3.6	04	17,603.80	4.95

Data source: own calculations based on UN Comtrade database.

Table 7: Indices of intra-industry trade in agricultural products between China and Poland in 2017 (%)

HS Code	01	02	03	04	05	06	07
IIT	0.03	0	3.99	48.54	8.66	33.27	5.61
HS Code	08	09	10	11	12	13	14
IIT	60.46	54.14	x	0	33.75	0	1.93
HS Code	15	16	17	18	19	20	21
IIT	14.34	38.79	66.26	1.08	9.51	16.43	45
HS Code	22	23	24	50	51	52	53
IIT	68.92	5.56	8.66	0	0.5	0.06	1.49

Data source: own calculations based on UN Comtrade database.

5. SUMMARY

In recent years, China-Poland agricultural trade has experienced the development, especially in case of import from Poland to China. However China-Poland agricultural trade asymmetry is substantial, and from 2010-2017 China has always been in a trade surplus. Unprocessed animal products, plant raw materials, and fish products are the main products traded between China and Poland. It is worth noting that product groups having the biggest share in the total export value in both countries had strong competitive position on destination market expressed by the comparative advantage and positive trade balance.

China and Poland should strengthen communication and coordination of agricultural economic and trade policies and create a favourable trade environment. Trade cooperation will inevitably be affected by other international uncertainties. It is necessary to promote the Polish “Go China” plan to link with China’s “Belt and Road” and actively explore a series of policy measures to promote trade liberalization and facilitation. Jointly planning the infrastructure construction of the sea-rail combined transport logistics channel should increase the future potential of China-Poland agricultural products trade.

China needs to increase imports of agricultural products from Poland and gradually change trade imbalances. Poland's apples, poultry, blackcurrant, cabbage, triticale, dairy products, and other products have a high reputation in the EU. China can appropriately expand imports to suit the needs of Chinese consumers, and gradually decrease the trade deficit of Poland's agricultural products with China.

In summary, China-Poland agricultural trade has great complementarity and cooperation potential and it is important to focus on the development of China-Poland agricultural trade due to its comparative advantage and complementarity. Strengthening agricultural economic cooperation between China and Poland will undoubtedly play a decisive role in promoting the economic development of China and Poland.

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