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The analysis of production and trade patterns in cocoa market worldwide and in Poland

Abstract. Cocoa belongs to the group of one of the most valuable commodities in the world. Most production of cocoa beans takes place in the African countries in the Equatorial "Cocoa Belt". However, most processing of raw products is made in Western European countries. Poland is a substantial producer of confectionery chocolate products, therefore the country imports cocoa butter and cocoa paste, which gives it 8th and 6th place in the world in terms of quantity imported. This paper presents an analysis of the world's major cocoa trading countries in four basic physical forms: cocoa beans, cocoa butter, cocoa paste and cocoa powder.

Key words: cocoa trade, cocoa production, market analysis, Poland

Introduction

Cocoa and its products has been grown and used in Central and South America for thousands of years, however in Western European culture cocoa was virtually unknown until the late 16th Century. Up to around the 20th Century, cocoa and the chocolate made from it was regarded as a luxury product. It was only after the turn of the 20th Century that cocoa production crossed the amount of 100,000 tons annually. But the real explosion of cocoa production started after the Second World War and steadily continues until today. In general, cocoa production can be split into two kinds: fine or flavored cocoas, which account for less than 3 per cent of the total and bulk cocoas [Wood et. al 2008]. Today cocoa is a well-established and important crop in the world commodities trade. It's also a cash crop for growing countries and a key import for processing and consuming countries [Cocoa 2012]. It is one of the world's most valuable crops, cultivated worldwide on more than 9 million hectares, grown in 58 countries, and worth over US$4 billion annually. Economic cocoa cultivars are grown for the production of dried beans, which are the source of cocoa liquor, cocoa butter, cocoa cake and cocoa powder [Pohlan 2010]. This article explores statistics data in production and trade of bulk cocoa and cocoa products. It presents an analysis of the world's major cocoa trading countries in four basic physical forms: cocoa beans, cocoa butter, cocoa paste and cocoa powder.

Research Method

The analysis is based on data from The Food and Agriculture Organization of The United Nations in the time period between 2007 and 2011. In cases where the time series is

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longer than the five year period, prices and production were derived from the Bloomberg database. The data was developed by utilizing a comparative analysis. Basic statistical measures were applied for the data analysis, as well as the classical method of inference. A deduction method was used for the assessment of events.

Analysis of Cocoa Production

In 2011 the world cocoa bean production reached the highest level in the period of interest and peaked at 4,6 mln tons. In terms of area harvested, 2011 was also a record year with over 9,9 mln hectares harvested. At the same time the prices for cocoa beans have seen a dramatic increase from around $1000 USD per metric ton in year 2000, up to $3000 USD in year 2011. However, looking at the graph it is difficult to draw a binding conclusion whether the increase in production was due to the rise in price. It should be taken into account that there are many factors behind the price increase, not only changes in consumer preferences, but also speculation, as well as monetary pumping in some of the biggest economies of the world.

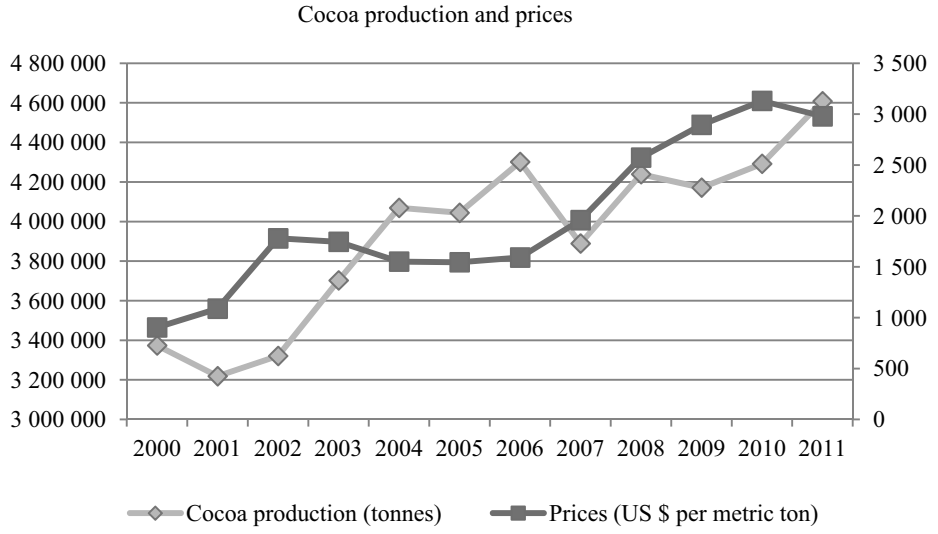

Fig. 1. Cocoa production and prices in the years 2000 - 2011

Source: own study based on the data from Bloomberg database [Bloomberg 2014].

In 2011, the top twenty producers supplied 4,5 mln tons of cocoa beans, which accounts for 98,5% of all cocoa bean production in the world. Looking at regional production of cocoa it's easy to notice the overwhelming predominance of African countries, followed by South-East Asia and South America. In 2011 out of the top twenty producers in the world, the African countries supplied 3,0 mln tons of cocoa beans which amounts to 66,7% of world production. The Asian countries supplied 0,78 mln tons which amounts to 17% and South American countries supplied 0,67 mln tons which is 14,7%.

Table 1. Production of cocoa beans in the world (top 20 largest producers)

No.	Country	Production (tonnes)				
		2007	2008	2009	2010	2011
1	Côte d'Ivoire	1 229 908	1 382 441	1 223 153	1 301 347	1 559 441
2	Indonesia	740 006	803 593	809 583	844 626	712 200
3	Ghana	614 500	680 781	710 638	632 037	700 020
4	Nigeria	360 570	367 020	363 510	399 200	400 000
5	Cameroon	212 619	229 203	235 500	264 077	272 000
6	Brazil	201 651	202 030	218 487	235 389	248 524
7	Ecuador	85 891	94 300	120 582	132 100	224 163
8	Togo	78 000	111 000	105 000	101 500	100 000
9	Peru	31 387	34 003	36 803	46 613	56 500
10	Dominican Rep.	43 322	45 518	54 994	58 334	54 279
11	Colombia	39 904	44 740	44 740	39 534	44 241
12	Papua N.Guin.	49 300	51 500	59 400	39 400	42 000
13	Mexico	31 000	27 000	24 000	20 000	21 388
14	Venezuela	18 911	20 457	18 000	18 000	18 000
15	Malaysia	35 180	27 955	18 152	18 929	15 975
16	Uganda	10 006	13 000	15 000	15 000	15 723
17	Guinea	12 484	14 016	14 577	15 160	15 000
18	India	10 180	10 560	11 820	12 900	14 400
19	Sierra Leone	14 000	10 500	10 000	14 000	12 000
20	Guatemala	9 924	9 911	9 956	10 713	10 927
	Total	3 828 743	4 179 528	4 103 895	4 218 859	4 536 781

Source: own study based on the data from Food and Agriculture Organization of The United Nations database [FAO 2014].

On a per country basis, the unquestionable leader remains Côte d'Ivoire, which in 2011 supplied 1,5 mln tons of cocoa beans alone, which amounts to 34% of the total world production, followed by Indonesia with 0,71 mln tons (15,5%) and Ghana 0,70 mln tons (15,2%) of the world cocoa bean production. Apart from production, what's important in the cocoa business is the grinding capabilities, which means further processing of cocoa beans into cocoa butter, paste and powder. Once the beans leave the farm the quality can get no better, which means they should be processed as soon as possible.

Analysis of Cocoa Trade

The picture of the cocoa trade would not be complete without taking into account all forms of cocoa products. Cocoa is traded on the world market in four basic physical forms: cocoa beans, cocoa butter, cocoa paste and cocoa powder. This stems from the fact that grinding of cocoa beans is more economically viable in countries closer to consumer markets, which traditionally include Europe, the US and now southeast Asia.

Cocoa Beans

Cocoa beans are the raw material for all further processing. By looking at countries which import the largest amounts of raw cocoa beans we can quite accurately establish where the grinding capacity is located. In 2011 the biggest processor of cocoa beans in the world was The Netherlands with over 0,78 mln tons of cocoa beans imported. The second biggest was the US with 0,46 mln tons, closely followed by Germany with 0,44 mln tons. In Asia, Malaysia with 0,32 mln tons imported is one of the biggest processors of cocoa beans, supplied mostly by Indonesia.

Table 2. Largest cocoa bean importing countries

No.	Country	Cocoa Beans Import Quantity (tonnes)				
		2007	2008	2009	2010	2011
1	Netherlands	628 215	680 942	731 814	686 057	784 316
2	USA	355 135	355 751	442 375	402 061	463 883
3	Germany	354 149	334 033	348 437	341 273	446 888
4	Malaysia	438 477	398 253	290 015	319 441	327 084
5	Belgium	187 970	178 462	157 422	160 235	201 471
6	France	173 019	155 826	163 352	137 065	145 493
7	Italy	64 615	68 191	73 274	81 902	91 870
8	United Kingdom	149 112	119 815	150 913	89 364	91 358
9	Spain	92 970	95 469	87 631	91 954	86 522
10	Singapore	89 693	93 917	80 575	93 445	84 630
	Total	2 533 355	2 480 659	2 525 808	2 402 797	2 723 515

Source: own study based on the data from Food and Agriculture Organization of The United Nations database [FAO 2014].

Table 3. Largest cocoa bean exporting countries

No.	Country	Cocoa Beans Export Quantity (tonnes)				
		2007	2008	2009	2010	2011
1	Côte d'Ivoire	803 886	782 868	917 700	790 912	1 073 282
2	Ghana	506 358	474 706	395 711	281 437	697 236
3	Nigeria	174 900	227 303	247 000	226 634	262 295
4	Indonesia	379 829	380 513	439 305	432 427	210 067
5	Netherlands	173 119	155 657	167 521	167 081	207 773
6	Cameroon	131 075	178 101	193 973	193 881	190 214
7	Ecuador	80 093	80 143	124 404	116 318	157 782
8	Belgium	142 040	117 763	97 578	82 614	81 350
9	Papua N. Guin.	46 900	51 588	59 276	57 764	62 751
10	Dominican Rep.	39 512	32 745	60 714	55 097	50 994
	Total	2 477 712	2 481 387	2 703 182	2 404 165	2 993 744

Source: own study based on the data from Food and Agriculture Organization of The United Nations database [FAO 2014].

The biggest exporter of cocoa beans in 2011 was Côte d'Ivoire with more than 1mln tons of beans exported, followed by Ghana with 0,69 mln tons and Nigeria with 0,26 mln tons. Traditionally, the third biggest exporter of cocoa beans in previous years was Indonesia, however in 2011, a higher export tax contributed to lower levels of exports. The export tax policy was introduced by the government of Indonesia in order to develop cocoa processing industry in-house, which can be seen in the following tables as a shift of export product composition from coca beans to other cocoa products [Rifin 2013].

Cocoa Butter

Cocoa butter is a byproduct of cocoa processing, and is widely used in chocolate manufacturing. The biggest importer of cocoa butter is the US with 92 thousand tons, followed by The Netherlands with 91 thousand tons and Germany with 89 thousand tons.

Table 4. Largest cocoa butter importing countries

No.	Country	Cocoa Butter Import Quantity (tonnes)				
		2007	2008	2009	2010	2011
1	USA	86 258	102 868	84 498	102 878	92 572
2	Netherlands	70 598	72 786	72 609	70 529	91 297
3	Germany	85 113	85 605	84 939	88 713	89 511
4	Belgium	75 283	64 782	70 155	65 336	75 003
5	France	78 858	69 153	64 495	57 639	61 948
6	United Kingdom	48 911	42 879	42 921	50 639	43 440
7	Russia	25 753	26 087	22 969	25 021	28 398
8	Poland	20 769	21 391	17 721	22 678	27 634
9	Switzerland	27 265	27 193	24 820	26 462	26 813
10	Canada	31 301	23 516	20 759	20 885	22 463
	Total	550 109	536 260	505 886	530 780	559 079

Source: own study based on the data from Food and Agriculture Organization of The United Nations database [FAO 2014].

The biggest exporter of cocoa butter in 2011 was the Netherlands with 0,21 mln tons exported, followed by Malaysia with 0,18 mln tons and Indonesia ,which expanded its processing capabilities with 82,5 thousand tons exported – a stunning 78% increase compared to the previous year. From examining the two tables of import and export trends in cocoa butter, it's reasonable to state that The Netherlands, by being a major processor, is also an important player in the cocoa butter trade on the world market, as the country appears on top of the table in both export and import of cocoa butter. Moreover, taking into account the exported amounts, The Netherlands is almost twice as big as the second biggest exporter of cocoa butter - Malaysia. The biggest importer of cocoa butter in the world is the US with 92,5 thousand tons of imports in 2011. The country has a large internal market for chocolate products, and uses the cocoa butter mainly for the internal confectionery industry.

Table 5. Largest cocoa butter exporting countries

No.	Country	Cocoa Butter Export Quantity (tonnes)				
		2007	2008	2009	2010	2011
1	Netherlands	209 598	205 653	197 595	219 435	212 629
2	Malaysia	103 307	103 696	100 024	104 407	118 374
3	Indonesia	51 149	55 584	41 606	46 687	82 535
4	France	79 587	78 863	80 324	74 729	79 181
5	Côte d'Ivoire	57 685	62 410	67 201	63 506	56 226
6	Germany	14 061	23 255	32 381	40 820	50 839
7	Ghana	15 920	6 105	10 490	23 026	39 054
8	Singapore	22 640	23 974	20 577	22 260	28 921
9	Brazil	32 744	25 997	20 669	24 957	22 433
10	USA	20 987	23 945	21 333	23 596	22 219
	Total	607 678	609 482	592 200	643 423	712 411

Source: own study based on the data from Food and Agriculture Organization of The United Nations database [FAO 2014].

Cocoa Paste

In 2011, three European countries where the biggest importers of cocoa paste: France with 84 thousand tons, The Netherlands with 82 thousand tons and Germany with 79 thousand tons. Côte d'Ivoire was the biggest exporter of cocoa paste in 2011 with 0,14 mln tons exported, closely followed by The Netherlands with 0,13 mln tons, and Germany which exported 51 thousand tons of cocoa paste.

Table 6. Largest cocoa paste importing countries

No.	Country	Cocoa Paste Import Quantity (tonnes)				
		2007	2008	2009	2010	2011
1	France	79 733	58 304	59 017	59 205	84 704
2	Netherlands	44 044	49 399	44 915	60 067	82 633
3	Germany	48 038	51 712	64 206	94 860	79 039
4	Belgium	43 529	40 910	42 347	41 039	49 137
5	Russia	25 588	32 795	29 831	31 042	34 597
6	Poland	29 386	32 272	31 956	31 154	32 134
7	USA	20 180	23 652	19 367	29 709	22 996
8	Ukraine	16 567	19 618	18 303	13 168	19 310
9	Canada	18 602	16 156	11 971	13 856	18 210
10	China	6 976	9 295	9 488	12 378	17 465
	Total	332 643	334 113	331 401	386 478	440 225

Source: own study based on the data from Food and Agriculture Organization of The United Nations database [FAO 2014].

Table 7. Largest cocoa paste exporting countries

No.	Country	Cocoa Paste Export Quantity (tonnes)				
		2007	2008	2009	2010	2011
1	Côte d'Ivoire	121 066	135 434	141 275	147 371	142 819
2	Netherlands	102 118	107 041	113 139	142 937	135 170
3	Germany	33 658	30 204	32 497	41 118	51 793
4	France	24 277	23 662	25 367	22 552	28 102
5	Malaysia	19 479	16 142	13 856	19 207	26 431
6	USA	15 087	16 162	11 175	11 617	17 864
7	Belgium	0	0	9 763	11 252	14 426
8	Singapore	11 868	12 242	11 548	11 009	12 931
9	Indonesia	2 055	1 448	1 640	6 253	11 538
10	Switzerland	2 977	8 143	10 477	8 508	8 647
	Total	332 585	350 478	370 737	421 824	449 721

Source: own study based on the data from Food and Agriculture Organization of The United Nations database [FAO 2014].

Côte d'Ivoire also stands out as a single African country which has got enough processing capabilities to export substantial amounts of cocoa paste despite all the negative effects of processing cocoa beans in the tropical belt of Africa. As mentioned in the Cocoa guide to trade practices - Côte d'Ivoire has long been attracted to the idea of adding value to its cocoa exports by capturing the cocoa-processing margin. Inherently, however, it is difficult for cocoa-producing countries to compete with the efficient large-scale processing operations in Europe. The country's processing industry continues to be subsidized by being given access to cheaper cocoa beans as well as special tax incentives [Cocoa 2001].

Cocoa Powder

Cocoa powder as a byproduct of cocoa processing is the second most traded cocoa product. In 2011 the US imported the largest amount of cocoa powder in total of 0,16 mln tons. The following two importers were much smaller than the US, with Spain importing 64 thousand tons and France importing 58 thousand tons of cocoa powder. The US with its large domestic market is a leader in cocoa powder consumption. As with cocoa butter, The Netherlands is also the biggest exporter of cocoa powder in the world. In 2011 the country exported over 0,21 mln tons of cocoa powder. The second was Malaysia with 0,15 mln tons exported, followed by Germany with 0,10 mln tons.

Table 8. Largest cocoa powder importing countries

No.	Country	Cocoa Powder Import Quantity (tonnes)				
		2007	2008	2009	2010	2011
1	USA	158 132	156 028	163 874	172 904	162 723
2	Spain	52 442	54 980	53 747	56 068	64 912
3	France	41 030	45 652	42 022	53 861	58 723
4	Germany	47 480	47 232	49 689	54 056	54 215
5	Netherlands	35 979	24 364	35 034	45 047	53 899
6	Russia	42 415	48 293	41 218	43 620	38 427
7	Malaysia	2 314	4 610	8 908	20 135	37 970
8	China	19 200	23 306	23 538	29 000	30 104
9	Italy	28 241	28 576	26 708	26 161	27 717
10	Australia	19 649	20 565	20 958	20 130	23 794
	Total	446 882	453 606	465 696	520 982	552 484

Source: own study based on the data from Food and Agriculture Organization of The United Nations database [FAO 2014].

Table 9. Largest cocoa powder exporting countries

No.	Country	Cocoa Powder Export Quantity (tonnes)				
		2007	2008	2009	2010	2011
1	Netherlands	215 329	221 028	221 801	261 074	214 553
2	Malaysia	112 968	132 922	110 156	117 485	155 380
3	Germany	53 168	59 921	72 814	104 805	107 998
4	Indonesia	52 350	63 016	39 294	50 115	84 878
5	Spain	45 172	46 836	47 836	48 955	50 155
6	France	47 662	48 730	51 847	50 306	48 680
7	USA	25 735	27 334	30 231	36 879	43 589
8	Singapore	33 044	38 075	37 249	33 952	34 607
9	China	9 266	11 373	16 207	19 856	28 686
10	Brazil	36 803	29 825	24 718	24 805	28 587
	Total	631 497	679 060	652 153	748 232	797 113

Source: own study based on the data from Food and Agriculture Organization of The United Nations database [FAO 2014].

The tables above demonstrate that some of the biggest processors of cocoa beans are at the same time the biggest exporters of other cocoa commodities. Such is the case with The Netherlands in Europe and Malaysia in Asia. On the other hand, countries in the top five positions on the list of cocoa bean importers with large internal markets – such as the US, and Germany, or export-oriented such as Belgium, which rank second, third and fifth respectively in the quantity of cocoa beans imported – remain net processors of cocoa beans mainly for the benefit of their own confectionery industry.

Cocoa Trade in Poland

Poland belongs to a group of marginal cocoa bean processors. In 2011 the country imported just 11 thousand tons of cocoa beans, which gives it 24th place among world cocoa importers. At the same time the country is not involved in cocoa bean export. On the other hand, the country is a substantial manufacturer of cocoa-related final products, such as chocolate and other cocoa-based confectionery. In 2011 Poland imported 27 thousand tons of cocoa butter and 32 thousand tons of cocoa paste – the main ingredients for chocolate production – which gives the country 8th and 6th place in the world in terms of quantity imported. At the same time, as presented in the Table above, Poland re-exported just 1 thousand tons of cocoa butter and 8,6 thousand tons of cocoa paste, which supports the claim that most of the import is further processed in the country by the confectionery industry.

Table 10. Imports and exports of cocoa-related half-products

No.	Poland	Cocoa trade for Poland (tonnes)				
		2007	2008	2009	2010	2011
1	Cocoa Beans Import	17 660	9 834	11 019	9 061	11 797
2	Cocoa Butter Import	20 769	21 391	17 721	22 678	27 634
3	Cocoa Paste Import	29 386	32 272	31 956	31 154	32 134
4	Cocoa Powder Import	23 014	23 306	18 677	23 665	23 517
5	Cocoa Beans Export	2	8	1	1	0
6	Cocoa Butter Export	1 553	1 556	2 182	1 571	1 735
7	Cocoa Paste Export	6 315	7 045	4 443	4 384	8 633
8	Cocoa Powder Export	7 724	7 642	5 836	5 784	7 291

Source: own study based on the data from Food and Agriculture Organization of The United Nations database [FAO 2014].

In the analyzed period, Poland imported 23,5 thousand tons of cocoa powder – the main product for hot chocolate and baking, giving it 11th place in the world. The country re-exported just 7 thousand tons of cocoa powder, which again is turned for products by the confectionery industry. On the basis of the above analysis it is safe to assume that contrary to countries such as The Netherlands or Malaysia, Poland is a consumer of cocoa-related commodities like cocoa paste, cocoa butter and cocoa powder, mostly for chocolate and related confectionery.

Conclusions

Cocoa is a very important crop worldwide – in 2011 between 40 and 50 million people depended on cocoa for their livelihood. Also in 2011, almost 67% of world cocoa production originated from African countries such as Cote d'Ivore, Ghana, Nigeria and Cameroon. More than 17% originated from Asia and Oceania with major producers such as Indonesia, Malaysia and Papua New Guinea, and more than 14% originated from the

Americas with top producers being Brazil, Ecuador, Colombia. The world's unquestionable leader in cocoa production in the analyzed time period was Cote d'Ivore with around 34% of the world's total cocoa production. For trade, cocoa changes hands on the world market in four basic physical forms: cocoa beans, cocoa butter, cocoa paste and cocoa powder. Those are all half-products for making more refined chocolate confectionaries. The most widely traded forms of cocoa are the cocoa beans which flow to the world's major grinding centers located in The Netherlands, USA, Germany and Malaysia. From there it is either consumed locally or exported as confectionaries, or by-products for further processing such as cocoa butter, paste or powder. One of the major cocoa butter and paste importers in Europe is Poland. Although the country has a negligible grinding capacity for processing of raw cocoa beans, it is nevertheless a substantial manufacturer of cocoa-related final products, such as chocolate and other cocoa-based confectionery. In 2011 Poland imported 27 thousand tons of cocoa butter and 32 thousand tons of cocoa paste – the main ingredients for chocolate production, which gives the country 8th and 6th place in the world in terms of quantity imported. Outside of western culture, we are witnessing dynamic growth of cocoa production and trade in the Asian region. Especially Indonesia and Malaysia lead the Asian region in terms of large increases of export of cocoa-related products such as cocoa butter, cocoa paste and cocoa powder.

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Application of fuzzy inference system to increase efficiency of management decision-making in agricultural enterprises

Abstract. Application of fuzzy inference system to increase efficiency of management decision-making in agricultural enterprises. Theoretical and methodological issues, practical recommendations on improvement of management decision-making in agricultural enterprises to increase their competitiveness have been intensified and developed in the article. A simulation example of a quality management system for agricultural products on the basis of the theory of fuzzy sets and fuzzy logic has been proposed. The factors that affect the quality of agricultural products have been defined.

Key words: fuzzy sets, fuzzy logic, linguistic variables, efficiency, product quality management system, administrative decisions, manager, agricultural enterprises

Introduction

A manager plays a vital role in the daily functioning of an agricultural enterprise, notably in the effective administrative decision-making that provides it with steady development. Success functioning of a company depends on many personal features of a leader: leadership abilities, organizational capabilities, qualification and working experience specifically in the agricultural arena, ability to set goals and reach them sequentially, and also to make decisions on time and based on considerable theoretical and practical knowledge and which contain scientific substantiation.

The realities of the modern market environment lend themselves to active application of innovative approaches, for example methods of mathematical design, in particular, application of fuzzy system modeling in administrative decision-making, which makes it possible to calculate final results and to choose more rational options.

Analysis of recent research and publications

Fundamental studies of the manager's role in management decision-making has been carried out by such scholars as Albert M., Boddi D., Drucker P., Kabushkin M., Knorring V., Ladanov N., Lantsyski E., Lutens, Meskon M., Mintzberg K., Peyton R., Yukl G., Skibitska L., Taylor, F., Faiol A. and others.

Considerable contribution to the application of fuzzy logic was done by the following scientists: Lotfy Zadeh, Leonenko A., Kruglov V., Nyedosekin O., Saaty T., Fishburne, Shtovba D.

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However, the problem of choosing the appropriate approaches to the acceptance of administrative decisions in domestic agricultural enterprises with application of artificial intelligence needs further research.

The purpose. To substantiate the use of the process approach in management decision-making. To identify and specify the factors that affect the quality of agricultural products. To investigate the possibility of applying fuzzy logic systems to improve decision-making in agricultural enterprises.

Results. The process of administrative decision-making envisages a conscious leader's choice among existent alternative actions, that will provide the achievement of the desired organization state for a certain period of time, and that corresponds to the general aims of the enterprise. The types of administrative decisions according to the classification criteria are shown in Table 1.

This process passes three stages:

1. finding out the problem (collection of information, determination of topicality, determination of the conditions when the problem is considered to be solved);
2. development of a decision plan (search of alternative decisions, analysis of a decision and its comparison with present resources, study of possible economic and social consequences after the decision-making, development of a detailed decision-realization plan);
3. decision implementation (to give information about a decision to concrete performers, motivation and control in decision implementation).

The result of administrative decisions is clear coordination of personnel, and also financial and economic indicators of industrial and business activities of enterprises. Thus, the more effective and efficient are decisions made by authorities, the more competitive products will be, and as a result, the more profitable the organization will be. Low quality of administrative decision-making leads to economic and social losses.

For effective development and rational decision-making by the authorities in the modern stage of organization management it is possible to use special technologies: "Management technology according to the results", "Management technology on the basis of necessities and interests", "Management technology by using permanent monitoring and guidance", "Management technology in exceptional cases", "Management technology on the basis of artificial intelligence", "Management technology on the basis of activation of personnel activity".

Due to intensive development of modern information technologies, application of "Management technology on the basis of artificial intelligence" is in greater demand. This technology envisages application of mathematical methods, statistics and economics, and special computer programs for the development and implementation of effective leadership decision-making. The method of mathematical programming allows calculation of the best variant in accordance with optimality criteria.

Decision-making becomes actual in the conditions of vagueness, namely insufficient amount of reliable information, data that are based on the use of fuzzy logic content rules. Practical applications of the theory of fuzzy logic take place in the different areas of science and industry in a national economy. Fuzzy logic is used in cases when, next to quantitative descriptions in Knowledge Base Intelligent Systems, there are also quality descriptions of a phenomenon or object. Fuzzy logic is used while analyzing new markets, for political rating, and to estimate the correlation of risks and profits, efficiency of personnel, choice of optimal pricing strategy, etc. [Asai 1993, Borisov 1990].

Table 1. Types of administrative decisions according to classification features

Classification feature	Groups of administrative decisions	Comments
Degree of problem repetition	Traditional	Constantly used in management practice
	Untypical	Require the search of alternatives
The significance of the purpose and action duration	Strategic	Designed the decision of perspective long-term tasks
	Tactical	Provide realization of strategic tasks
	Operating	Decisions of current issues in order to reach tactical and strategic aims
Sphere of influence	Global	Decisions that influence activity of organization in general
	Local	Decisions that are made in a single department
Duration of selling process	Long-term	Selling process takes up to few years
	Short-term	Selling process requires a few hours, days or months
Method of solution development	Formalized	Made according to predetermined algorithm
	Unformalized	Decisions made in non-standard and untypical situations
Number of selection criteria	According to one criterion	Typical for formalized decisions
	According to many criteria	Typical for unformalized decisions
Type of decision-making	Individual	Made by one person
	Collective	Made by group
Method of solution fixing	Documented	In written form
	Non documented	Declared in oral form
Character of used information	Determined	Made in conditions of certainty
	Credible	Made in conditions of uncertainty
Background for decision-making	Intuitional	Made on the basis of accuracy
	Decisions based on assertions	Made on the basis of experience
	Rational	Made on the basis of analytical thinking
Role and functions in management process	Informative	Information transformation into the form, that corresponds to task decision in the best way
	Organizational	Determination of structure, distribution of functions between subdivisions and public servants in accordance with the scheme and established procedures
	Technological	Setting goals and objectives, readiness to work fulfillment, facilities and methods

Source: own research.

Methods of fuzzy sets application should also be used in agricultural production as well, where there are a great deal of factors that influence stability of the system. The theory of fuzzy sets makes possible the use of subjective expert knowledge about this

problem for making decisions, to form the field of alternative actions, and to forecast system behavior.

The management of an agricultural enterprise is interested in rational decision-making and sequential fulfillment of procedures aimed at increasing production of competitive goods and increasing profits. One of the key questions is to take into account the factors that influence product quality of during its life cycle.

Among the investigated totality of agricultural enterprises of the Bilotserkivskyi and Zhashkivskyi districts in Ukraine, a considerable part of agricultural production is occupied by sunflower growing. According to the State Statistics Service, Ukrainian agrarians harvested 11051 sunflower seed in 2013 with an average yield of 21,7 hundredweight per hectare [Asai 1993]. Under the perspective of European Integration and getting new markets, the quality of raw materials and the factors that influence product quality are significant issues. Therefore, taking into account the considerable production potential of agricultural enterprises and the strong position of sunflower growing as a strategically important crop, we have proposed a fuzzy model of quality management system of vegetable oil in the agricultural enterprise.

Traditional system modeling, in view of a lack of full information as to growing conditions, seed storage and processing of oil crops can not be applied. In such cases it is advisable to use methods that are specifically focused on building models that take into account the accuracy of input data, in particular fuzzy modeling [Leonenkov 2005, Shtovba 2007].

Fuzzy system of quality management of vegetable oil in an agricultural enterprise consists of ten knowledge bases combined into a hierarchical system of three levels: technology, quality and cost effectiveness. The efficiency of sunflower growing, its harvesting and distribution is determined by the level of profitability Z.

The level of technology includes four knowledge bases:

- crop capacity (y_1);
- oil content (y_2);
- moisture (y_3);
- impurity (y_4).

Knowledge base that characterizes the sunflower productivity (capacity) is presented in the formula:

$$y_1 = f_1(x_1, x_2, x_3, x_4),$$

where x_1 – is a linguistic variable (LV) of soil; description; x_2 – LV of climatic conditions; x_3– LV of category of sowing material; x_4– LV of agricultural technologies.

Knowledge base that characterizes the oil content of sunflower is calculated by the formula:

$$y_2 = f_2(x_1, x_2, x_3, x_4)$$

Knowledge base that characterizes moisture of sunflower is calculated by:

$$y_3 = f_3(x_5, x_6, x_7),$$

where x_5 – LV weather conditions during harvesting; x_6 – LV of harvesting; x_7 – LV of sunflower transporting and storage.

Knowledge base that characterizes the presence of garbage and oil additives in sunflower seed – “Impurity" is described by the following formula:

$$y_4 = f_4(x_4, x_6, x_8),$$

where x_8 – LV of sunflower cleaning.

The level of quality consists of four knowledge bases:

- quality of products (y_5);
- quality of production (y_6);
- quality of organization (y_7);
- quality of selling process (y_8).

Knowledge base that characterizes quality of products (class of sunflower seed) – "Quality of products" is calculated by:

$$y_5 = f_5(y_2, y_3, y_4).$$

Knowledge base that characterizes the quality of production – "Quality of production" is calculated by:

$$y_6 = f_6(x_9, y_1, x_{10}, x_{11}),$$

where x_9 – LV of technical level of equipment; x_{10} – LV metrology provision; x_{11} – LV minimization of environment influence.

Knowledge base characterizes the quality of organization is calculated by:

$$y_7 = f_7(x_{12}, x_{13}, x_{14}),$$

where x_{12} – LV of administrative decisions quality; x_{13} – LV of personnel qualification level; x_{14} – LV of processes clearness and perfection.

Knowledge base that characterizes the quality of selling process is calculated by:

$$y_8 = f_8(x_{15}, x_{16}),$$

Where x_{15} – LV of logistics; x_{16} – LV of marketing.

The level of economic efficiency includes two knowledge bases:

- cost of seed (y_9);
- selling price (y_{10}).

Knowledge base determines the cost of seed and is calculated by:

$$y_9 = f_9(y_6, x_{17}, y_7),$$

where x_{17} – LV of expenses on growing and harvesting.

Knowledge base that characterizes the cost of sunflower seed selling is calculated by:

$$y_{10} = f_{10}(x_{18}, y_5, x_{19}),$$

where x_{18} – LV of demand; x_{19} – LV of inflation index.

Let's define linguistic variable models and their term-set. Thus, for denotation of variables we have used terms: very low (VL), low (L), medium (M), high (H) and very high (VH) [Lofti, Zadeh 2002].

Indexes mentioned above will be input variables for the system of unclear conclusion.

Output parameters are indicated by the following indicators:

- the first knowledge base of sunflower productivity is given in centner per hectar;
- the second knowledge base of oil content – in percentage;
- the third knowledge base of moisture – in %;
- the fourth knowledge base of impurity – in %;
- the fifth – the class of seed is estimated in relative units – in points;
- the sixth is a sort of seed – in points;
- the seventh knowledge base of the cost of sunflower oil – in hryvna;
- the eighth is the selling price of oil – in hryvna. We will get a profitability parameter on the output model.

We have used MatLab software for system implementing. We have introduced linguistic variables for the construction of unclear conclusion systems. Model authenticity first of all depends on the degree of correspondence of rules to real agricultural production and on the terms belonging to functions. Further we have defined the functions of terms belonging to input and output parameters of the model (Fig. 1). Then we have introduced them to each knowledge base using the operations of fuzzy logic (min-crossing of term set of dependences).

To phase the variables we will use the piece-linear functions of belonging "triangular" and "trapezoid", because it is necessary to set properties of an uncertainty set like "located in a range" [Shtovba 2007]. Data of sunflower growing and its processing into oil have been used in phasing the variables and making rules of the fuzzy system.

Taking into account the number of freedom degrees of input linguistic variables that are included in equations of knowledge bases we have calculated the maximal amount of base rules of unclear system 3·3·3·3 + 3·3·3·3 + 3·3·3 + 3·3·3 + 5·4·3 +3·3·3·5 + + 3·3·3 + 3·3 + 3·3·5 + 3·3·3·4 = 600.

The modeling of the unclear conclusion system was carried out by the Mamdani algorithm [Mamdani 1974]. Then aggregating of sub-terms in unclear rules was carried out according to the following principle: those rules, the true degree of which differs from zero, are considered to be active and used in the following calculations.

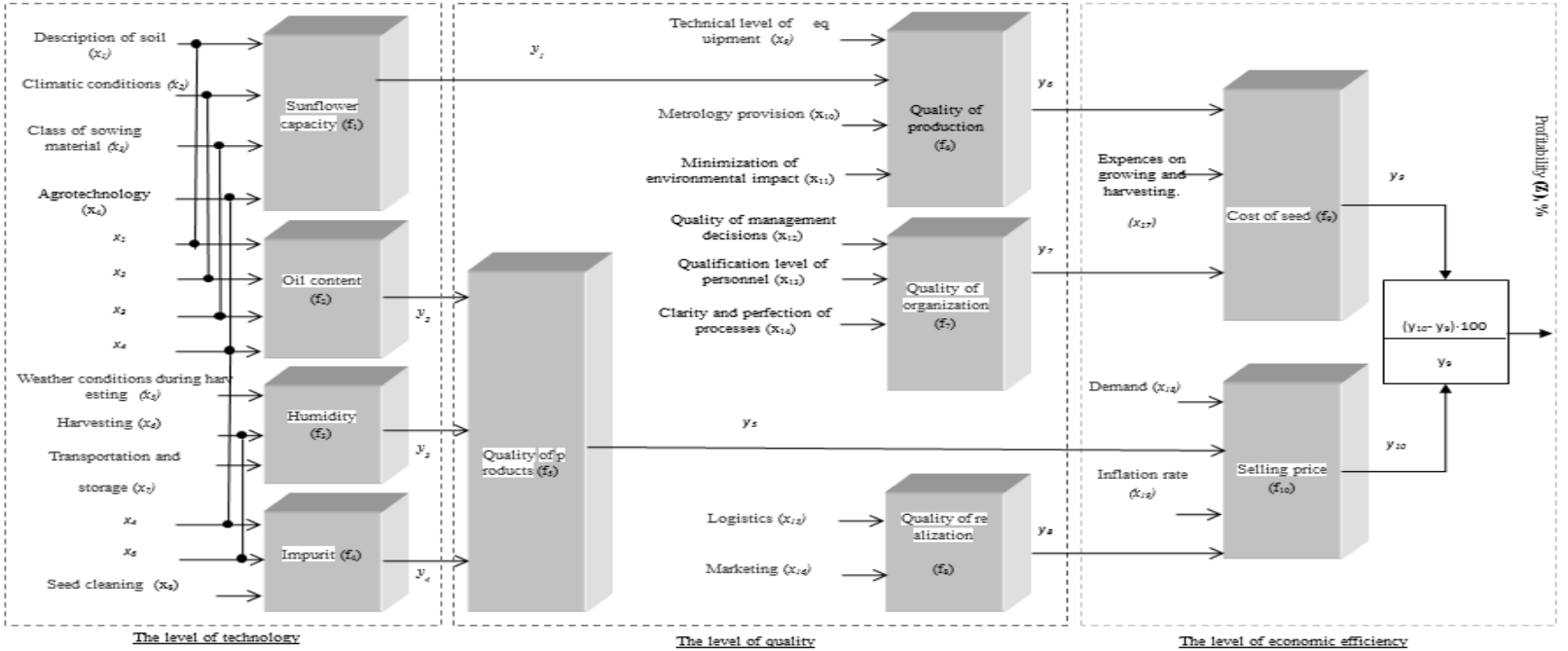

Fig 1. Hierarchical system of fuzzy logic of sunflower seed quality management in agricultural enterprise

Source: own research.

Activation was implemented in accordance with a method of min-activation using Mamdani algorithm [Mamdani 1974]:

$$\mu'(y) = \min\{c_i, \mu(y)\},$$

Where $\mu'(y)$ – is the result of activation of belonging function of output fuzzy set; c_i – is the degree of truth of conclusions for every rule; $\mu(y)$ – is the function of belonging of output fuzzy set.

We have calculated accumulation for obtaining belonging functions of output variables by the formula [ ]:

$$\mu_D(x) = \max\{\mu_A(x), \mu_B(x)\} \qquad (\forall x \in M_x),$$

where $\mu_D(x)$ – is the belonging function of output fuzzy set D; $\mu_A(x), \mu_B(x)$ – is the belonging function of input fuzzy sets A and B.

Dephasing of output linguistic variable sets Mx = {X1, X2, ..., Xs} was calculated according to the method of gravity centre (centroid) [Knorring 2001] by formula:

$$y = \frac{\int_{Min}^{Max} x \cdot \mu(x) dx}{\int_{Min}^{Max} \mu(x) dx},$$

where y – is the result of dephasing; x – is the variable that corresponds to the output linguistic variable X; $\mu(x)$ – is the belonging function of fuzzy set that corresponds to the output variable X after accumulation stage; *Min* and *Max* –is left and right points of interval of fuzzy set.

MatLab software allows to present graphically the surface of input parameters of vegetable oil quality management system in an agricultural enterprise and output parameters such as: influence of soil quality, climatic terms, sowing material and agricultural technology on productivity; influence of harvesting, transporting and storage on seed moisture; influence of material moisture and impurity on quality of products; effects of level of equipment and minimization of environment impact on quality of production; role of personnel qualification and clearness of organizational processes on production organization quality; influence of logistics and marketing on seed distribution results, etc. (Figure 2, Figure 3).

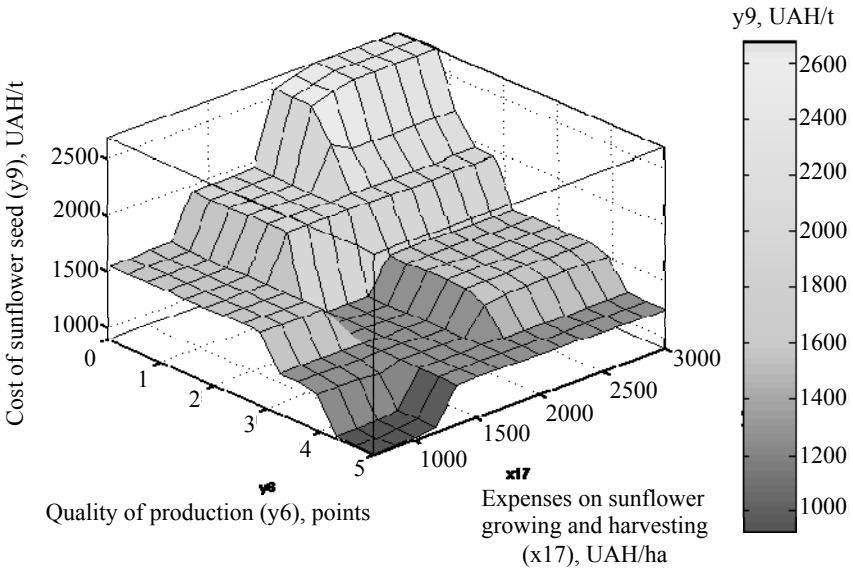

Fig. 2. Surface of response of production organization quality, costs on sunflower growing and harvesting to the cost of seed

Source: see fig. 1.

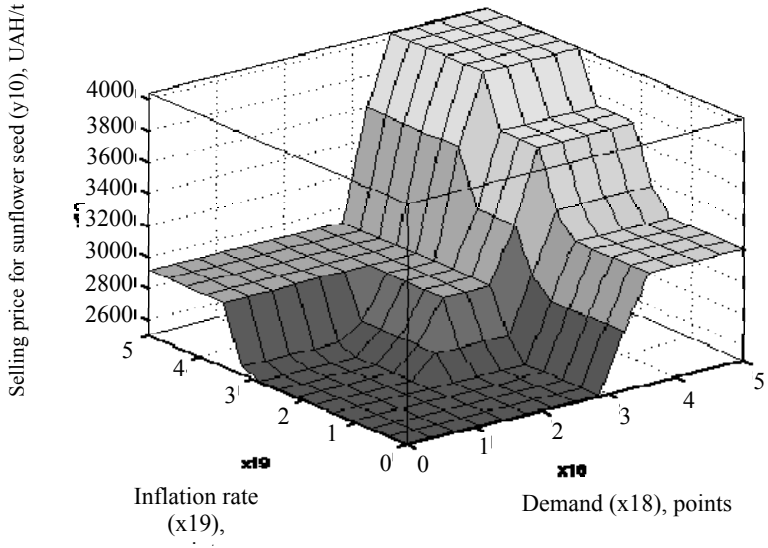

Fig. 3. Surface of response of demand and inflation rate to the selling price of seed

Source: see fig. 1.

Thus, by means of a clear management system of oil and sunflower seed quality in agricultural enterprises, a manager can make reasonable and effective decisions that will allow increasing profitability of sunflower seed and oil production.

Conclusions

Alongside the use of traditional approaches to the practical problems that can arise today in management systems of agricultural enterprises, the application of the theory of fuzzy sets and the fuzzy logic built on its basis is becoming more and more popular. The synthesis of classic and innovative methods in management and decision-making allows enterprises in the agricultural sector in Ukraine to realize their potential and to achieve a maximal effectiveness that has positive impact on quality of products and on production organization in general.

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The impact of intellectual and social capital on the competitiveness of Polish regions

Abstract. This article looks at competitiveness from a regional perspective (NUTS-2). After the establishment of indicators for regional competitiveness in Poland, social and intellectual capital, the relations among the three were analysed for the 16 Polish regions using 2SLS. GDP per head is positively affected by the level of competitiveness. It was found that an increase in competitiveness by 1% increased the GDP per head by 0.53%.The analysis done here showed that there was not a significant correlation between the presence of social capital and regional competitiveness. However, intellectual capital had a highly significant impact on competitiveness: an increase in intellectual capital by 1% would increase competitiveness by 0.47%.

Key words: Regional Competitiveness, Polish Regions, Social Capital, Intellectual Capital

Introduction

Competitiveness has an immense impact on regional development and growth. It is: "*a way of discussing the relative performance of economies in a benchmarking sense. It can help identify areas of the economy that are lagging behind but not the reason for those lags*" [Dunning et al. 1998]. Competitiveness is affected and described by many different factors. Social and intellectual capital are two forms of capital to which much attention has been paid in recent literature on economic development. Social capital is commonly considered a fourth form of capital, along with financial, human and physical ones. Just as the other forms, it is an important determinant of prosperity and its purpose is to make productive activity possible [Coleman 1988]. Although the definition of social capital has remained elusive and ambiguous, this notion is also considered an important factor in explaining economic success. Hanifan defined it as: "*those tangible substances that count for most in the daily lives of people: namely good will, fellowship, sympathy, and social intercourse among the individuals and families who make up a social unit"* [Hanifan 1916]. Social capital is the opposite of physical capital, which comprises land, buildings and all other forms of privately or publicly-owned physical capital. Much of the general literature concerning social capital is focused on using it to build human capital, in the sense of developing strong communities. However, in recent years, research has grown around social capital building for community development [Servan 1997] and for economic development. Relationships among individuals, norms and trust all help facilitate coordination and cooperation that enhance productivity [Routledge and von Amsberg,

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2002]. Putnam et al. [1993] emphasise that traditions of civic engagement, voter turnout, active community group and other manifestations of social capital are necessary for both good government and economic and financial development. Undoubtedly, in an economy based on information and knowledge, intangible assets have gained in importance and have become perceived as the undeveloped source of future success and a key determinant of growth. The key factor of success and foundation of competitive advantage is knowledge [Bradley 1997; Bontis 2004; Daley 2001; Edvinsson 2002; Edvinsson and Stenfelt 1999; Malhotra 2000; Pasher 1999] and that is why the theory of intellectual capital attracts so much attention. Intellectual capital (IC) is understood as a multidimensional concept that is reflected in a variety of definitions, different components and features. One of the widely used definitions explains it as the difference between the market value and the book value of the firm [Brooking 1997; Daley 2001; Pasher 1999; Petrash 1996]. According to Bontis [2004] IC is *"hidden values of individuals, enterprises, institutions, communities and regions that are the current and potential sources of value creation"*, whereas Andriessen and Stam [2005] define it as *"all intangible resources available to a country or a region, that give relative advantage, and which in combination are able to produce future benefits*". In the economy of knowledge, values created by countries, regions, organizations and individuals are directly connected to their knowledge and intellectual capital [Edvinson 2002]. The key point is to show that intangible factors create value and determine growth and competitiveness. This paper is structured as follows: First, theoretical approaches on the relation of social and intellectual capital and competitiveness are discussed. In the next part data and method of the empirical part is presented, then the results of the impact of social and intellectual capital on the competitiveness of 16 Polish regions are revealed. Finally, the conclusion and discussion are included.

Social and intellectual capital in relation to competitiveness

Social capital has attracted much attention from scholars and practitioners. The phenomenon of social capital is a very popular concept covering both economic and social dimensions, widely used in multidisciplinary research. It is considered an important factor in explaining economic success and development. There are many different approaches and definitions attached to the concept of social capital. However, there is some consensus within the social and economic sciences towards a definition that emphasizes the role of networks and civic norms. Social capital is generally understood as the property of the group rather than the property of the individual. The key indicators of social capital include social relations, formal and informal social networks, group membership, trust and civic engagement. Social capital emerges in numerous manners. This notion is defined and explained in various ways, depending on the context and application of the concept, so it is difficult to conceptualize this phenomenon precisely. A number of academics and researchers emphasize the increasing role of social capital in relation to many different human areas including economic development. However, it was the work by Robert Putnam [et al.1993; 2000] that launched social capital as a popular form for research and policy discussion. According to Beekman [2008] social capital *"can be recognized by social interactions and their by-products: trust relations, reciprocity and exchanges, common rules and norms, and networks and groups."* The OECD defines social capital as "networks together with shared norms, values and understandings that facilitate cooperation

within or among groups" [cited in Cote and Healy 2001], whereas The World Bank [1998] provides a more extensive explanation of this term and suggests that *"social capital refers to the institutions, relationships and norms that shape the quality and quantity of society's social interactions" and emphasizes that "social capital is not just the sum of the institutions which underpin a society – it is the glue that holds them together."* The definition created by The World Bank is similar to the most commonly used definition that originates from Putnam et al.[1995]. Putnam [2000] also argues that social capital "*has forceful, even quantifiable effects on features of social life – networks, norms, and trust – that enable participants to act together more effectively to pursue shared objectives. Social capital, in short refers to social connections and the attendant norms and trust".* Social capital relates to many different aspects of our lives, which include diverse dimensions such as better health [Wilkinson 1996], lower crime rates [Putnam 2000], improvement in education [Coleman 1988], greater levels of income equality [Wilkinson 1996], less corrupt and more effective government [Putnam et al. 1995], better economic achievement and lower transaction costs [Fukuyama 1995]. Coleman [1990] points out that *"social capital is defined by its function, it is not a single entity, but a variety of different entities having characteristics in common: they all consist of some aspect of a social structure, and they facilitate certain actions of individuals who are within the structure."* Social capital generates many advantages. Woolcock [2001] notices that *"one of the primary benefits of the idea of social capital is that it is allowing scholars, policy makers and practitioners from different disciplines to enjoy an unprecedented level of cooperation and dialogue."* Much of the general literature concerning social capital is focused on using it to build human capital, in the sense of developing strong communities. However, in recent years, research has grown around social capital building for community development [Servan 1997] and for economic development [Grisham 1999; Flora 1998 and Flora et al., 1997]. Relationships among individuals, norms and trust all help facilitate coordination and cooperation that enhance productivity [Routledge and von Amsberg 2002]. Flora et al. [1997] call the social capital necessary for successful economic development in the entrepreneurial social infrastructure. They assert that cooperation, not competition is more likely to foster economic activity. Putnam et al. [1993] emphasize that traditions of civic engagement, voter turnout, active community group and other manifestations of social capital are necessary for both good government and economic and financial development. However, the connection between economic prosperity and social capital is not always clear. Definitely, social capital is a multidimensional and dynamic concept and that is why it can be described in numerous ways. Dasgupta [2002] argues that social capital should not be defined only in terms of the presence of cooperation or some other outcome. It should rather be directly regarded as social structure, because social capital is an aspect of human capital; it is also a component of what economists call total factor productivity. Ostrom [2000] points out that social capital is the shared knowledge, understanding, norms, rules and expectations about patterns of integration that groups of individuals bring to a recurrent activity. Undoubtedly, one of the greatest weaknesses of the term of social capital is the absence of common agreement of how to measure it. This notion is usually depicted by such categories as trust, associational activity, groups, networks and knowledge. Social capital measures are also indicated as educational achievements and family structures [Peterson et al., 1999]. Furthermore, non-governmental organizations are considered a key factor in building social capital. Social capital is always desirable, since its presence is equated with beneficial consequences. It measures the degree to which a community can

cooperate to achieve desired results [Buckland 1998]. Educational institutions do not simply transmit human capital; they also pass on social capital in the form of social rules and norms [Fukuyama 1999]. Over the past few years there has been increasing focus on the issue called knowledge paradigm. In the economy based on information and knowledge, these intangible assets have gained in importance and have become perceived as the undeveloped source of future success and a key determinant of development and competitiveness. The concept of intellectual capital is a new way of thinking about new forms of economic value. Knowledge is considered the key factor of success and foundation of competitive advantage [Bradley 1997a, 1997b; Bontis 2002, 2004; Daley 2001; Edvinsson 2002; Edvinsson and Stenfelt 1999; Malhotra 2000; Pasher 1999]. Knowledge is perceived as the basis of intellectual capital, the crucial factor of competitiveness and widely comprehended development. According to Bontis [2004] intellectual capital is defined as: *"hidden values of individuals, enterprises, institutions, communities and regions that are the current and potential sources of value creation"* whereas, Andriessen and Stam [2005] describe it as *"all intangible resources available to a country or a region, that give relative advantage, and which in combination are able to produce future benefits*". In the economy of knowledge, values created by countries, regions, organizations and individuals are directly connected to their knowledge and intellectual capital [Edvinsson 2002]. But the key point is to show that the intangible factors create value and determine the growth and competitiveness. Although in the literature the notion of intellectual capital is not used in precisely the same way and there is not one interpretation, a significant number of researchers and practitioners have focused on key factors to be regarded as components of intellectual capital. Undoubtedly, intellectual capital is perceived as a dynamic and qualitative category. Different kinds of approaches to intellectual capital have been developed. Nevertheless, one of the widely used is the typology created by Bontis [2002; 2004]. He singled out three main components of intellectual capital: human capital, structural capital and relational capital. Each of the distinguished components contains a series of assets that are measured by means of a series of indicators. Human capital represents anything related to the people and comprises variables concerning the potential of people, such as their educational background, life experience, attitudes, skills and tacit knowledge. Structural capital encompasses both the organizational framework and the tangible elements of social and technical infrastructure designed to ensure a high quality of life. And lastly, the relational capital illustrates the potential related to the external image, cooperation, attractiveness and networks.

Data and method

This part of the article aims at evaluating Poland's regional performance of competitiveness, social and intellectual capital. In order to present the position of 16 Polish voivodships, which correspond to the EU NUTS II level, we employed the following research approach: We selected a list of variables that potentially might have influence on the phenomenon of competitiveness, social and intellectual capital. Furthermore, we carried out the principal component analysis (PCA). For competitiveness the variables are listed in Table 1, as are additional variables such as activity rate (share of people that are economically active), employment rate, innovation rate and three variables that relate to the unemployment rate (total, registered, age/sex subcategory). For social capital the variables

and the voting turnout are listed in Table 2; for intellectual capital the variables and additional variables regarding the exam results for the grammar school and other forms of secondary education are listed in Table 3. The usual criteria in PCA were applied: Eigen value larger than one, loadings on components eventually larger than 0.8, and theoretically sound labelling at least the main component. The final result for competitiveness is given in Table 1, for social capital in Table 2 and for intellectual capital in Table 3. The nine variables listed in Table 1 have high loadings (weights) on the component that can be clearly labelled as competitiveness, three variables listed in Table 2 can be understood as social capital and fourteen variables in Table 3 can be considered intellectual capital. In our model GDP per capita is positively affected by competitiveness, while competitiveness is positively affected by social and intellectual capital. The test of this model calls for a 2SLS procedure in which competitiveness is the predictor variable and social and intellectual capital are instrumental variables.

Table 1. Competitiveness

Variable	Factor loading
Entities entered in the National Official Business Register (NOBR) per 10 thousand population	.926
Entities unregistered form the NOBR register per 10 thousand population	.825
Investment outlays in enterprises by PKD 2007	.859
Investment outlays per capita (total)	.718
Investment outlays in private sector per capita	.721
Natural persons conducting economic activity per 100 persons of working age	.878
New entities of the national economy recorded in the NOBR register per 10 thousand population	.881
Structure of employed persons by economic sector (in services sector)	.867
Average monthly gross wages and salary in relation to the average domestic (Poland=100)	.831

*Explained variance 71 per cent.

Source: Own calculations.

Table 2. Social Capital

Variable	Factor loading
Foundations, associations and social organizations per 10 thousand population	.915
Number of organizations per 10 thousand population (Foundations)	.960
Number of organizations per 10 thousand population (Social organizations and associations)	.835

*Explained variance 82 per cent.

Source: Own calculations.

Table 3. Intellectual Capital

Variable	Factor loading
Academic teachers per 10 thousand population	.979
Employment in R&D (Employed persons per 1000 economically active persons)	.944
Employment in R&D (Share of employed in R&D in economically active population)	.895
Expenditures on R&D (Share of entities incurring expenditure on R&D in the total number of entities)	.904
Graduates per 10 thousand population (social and behavioural science)	.894
Higher school students per 10 thousand population	.865
Lifelong learning of persons aged 25-64 (share)	.905
Professors per 10 thousand population	.930
Protection of industrial property in Poland (utility model applications) per 100 thousand population	.885
Protection of industrial property in Poland (rights of protection granted) per 100 thousand population	.978
Share of children covered by preschool education	.829
Students of doctoral studies per 10 thousand population	.864
The share of population (15-64) by level of education in the total population at this age (tertiary)	.978
The share of population (15-64) by level of education in the total population at this age (general secondary)	.878

*Explained variance 82 per cent.

Source: Own calculations.

The data used in our research come from the Polish Central Statistical Office from the year 2011 or 2010. For the construction of the competitiveness, social and intellectual capital indexes we used the method of relative distance comparison. All distinguished variables used in the analysis were divided, according to their impact on the phenomenon examined, into two groups i.e. stimulants-variables affecting in a positive way and destimulants-variables affecting in a negative way. For stimulants we applied normalization expressed by the formula (1) and for one destimulant - Entities unregistered form the NOBR register per 10 thousand population-the one by formula (2). It allowed for achieving all variables in the range of 0-100 points, which undoubtedly facilitated the positioning of the 16 regions.

$$H_{ij} = \frac{100\,(x_{ij} - x_{i\,\min})}{x_{i\,\max} - x_{i\,\min}} \tag{1}$$

$$H_{ij} = \frac{100\,(x_{i\,\max} - x_{ij})}{x_{i\,\max} - x_{i\,\min}} \tag{2}$$

where: x_{ij} – empirical value of i-th variable w j -th region,
$x_{i\,\min}$ – the lowest among the regions value i –th variable,
$x_{i\,\max}$ – the highest among the regions i –th variable.

Results

In the analysis of performance of regional competitiveness, the highest scores were achieved in the Mazowieckie region. In the top of the ranking we could find Pomorskie and Dolnośląskie (tab. 4). These are regions that have the ability to attract skilled, creative and innovative people, to provide high quality cultural facilities, and to encourage the development of social networks and institutional arrangements that share a common commitment to regional prosperity. These are also regions that have the highest density of firms, the most knowledge-intensive firms and the highest level of economic participation. In these regions new firms stimulate competitiveness via market selection and competitive pressures, by forcing less efficient incumbents to exit or to improve their productivity. In this way, both the creation and destruction of firms may improve competitiveness. The more middle-ranked regions show more fluidity in their rankings. The most economically disadvantaged regions in Poland were Lubelskie, Świętokrzyskie and Podkarpackie. The poor economic performance of these regions can be caused by the predominance of agriculture in the regional economy. The problem of these regions is the absence of a basis innovative capacity in business. That is why more emphasis should be put on mobile investment and on creating environments where high-quality business can start and succeed [Turok 2004].

Table 4 Index of Competitiveness of Polish regions

Region	Index of Competitiveness	Rank
Mazowieckie	85,63	1
Pomorskie	59,80	2
Dolnośląskie	58,84	3
Zachodniopomorskie	53,42	4
Lubuskie	52,13	5
Wielkopolskie	48,90	6
Śląskie	47,23	7
Łódzkie	42,00	8
Małopolskie	41,76	9
Kujawsko-Pomorskie	32,42	10
Opolskie	27,17	11
Warmińsko-Mazurskie	25,61	12
Podlaskie	23,77	13
Podkarpackie	23,56	14
Świętokrzyskie	20,07	15
Lubelskie	18,83	16

Source: Own calculations.

The standard measure of regional success is GDP per capita. In recent years, the Polish regions have experienced rapid economic growth. However, this increase is not evenly distributed. In 2009, as in previous years, the share of regions in GDP was much differentiated. Four voivodeships i.e. Mazowieckie, Wielkopolskie, Śląskie and

Podkarpackie increased the share in GDP; simultaneously the value of GDP produced in Mazowieckie was almost 10 times higher than in Opolskie. At the same time two regions i.e., Mazowieckie and Śląskie, produced 35% of the total national gross domestic product.

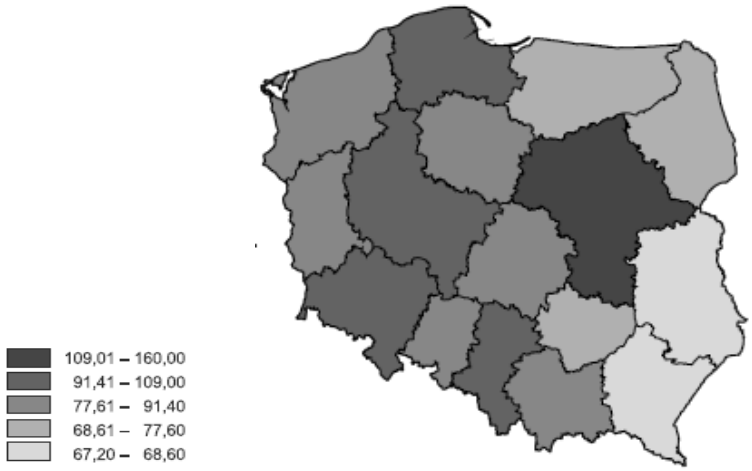

Fig. 1. GDP per capita in Polish regions in 2009 (Poland=100)

Source: Own calculations on the basis on data CSO, 2009.

In the analysis of performance of social capital (Table 5) the highest score was achieved in Mazowieckie region. Therefore, it is possible that the regional prosperity and competitiveness create or foster regional social capital. The presence of a high level of social capital facilitates mutually beneficial collective actions that foster prosperity of that region. On the other hand, in the top of the ranking were also Warmińsko-Mazurskie and Lubelskie voivodeships. These are less developed regions and a high level of the social capital can, at least theoretically, contribute to reduce regional disparities. In the analysis of the performance of the intellectual capital (Table 6) the highest score was achieved in Mazowieckie region. In the top of the ranking we find Malopolskie, Dolnośląskie, Pomorskie and Wielkopolskie. The middle-ranked regions are Śląskie, Lodzkie and Opolskie. Lastly, the lowest positions were taken by Lubuskie, Warmińsko-Mazurskie and Swietokrzyskie. Undoubtedly, the absolute leader is Mazowieckie, the capital region where economic concentration goes together with the political centre of the country. Mazowieckie owes its high position to its very dynamic growth, both economically and socially. Combining the index of intellectual capital with the competitiveness performance shows a positive relationship between intellectual capital and competitiveness. Regions which achieved high scores in the index of intellectual capital also have a high classification in the index concerning regional competitiveness.

Table 5. Index of social capital

Region	Index of Social capital	Rank
Mazowieckie	82.98	1
Warmińsko-Mazurskie	55.10	2
Lubelskie	54.71	3
Wielkopolskie	54.18	4
Podkarpackie	50.43	5
Małopolskie	50.05	6
Dolnośląskie	47.86	7
Pomorskie	42.03	8
Opolskie	40.25	9
Łódzkie	38.92	10
Lubuskie	38.89	11
Podlaskie	38.14	12
Zachodniopomorskie	36.95	13
Świętokrzyskie	32.58	14
Kujawsko-Pomorskie	32.39	15
Śląskie	4.38	16

Source: Own calculations.

Table 6. Index of Intellectual capital

Region	Index of Intellectual Capital	Rank
Mazowieckie	82,82	1
Małopolskie	62,52	2
Dolnośląskie	50,88	3
Pomorskie	44,99	4
Wielkopolskie	43,88	5
Śląskie	42,17	6
Łódzkie	41,17	7
Opolskie	35,26	8
Lubelskie	34,93	9
Podlaskie	32,29	10
Zachodniopomorskie	31,09	11
Kujawsko-Pomorskie	28,44	12
Podkarpackie	23,18	13
Świętokrzyskie	19,37	14
Warmińsko-Mazurskie	17,63	15
Lubuskie	12,05	16

Source: Own calculations.

An inspection of the correlations between competitiveness (*COMP)*, GDP per capita (*GDP*), social (*Socc*) and intellectual capital (Intelc) shows that all four are highly correlated. However this holds the least for social capital.

In our model GDP per capita is positively affected by competitiveness, while competitiveness is positively affected by social and intellectual capital. The test of this model calls for a 2SLS in which competitiveness is the predictor variable and social and intellectual capital are instrumental variables. Before doing so, we did an OLS-estimation to check whether social and intellectual capital both are to be taken as instrumental values in the 2SLS-equation, see equation (3). From this equation we can conclude that the impact of social capital on competitiveness is not significant. Hence we excluded social capital as an instrumental value.

$$COMP = 23{,}377 + 13.04Soc + 73.47Intelc \tag{3}$$

with t-values for the constant and coefficients of 12.16,0 .551 and 5.070 respectively (adj R^2=0.79).
Equation (4) gives the loglinear specification that allows computation of the competitiveness- intellectual capital elasticity.

$$Ln(COMP) = 2.46 + 0.47Ln(Intelc) \tag{4}$$

with t-values for the constant and coefficients of 7.80 and 6.62 respectively (adj R^2=0.74).
Equation (5) gives the 2SLS-estimation, Competitiveness is the predictor variable and intellectual capital the instrumental variable.

$$GPD = 17{,}257 + 148.79COMP \tag{5}$$

with t-values for the constant and coefficient of 7.73 and 7.34 respectively (adj R^2=0.78).
Equation (6) gives the loglinear specification that allows computation of the elasticity.

$$Ln(GPD) = 7.96 + 0.53Ln(COMP) \tag{6}$$

with t-values for the constant and coefficient of 16.07 and 4.83 respectively (adj R^2=0.60).
Increasing competitiveness by 1% increases the GDP per head by 0.53%.

Conclusions

In the world of performance of indicators and rankings, it is apparent that regions are compared with one another in terms of their economic position. This article looked at competitiveness from a regional perspective (NUTS-2) and has attempted to conceptualise regional competitiveness for Poland, and also to investigate the relationship between social and intellectual capital and competitiveness for the 16 Polish regions. Our 2SLS- analysis shows that GDP per head is positively affected by competitiveness, intellectual capital being the instrumental variable. Furthermore that competitiveness is positively affected by

intellectual capital. The analysis done here proved that there is not a significant relationship between the presence of social capital and regional competitiveness. Increasing competitiveness by 1% increases the GDP per head by 0.53%., according to the 2SLS equation and, according to the OLS equation, an increase of intellectual capital by 1% leads to an increase of competitiveness by 0.47%. Though there is no significant relationship between competitiveness and social capital, social economic researchers dealing with issues of social capital emphasize the importance of this kind of capital for the integration of society. A high level of social participation can also be understood as a compensation for market failure and the welfare state [Sałustowicz 2007]. The development of scientific research, technological progress and innovation are crucial to attain high competitiveness. Knowledge and its quality, scientific research, technological progress, quantity and quality of human capital are considered crucial factors for economic growth and a high quality of life. Although the ability of regions to adapt to fundamental changes in the economic environment rests on a range of issues including their socio-economic structure, level of initial development and proximity to capital and innovation, as well as the way in which they are affected by national policy decisions [Gorzelak 2000], it is widely recognized that the development of regional competitiveness depends mainly on endogenous factors. In this respect we can expect that intellectual capital will be perceived as one of the most important factors for economic growth. In a globalised and strongly competitive world, only regions with the ability to attract and to keep intellectual capital can win [Florida 2012].

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Regional approach to the effects of the production of agricultural holdings with respect to the CAP policy

Synopsis. The productivity is a key issue in economics as it is one of the factors affecting the economic prosperity. An analysis of the agricultural production has a special place in economics of agriculture due to its high dependency on many factors. Therefore, many authors try to define what and to what extent affects the production in agricultural holdings. In their paper, the authors wanted to show that apart from basic production inputs, we also observe an impact of various types of payments on the production. These payments are used in agricultural holdings to cover costs related to the agricultural production, e.g. purchase of fertilisers and plant protection products. In the longer term, such activity may have negative consequences, namely it may result in the stagnation of the development of a holding. This is related to providing the holding with additional funds which protect it against bankruptcy and consequently delay making a decision on reorganising the holding. The paper also attempts to approach the analysed issue in spatial terms, because, as many authors notice, changes in the production and the system of payments are strongly diversified regionally. The studies used the spatial econometrics the SAR model. Based on the above model, an econometric production model, extended by various types of payments, has been proposed.

Key words: direct payments, production, spatial analysis

Introduction

A basic instrument in support of agriculture, after Poland's accession to the EU are direct payments which are one of the Common Agricultural Policy instruments. The system of direct payments consists in granting financial support in an amount proportional to the area of agricultural land, regardless of the type of pursued agricultural activity. The system of payments includes single area payment (JPO – SAP) and complementary national direct payment (UPO – CNDP). Besides, Polish agriculture was supported by other operational activities, namely SAPARD (in the years 2002-2004), RDP and SOP Agriculture (in the years 2004-2006) and RDP (in the years 2007-2010). Most of the funds allocated to holdings are characterised by the strong spatial diversification which is related to the size of the area of agricultural land [Głębocki 2014]. In the year 2015 it is planned to change the method of granting direct payments, therefore an important aspect is to focus on examining a relation between direct payments and factors affecting the development of agricultural holdings. The relation of direct payments and virtually of their impact on the production has been analysed by many authors. Sadowski and Antczak [2012] claim that a positive impact of payments on the production growth is basically inconsistent both with the

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original function of using direct payments and with additional, environmental objectives set within the framework of the Luxembourg reform [Sadowski and Antczak 2012]. In his paper, Sadowski proved that the production growth had resulted from the use of direct payments for funding current production expenses, e.g. purchase of mineral fertilisers. However, many authors think that the introduction of direct payments results, in the longer term, in a negative impact on the productivity in agriculture. This is related to providing the holding with additional funds which protect it against bankruptcy, and consequently delay making a decision on reorganising the holding [Rude 2007]. As it results from analyses carried out by other authors, in Poland there are important socio-economic differences between the economy and agriculture as well as disproportions caused by different environmental conditions and different organisation of agricultural holdings at the regional level [Krasowicz and Kopiński 2006]. As noticed by Czubak [Czubak et al. 2011], payments are strongly diversified regionally, which is also a result of different agrarian structures specific to the individual regions of Poland.

The issue of connecting the productivity and direct payments is a problem which has already been dealt with by many foreign authors. In their studies, the authors found both a negative and a positive impact of payments on the productivity. In one of the papers on the productivity, Lee, who conducted studies in Korea [Lee 1996] as well as Beanson and Weinstein, who conducted studies in Japan [Beanson and Weinstein 1996] stated that payments had a negative impact on the production growth. When conducting studies on the production effectiveness in Sweden, Bergstrom concluded that payments had a positive impact on the production growth [Bergstrom 2000]. However, when it comes to the issue of direct payments in agriculture and their inclusion in the production function, such analyses were carried out by Rizov [Rizov et al. 2013]. When analysing the impact of grants received under the CAP, Rizov studied the productivity of commercial holdings in the EU. The data used in that study concerned the countries belonging to the EU-15 of the years 1990/1996-2008 and came from FADN. That paper used the nonparametric regression function, which allowed to increase a possibility of getting more coherent estimates of the production function parameters. Rizov et al. conducted regional analyses on the macro level as they also wanted to state whether there were any differences in the productivity between the states of Northern and Southern Europe. The analyses carried out confirmed the impact of grants on the production for all EU-15 states. The authors also found that payments had rather a negative impact on the agricultural production. A certain reservation regarding the conducted studies applies to the study sample used (EU-15), namely, the study used the states whose economies were more developed and thus, the market imperfections were less visible.

On the basis of the analyses carried out by other national and foreign authors, the authors decided to conduct similar studies for Poland based on the Economic Accounts for Agriculture (EAA) at the NUTS 2 level. Due to earlier studies, which determined the regional diversification of payments and the production value, the spatial effect has been included in the production function. The objective of the paper was to determine the impact of payments on the production value, with consideration given to the spatial nature of this relation.

Data and methods

In this paper, we used the data derived from the Regional Accounts for Agriculture (RAA) which are drawn up on a basis of a methodology of the Economic Accounts For Agriculture (EAA). The first account is drawn up at the NUTS 1 level, the other at the NUTS 0 level. In Poland, the EAA have been drawn up at the Institute of Agricultural and Food Economics National Research Institute, since 1998 at the national level (EAA) and since 2009 – at the regional level (RAA), both in cooperation with the Department of Agriculture of the Central Statistical Office. The EAA is an instrument used in agricultural statistics by Eurostat for the purposes of the European Union. They are used to calculate the volume and value of the agricultural production in the European Community countries. The EAA are drawn up for the entire agricultural sector and are the satellite accounts to the National Accounts (NA). The EAA and RAA are the accounts of macroeconomic nature taking into consideration the volume and value of the production of holdings in a given year. The EAA are drawn up on an accrual basis, i.e. at the moment of the existence of an economic event, when the economic value of the product is being created rather than at the moment when payment is actually made (cash basis). The method for preparing the EAA has been developed and standardised by Eurostat. The identical system of calculating the EAA in all Member States allows to compare the production and economic results as well as to monitor agricultural income in the EU. Simultaneously, the accounts provide the information necessary when determining the major priorities or making decisions within the framework of the Common Agricultural Policy (CAP). A legal basis for the Economic Accounts for Agriculture is the the EC Regulation 138/2004 of the European Parliament and of the Council of the European Union of 5 December 2003 *on the economic accounts for agriculture in the Community*, which is an essential document obliging the EU countries to develop the EAA and simultaneously specifying the scope and method of the accounts. The rules for calculating the EAA have been included in the "Manual On The Economic Accounts For Agriculture And Forestry Eaa/Eaf 97 (Rev. 1.1)" as amended (Commission Regulation (EC) No 306/2005 of 24 February 2005, Commission Regulation (EC) No 909/2006 of 20 June 2006, Commission Regulation (EC) No 212/2008 of 7 March 2008).

An analysis to study the impact of payments on the production value used the results of the Regional Economic Accounts for Agriculture (RAA) for the years 2005-2008 which are drawn up in the fashion of the Economic Accounts for Agriculture (NUTS 0 level). Chart 1 shows the changes in the production value in the years 2005-2008. As it may be noticed, two voivodeships (Mazowieckie and Wielkopolskie) in the analysed period were clearly different from others, in terms of that feature.

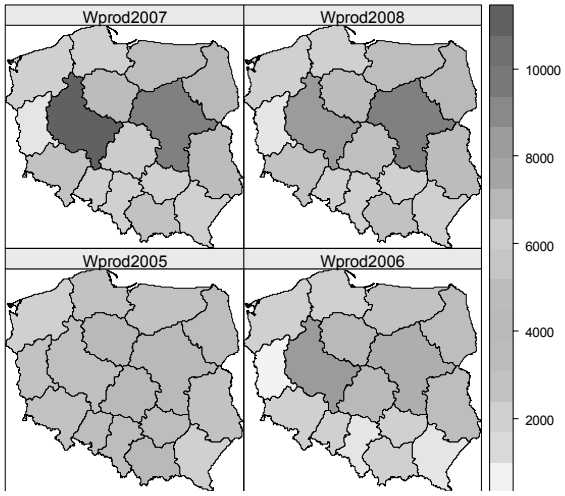

Fig. 1. Production value in thous. zl of individual holdings in the individual voivodeships for the years 2005 – 2008

Source: own calculations, based on the Regional Economic Accounts for Agriculture (RAA).

Chart 2 shows the average amounts of three types of payments by voivodeships. As we may notice, the spatial layout of granted payments is similar to that presented for the production value in Fig. 1

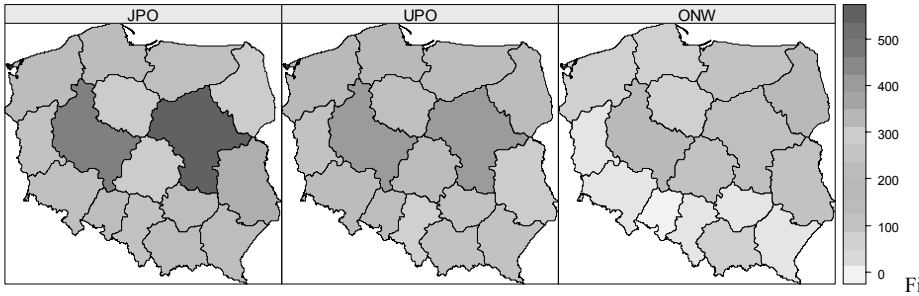

Fig. 2. Average amounts of three types of payments (JPO – single area payment, UPO – complementary national direct payment, ONW – payments to less-favoured areas) by voivodeships in thous. zl.

Source: own elaboration based on the EAA data from the years 2005 – 2008.

The production potential of agriculture is formed by resources of basic production factors i.e.: land, capital and labour. The resources of these factors are significantly diversified regionally. In order to remove the impact related to changes in prices, the fixed prices of 2005 have been adopted. All variables in the analysis are considered in value terms.

In the conducted studies, the effect of agricultural activity – the value of production of plant and animal goods – has been adopted as a dependent variable (Wprod). Independent variables were production inputs, in which indirect consumption has been included (NAK1). In the RAA accounts, this component covers materials inputs in agriculture, including: seed material; energy and fuel; fertilisers and plant protection products;

veterinary services; purchased and self-manufactured feed; as well as the maintenance of machinery, buildings and equipment. As another component complementing material inputs and reflecting the capital input, the costs of depreciation of buildings and structures and machinery used in the agricultural production process (NAK2) have been included. On the other hand, as the labour component, the number of persons employed in agriculture expressed in thousand AWU (NAK3) has been included. For the purposes of the study on indirect consumption, the following have been additionally singled out within the inputs: fertilisers (NAK4); inputs for purchase of plant protection products (NAK5). As the land factor, the value of agricultural land has been introduced (NAK6). We have to add that the above structure of the groups of inputs reflects the technology of the agricultural production. In addition, the values of single area payments (JPO), of complementary national direct payments (UPO), of payments to less-favoured areas (ONW) and of other payments (InneDop) have been included. The value of other payments consisted of: payments to loans, to biological progress, to plant protection, to organic farming, to support for agri-environmental projects, to support for semi-subsistence farms, return of excise duty included in the price of oil used for the agricultural production, payments of compensation for renouncing the milk quotas, payments to seed material as well as historic payments not related to the current production: complementary payment to the hop production area and separate payment to fruit and vegetables (payment to tomatoes). Due to the key importance of cereal crops in Poland and the existence of the regional diversification at the production level, the amount of complementary payments has been divided into complementary payments to the production of cereals (ZbozaDop) and complementary payments related to the production of other plants (UPOb). In order to eliminate the collinearity in the analysed regression model, indirect consumption has been decreased by inputs for fertilisers and plant protection products (the variable obtained in this way has been designated in short as NAK1a).

As a result, the following production model has been considered:

$$Wprod = \beta_0 NAK1^{\beta_1} \cdot NAK2^{\beta_2} \cdot NAK3^{\beta_3} \cdot NAK4^{\beta_4} \cdot NAK5^{\beta_5} \cdot NAK6^{\beta_6} \cdot JPO^{\beta_7} \cdot UPO^{\beta_8} \cdot ONW^{\beta_9} \cdot InneDOP^{\beta_{10}} + \varepsilon \quad (1)$$

An analysis of the data for the above model may be found in the paper by Buks and Pietrzykowski [Buks and Pietrzykowski 2014]. The extension of the conducted studies consisted in including the spatial effects in the analyses carried out.

The classic production model consists of three elements: capital, land and labour. Thus, we may write it down using the following formula:

$$y = f(x_1, x_2, \ldots, x_p) = \beta_0 \prod_{i=1}^{p} x_i^{\beta_i} + \varepsilon \quad (2)$$

where $x_1, x_2, \ldots, x_p \geq 0$ and correspond to individual production inputs and β are the regression coefficients. In the previous paper, the authors extended the above model by various types of payments [Buks and Pietrzykowski 2014]. The model written using formula 1 does not include spatial autocorrelation. In the spatial analyses, we may consider spatial autoregressive models (SAR), spatial error models (SEM, SMA, SEC) and spatial cross-regressive models (SCM). In the study the SAR model (Spatial Autoregressive

Model) describing spatial autocorrelations has been selected [Arbia 2006], which in the matrix form may be written down using the following formula:

$$\mathbf{y} = \rho\mathbf{W}\mathbf{y} + \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon} \tag{3}$$

where **y** – vector dependent variables, **X** – matrix of independent variables, **β -** vector of regression coefficients**, ε -** vectors of independent identically normal distributed random errors N(**0,** σ^2**I)**, ρ - autoregression parameter, **W –** matrix of spatial weights.

In standard terms the SAR spatial model may be presented by means of the following formula:

$$y_i = \rho\left(\sum_{j=1}^{N} w_{ij} y_i\right) + \sum_{i=1}^{k} x_{ij}\beta_i + \varepsilon_i \tag{4}$$

where: w_{ij} is elements of this weight matrix **W**.

The study used the first-order binary weight matrix $\mathbf{W}^3$. The application of this type of matrix in the SAR model results in the appearance of the so-called global autocorrelation dependency of observations in a given location with respect to the other locations of the analysed phenomenon [LeSage 1999]. The global autocorrelation dependencies may be presented by means of the following formula:

$$(\boldsymbol{I} - \rho\boldsymbol{W})^{-1} = \boldsymbol{I} + \rho\boldsymbol{W} + \rho^2\boldsymbol{W}^2 + \rho^3\boldsymbol{W}^3 + \cdots \tag{5}$$

Formula 5 describes the extension of the matrix $(\boldsymbol{I} - \rho\boldsymbol{W})^{-1}$, which is to illustrate a change in the random factor appearing in one location and then this extension is transferred to other areas of the impact of the analysed feature.

In the conducted studies, for the purpose of including the spatial relations, the following autoregressive model has been proposed to describe the dependency of the production value on inputs and various payments:

$$\ln(y_i) = \rho\left(\sum_{j=1}^{N} w_{ij} y_i\right) + \ln(\beta_0) + \sum_{i=1}^{k} \ln(x_{ij})\beta_i + \varepsilon_i \tag{6}$$

where y_i – production value, x – inputs (values: labour, capital and land). The proposed model determining the production value (formula 6) is the production model presented in a linear form.

The analysed function has been extended by payments, to obtain the following econometric model:

$$\ln(y_i) = \rho\left(\sum_{j=1}^{N} w_{ij} y_i\right) + \ln(\beta_0) + \sum_{i=1}^{p} \beta_i \ln(x_{ij}) + \sum_{j=(p+1)}^{k} \beta_j \ln(d_j) + \varepsilon \tag{7}$$

where x_i correspond to production inputs, whereas d_j correspond to various types of payments. The final form of the proposed model is presented using formula 8:

[3] The weight matrix in binary style, units for neighbouring voivodeships, otherwise zero.

$$\ln(y_i) = \rho\left(\sum_{j=1}^{N} w_{ij} y_i\right) + \ln(\beta_0) + \sum_{i=1}^{p} \beta_i \ln(x_i) + \ln(D_i) + \varepsilon \quad (8)$$

$$D_i = \exp\left(\sum_{j=(p+1)}^{k} \beta_j x_j\right) \quad (9)$$

Due to a failure to meet the assumptions for the classic least-squares method (OLS), the maximum likelihood method has been used to estimate the parameters of that model. All calculations have been made using the R-CRAN programme [R: A language… 2009].

Results

As a result of the analyses carried out, two econometric models were considered. In the first model, various production inputs were considered and also various types of payments were added (Model A, presented by means of formula 8 – table 1). In the other model (Model B –table 2), only payments themselves were included, to be treated as funds which are not a regular input but an input which provides additional cash flow. Table 3 (Model C) included the results obtained for the model without the spatial effects. When comparing the considered models for the purpose of determining the quality of obtained fits, the adjusted coefficient of determination has been used (D_{adj}). For model C, which did not include the spatial effects, the value $D_{adj} = 0{,}9746$ has been obtained, whereas for model A, which included the spatial effects, i.e. interdependencies among neighbours the value was $D_{adj} = 0{,}9981$. In model A, the production value was significantly affected by the value of the land, amount of fertilisers applied, direct consumption (excluding the input for fertilisers and plant protection products) and all payments received by farmers and taken into account in the analyses carried out. The calculations for model B were made in order to determine the relation between the production and payments, except for other explanatory features. Model B has obtained the lowest coefficient $D_{adj} = 0{,}9128$, but this is natural due to the fact that other variables were not included in it. It should be noted, however, that the removal of typical inputs from the production model, and leaving payments only did not result in a great change in the value of the coefficient (decline in value by 0.06). Therefore, we may conclude that payments have a large impact on the obtained production value, because 91% of the production variability are explained by the variability of features which describe payments (while only 9% remain unexplained or reserved for other features which may be included in the study).

The analyses carried out allowed to assess more precisely a relation between the production value and payments received in agriculture. In model C, no relation for all types of payments with the production value has been shown. It seems that the relation described by means of this model may prove a positive trend in the evolution of the CAP (in accordance with the assumptions, the impact of payments on the production is gradually decreasing). In model A, however it has been confirmed that payments have the greater impact on the production value in the ranking of analysed variables. The obtained effect may be explained by the regional diversification at the level of voivodeships, i.e. in the model, which did not include spatial dependencies, the impact of payment has been simply decreased (masked as a result of having not included spatial correlations). Moreover, the analysis showed a negative relation between the production and complementary payments (UPOb, ZbozaDop) and other payments, which would confirm a thesis that obtaining this

type of payments by farmers results in weakening of activities for the development of holdings. Therefore, it should be stressed that thanks to the inclusion of the spatial effects, the impact of location on the production has been found, through the diversification of the use of payments in the individual voivodeships.

Table 1. Values of regression coefficients of the spatial econometric production model according to formula 8

Variables	Estimate coefficients	Standard errors	t value	p – value
(Intercept)	4,3298	0,8333	5,1961	2,04E-07
NAK6	0,2012	0,0678	2,9685	0,002992
NAK1a	0,1588	0,0617	2,5735	0,010068
NAK4	0,3875	0,0783	4,9507	7,40E-07
JPO	0,0103	0,0016	6,6470	2,99E-11
UPOb	-0,0151	0,0019	-8,0395	8,88E-16
ONW	0,0054	0,0005	10,7573	< 2,2e-16
InneDop	-0,0030	0,0005	-6,0820	1,19E-09
ZbozaDop	-0,0061	0,0013	-4,7630	1,91E-06

Source: own calculations based on the Regional Economic Accounts for Agriculture (RAA).

Table 2. Values of regression coefficients of the spatial econometric production model including the impact of payments only

Variables	Estimate coefficients	Standard errors	t value	p – value
(Intercept)	14,3805	0,1115	129,0228	< 2,2E-16
JPO	0,0219	0,0062	3,5016	0,0005
UPOb	-0,0223	0,0053	-4,1753	2,98E-05
ONW	0,0077	0,0025	3,1068	0,0019
InneDop	-0,0065	0,0023	-2,7693	0,0056
ZbozaDop	0,0095	0,0032	3,9604	7,48E-05

Source: own calculations, based on the Regional Economic Accounts for Agriculture (RAA)

Table 3. Values of regression coefficients of the econometric production model without the spatial effects.

Variables	Estimate coefficients	Standard errors	t value	p – value
(Intercept)	2,0806	0,8615	2,415	0,0190
NAK6	0,1885	0,0508	3,714	0,0005
NAK4	0,1891	0,0585	3,233	0,0021
NAK5	-0,1597	0,0844	-1,891	0,06371
NAK1a	0,6487	0,0580	11,181	6,85E-16
JPO	-0,0020	0,0009	-2,210	0,0311
UPO	0,0009	0,0002	3,641	0,0005
InneDop	0,0011	0,0004	2,766	0,0077

Source: own calculations, based on the Regional Economic Accounts for Agriculture (RAA).

Figure 3 shows the spatial distribution of residuals for model A (including the spatial correlations). In the figure, the negative residuals (light grey voivodeships), positive residuals (dark grey voivodeships) and distant points, so-called "outliers" have been marked. The voivodeships marked black are the voivodeships for which the values of residuals were positive (outliers+), and those marked white mean negative residuals (outliers). Most voivodeships obtained the positive values of residuals which would mean that in these voivodeships the model underestimates the production value. Two voivodeships, namely the Opolskie voivodeship (positive value of residuals) and Lubuskie voivodeship (negative value of residuals) are different from the other

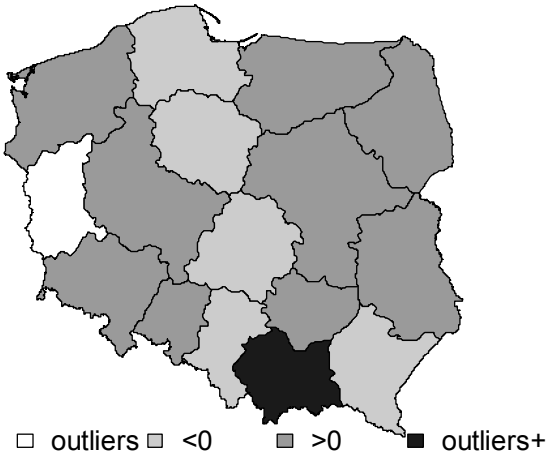

Fig. 3. Spatial distribution of residuals value for model A

Source: own elaboration based on the EAA data from the years 2005 – 2008

In the Pomorskie, Kujawsko-Pomorskie, Łódzkie, Śląskie and Podkarpackie voivodeships, the negative values of residuals were obtained. Therefore, it may be concluded that in those voivodeships the production value would be higher than that derived from the model estimated on a basis of obtained features (including payments). The greatest differences will be noticeable for the Lubuskie voivodeship. The econometric spatial model is the "better" model due to the criterion adopted (adjusted coefficient of determination). However, it should be stated that the difference is not very significant, but the inclusion of the spatial effects allowed to determine the impact of all payments on the production value, which was not achieved in the standard model.

Summary

The results obtained allowed to confirm the opinions of other authors pointing to the impact of payments on the production value. The use of spatial analyses showed that the impact of payments was diversified regionally. The study showed the production value model which also included the land factor and other total inputs included in indirect consumption. The greatest impact on the production value was found for inputs aggregated

in indirect consumption, namely, an increase of those inputs by one percentage point would result in the production growth by 38.75%, on average. In the model with the spatial effects, it was possible to state the impact of all types of payments on the production value (it was impossible to achieve that in model C without the spatial effects). Both models show minor changes in the production value with an increase in payments by one percentage point. However, in the model including the spatial effects that impact would significantly higher. We should also note that in the model including the spatial effects, complementary payments (broken down in terms of payments to the production of cereals and other plants) as well as other aggregated payments affect the production value in a negative manner. The use of the SAR model allowed to state the impact of all payments on the production value. This analysis has confirmed the relation and diversification of payments and production in the space which the reference area of Poland at the NUTS-2 level was.

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Modern theoretical foundations of international trade of biomass and its implications for Ukraine

Abstract. The energy dependence of Ukraine necessitates finding alternative energy sources, which primarily should take into account the resources available, the possibility of prospective studies and cost-effectiveness of such developments. One of considered alternative sources is the potential of biomass used for processing of different types of fuel. Analysis of international experience of energy use of biomass shows that this fuel cannot compete with conventional (fossil types). In other countries, development of the energy sector takes place with state support in the form of subsidies, grants and tax benefits. In Ukraine now there is no real economic support of bioenergy. But Ukraine has significant potential of biomass in the form of agricultural residues and waste wood processing, which can be used to produce heat and electricity. It should be noted that lack of public funding of these programs can be compensated by attracting foreign investors to increase their interest, and could become the country's competitive advantage in international markets. Given the above, it is reasonable to study the potential competitive advantages that are possible on the basis of international biomass trade between countries. Article objective is to present modern theoretical foundations of international trade with relation to biomass and to deliberate the potential economic benefits from Ukrainian economy.

Key words: biomass, international trade, Poland, Ukraine

Introduction

Modern theoretical principles outlined in international trade have been deliberated by many scientists. Problems of development of alternative energy sources are actively engaged in both domestic and foreign scholars. Considerable is contribution of scientists who mainly explore the effectiveness of alternative energy sources and consider their individual destinations.

The attempts consider the scientific and technological revolution in international trade impact has led to creation of neotechnological theories of foreign trade. Their supporters try to explain the foreign trade relations not by supply or by production factors, which was characteristic for the neoclassical theory, but by spending on research and the invention of technological innovations, by level of average wages and the proportion of skilled labor.

This article will elaborate application of theories on international trade to examine stage of maturity of biomass potential as export product of Ukraine. Poland there is an very important trade partner for Ukrainian State that is why it would be often recalled as comparative material for conducted examination. Research method would be theoretical

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revision of literature and it will try to give answer for problem if theory can define potential benefits of international biomass trade.

Today, the costs of maintaining an apartment, house, or other objects largely depend on their costs to heat the rooms. The unstable market and rising fuel prices in Poland and in the world cause the rise in popularity of pellets and briquettes. With higher prices for basic energy sources such as oil, gas and coal, the number of cheaper, eco-friendly fuel is increasingly rising. They are often used by institutions and individual customers in the newly built facilities, as well in the old but renovated buildings. The Biomass is defined as the product of agricultural origin used directly as a fuel or process combustion to other form prior one, which can be processed for other types of energy as for instance the electricity. As defined by the European Union *biomass* (Directive 2001/77/EC) means the biodegradable fraction of products, waste and residues; or agriculture products (including vegetal and animal substances); from forestry and related industries, as well as industrial waste from urban areas.

Ukraine is the most important, accessible and abundant source of energy with zero CO_2 balance for European Union countries. The need to protect forests and rational use of forest biomass for energy increasing importance biomass to Ukraine, in which agricultural plays still an important role. The Agro-energetics create alternative income opportunities for Ukrainian farmers, while fits perfectly into the concept of a distributed energy policy, therefore have crucial role of increasing safety the country's energy sources and at the same time it gives new platform of economic cooperation between the Poland and Ukraine.

The European Union and Ukraine initialed on July 19 2012, the agreement which established the comprehensive free trade area. Negotiated agreement between the EU and Ukraine is much more wider than other typical free trade agreement signed by EU in the past. It concerns not only the elimination of tariffs and non-tariff, but also, more importantly, acceptance by Ukrainian government the EU legislation and standards. The European Union priorities in the negotiation were primarily: Ukraine's closer integration with the EU single market, opening and liberalization of the Ukrainian market.

Modern theoretical foundations of international trade of biomass

Among such neotechnological theories, the theory of product life cycle (Vernon R.) should be noted. This theory defends the view according to which the development of international trade depends on the life cycle of the product. These stages are: 1) design and production launch, 2) increasing of production, 3) maturity, and 4) decline. In the first stage the product development is a response to the increased need for it. Here there is a small-scale production; the second stage means the growth of demand for this type of product, there are competitors, expanding exports. The third stage is characterized by serial production with competition, where price becomes a dominant factor. In the fourth stage, the significant reduction in demand for the product leads to the fact that the country initiating innovation is only the private importer, and production and markets are mainly concentrated in developing countries. Thus, based on this theory, the product production moves from one country to another, depending on the stage of the cycle. It should be noted that, according to the standards of ISO, the first stage of the product life cycle is a strategic marketing (zero phase), which actually determines and projects the need for this type of product for a particular market.

In theoretical considerations of international trade of biomass as a feedstock for energy production, Poland currently is in the second phase of the product life cycle. In 2012, had been observed high increase of supply for biomass, especially thanks to significant investments using European Union funds for labels, briquettes and pellets from straw and imports of resources from the East Europe and ACP countries. Contrary, Ukraine is on zero stage and partly on first stage of the life cycle, and this requires clear identification of the need for such resources and forecasting of demand.

The disadvantage of the theory it the following: many products do not develop according to the logic-based approach to the life cycle. These products have: too short life cycle; high transport costs; narrow range of potential customers, etc. But these flaws are minor concerning international trade of biomass, since the life cycle of these products is long (due to the constant energy dependence), moderate transportation costs, and the number of potential customers will likely expand. According to the State Agency for Investment and National Projects of Ukraine, the potential capacity of the market to grow, and the potential power generation of 400 MW of electricity and 9000 MW thermal [Shurinh 2013]. Only 1 million tons of standard fuel in the form of biomass is used in Ukraine today, but capacity is 30 million tons of standard fuel, and that can replace 26 billion m³ of natural gas and 40% of its consumption in Ukraine [Doroshenko 2013]. Given that investment projects in Ukraine are implemented very slowly, and their payback periods are up to 5-7 years, there is a feasibility of sale of part of biomass potential to other countries demonstrating demand for it, and where the industry is evolving more rapidly, for example to Poland. The demand for biomass energy in Poland may reach this year 6.5-7 million tons of biomass, of which about 4-6 million tons in this country can be produce from straw, and the rest - from energy plantations or residues of food industry [Doroshenko 2013]. It's important to underline that the strong demand for biomass, which generates energy industry, creates opportunities for producers.

Another very common theory is the theory of scale effect. It argues that countries specialize in production of certain goods, after meeting the demand of the domestic market expanding production through expansion into foreign markets. In this case, the unit costs of production are reduced as a result of scale effects. In applying this theory on Ukraine, one could argue that Ukraine, not having the sufficient processing capacity, carrying out foreign economic activities towards the implementation of biomass, can at least reduce the loss and gain additional profit.

Supporters of neotechnological directions claim that the cause of trade between industrialized countries is the advanced technological gap that occurs in certain areas and allows succeeding countries to conquer foreign markets for this product. Technological theories include theories of intra-industry trade, including S. Linder theory which explains the trade desire to expand the range of products offered in the market in different countries.

One of the known theories of this school is the technological gap theory, the basis of which was founded by the British economist M. Posner in the early 60's of XX century. According to this theory, trade arises from differences between several countries according to the pace and nature of innovations [Posener 1961]. M. Posner suggested that one of developed countries due to the discovery receives a fundamentally new technology or a new product that are in demand in other countries. So trade of this product will take place even between countries that have the same endowments. Due to the preferential position of one country there is a technological gap between countries. However, technological innovations cannot be usurped by one or another country: they gradually become the

property of other countries too. As a result, the previously formed technological gap is overpassed, and the initial benefits are lost. However, until a gap exists, it has a positive impact on the export of products, production of which includes new technologies. At the same time it stimulates the economy of the importing country. In the first case there is a kind of "technological rents", in the latter case more technically advanced products are acquired, the use of which improves economy efficiency.

Technological gap theory can be taken as a basis for interpreting the importance of using renewable energy in Ukraine, the most attractive destination of which, according to experts, is the use of biomass and waste (Fig. 1).

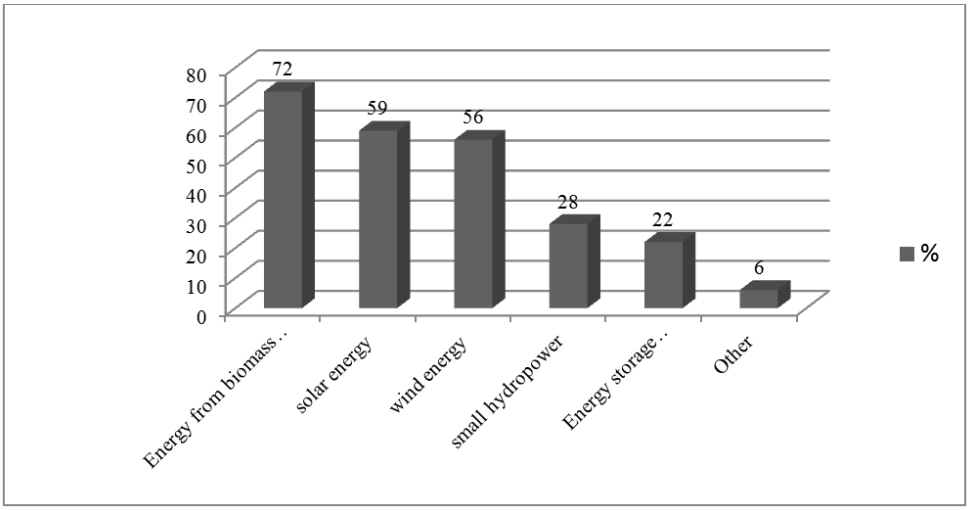

Fig. 1. The most attractive areas for renewable energy investors in Ukraine

Source: [Zarrill 2010].

The potential effectiveness of biomass can be estimated, taking into account the potential theoretical, technical and economic data. Theoretical size of the biomass resources size that does not have a practical significance, because given only the size of the raw material. The technical potential shows how much you can spend for energy, taking into account the technical possibilities of acquiring, while the economic potential is part of the technical potential and has a certain value. Ukrainian specifics are presented in the table below (1 PJ = 1015 Joules, 1Mt = 106 tons).

Table 1. Potential of forest biomass in Ukraine (2008)

Type of forest biomass	Theoretical potential		Technical potential	
	PJ	Mt	PJ	Mt
Stemwood	263,72	14,7	49,95	2,79
Primary forest residues	28,70	1,79	22,63	1,41
Secondary forest residues	19,82	1,11	16,50	0,92
Total	312,24	17,6	89,08	5,12

Source: [Böttcher 2010].

We may also extract the market potential production from wood stock biomass, which can be purchased for specific industrial, like biomass resources for energy purposes. Polish example is presented in in the table below:

Table 2. Wood stock production in State Forests in 2006-2008 (in tones)

Trading sort	2006	2007	2008
small dimension heating wood	929	1 109	1 394
heating wood	2 170	2 087	2 190
general purpose industrial wood	13 363	14 601	14 493
Wood chips	180	149	164

Source: [Burczy 2010].

In the early 80's of XX century Krugman [Krugman 2008] suggested an alternative to the classical explanation of international trade based on economies of scale. According to the perspective of this theory, many countries (including industrialized) are provided with the basic factors of production in similar proportions, and in such conditions it would be profitable for them to trade with each other, upon specialization in industries that are characterized by the effect of mass production. In this case, specialization can expand output and produce a product with less cost and therefore with lower price. In order to realize this effect, companies require a fairly large market. International trade plays a crucial role in this case because it allows expanding the market. In other words, international trade allows to create a common integrated market that is bigger than the market of any separate country, thus it makes possible to offer customers better products at lower prices.

Thus, the theory of scale economy argues that countries specializing in production of certain goods, after meeting the demand of the domestic market expand their production through expansion into foreign markets. In this case, the unit costs of production reduce, as a result of positive action of scale effects. When applying this theory to Ukraine, it can be claimed that even without sufficient processing capacity Ukraine, carrying out foreign economic activities towards the realization of biomass, can at least reduce the loss and gain additional profit.

However, realization of scale economy usually leads to disruption of perfect competition, since it is related to concentration of production and consolidation of companies. Accordingly, changes in market structure take place, and markets become either oligopolistic with domination of inter-industry trade in homogeneous products, or markets with monopolistic competition with developed intra-industry trade in differentiated products. In this case, international trade increasingly concentrates in the hands of giant multinational companies, multinational corporations, which inevitably leads to increase in intra-company trade which is often determined not by the principle of comparative advantage or differences in the factors of production, but by strategic goals of the company itself.

Polish-born British economist Rybczynski specified the conclusions of the value inputs theory of Heckscher-Olin model. He proved the theorem, according to which, at constant world prices and the availability of only two sectors in the economy, increased use of excessive factor in one of them leads to reduction in production and release of goods in another sector [Rybczynski 1955]. This theorem allows to explain the challenges in the last

decade of the XX century in many countries, which began intensive development of new export raw resources: oil, gas, etc., so-called "Dutch disease".

The name of this phenomenon is attributed to the late 60's - early 70's of last century, when the Netherlands began to develop natural gas in the North Sea with further expansion of its exports. Economic resources moved to gas production. The dominant orientation of resources on oil worsened economic conditions of machine building industry and the expansion of imports of missing goods. The “Dutch disease” in different periods attacked Norway, the UK, Mexico and other countries. Further reduction in commodity prices triggered a new phase of the “Dutch disease”. Decreased incomes, reducing production of non-traded goods, outflow of resources form commodity export sectors. The position of traditional export manufacturing industries was again strengthened, and this led to social problems. But this theory of international trade does not apply to our object of study, because in Ukraine there is a surplus of biomass and lack of energy.

Modern theories of firms indicate the strengthening of the role of individual businesses and corporations in international trade. Eventually, comparative advantages are always achieved not by a nation, but by a separate company, an exporter of a certain commodity. The studies revealed that technologically complicated products are created by individual firms based on the needs and demand that exist in the domestic market. The firm can enter the foreign market only after expansion of production and saturation of the domestic market. But in order to sell manufactured products, it is necessary to find a purchasing country, in which the structure of demand in the domestic market would be most close to the demand structure of the exporting country. This explains the possibility of trading between countries that have similar levels of economic development. This concept was first proved by American economist E. Linder [Linder 1965].

A kind of generalization of modern theories of foreign trade is a theory of international competitiveness, developed by American researcher M. Porter. Based on the analysis of significant statistical data, Porter created an original theory of achievement of competitive advantages of the country. According to him, under the conditions of intensification, expansion and deepening of internationalization of production that became global, the structure of international competition complicated, and new factors of influence appeared.

The most comprehensive formulation of essence of the new approach to the competitiveness and capabilities of their specialization in international division of labor was made by M. Porter, who along with the main determinants of competitive diamond, highlighted the following four stages of competitiveness of the national economy: stage driven by factors; stage driven by investments; stage driven by innovation and stage driven by wealth [Porter 1990].

But the principal, in his view, is an innovative technological component of competitiveness. Ukraine faces the task of raising the country's competitiveness and strengthening its position in international trade by switching from traditional exploitation of comparative advantages (natural resources, labor, etc.) to the use of competitive advantages based on diversification through unique products and more efficient processes. In a broad sense, this is a shift to innovation, which involves intensive development of new products and processes that will enable the country to outrun other countries in terms of technology. This activity requires Ukrainian business entities, firstly, to have clear and deep understanding of the nature and organizational mechanisms of international cooperation; secondly, to develop the mechanisms of support and use of the benefits of economic globalization in order to form a new quality management component of the national

economy; thirdly, to organize investment processes for innovative development through attracting both domestic and foreign investments.

The promising direction of further research could be the study of influence of basic functions of international trade on the socio-economic development of Ukraine and Poland, in particular, complementary, substitution function of consciousness of additional demand, when aggregate demand of domestic production and consumption increases by the amount of exporter's demand, and decreases by the amount of importer's demand.

To succeed on the global market, a combination of properly chosen competitive strategy of the company with competitive advantages of the country is requires, because on the global market, according to Porter, firms compete, but not countries. Along with traditional factors of production, Porter highlights such factors as knowledge resource, i.e. the amount of scientific, technical and market information affecting the competitiveness of goods and services, and infrastructure. With regard to biomass use, Poland has significant competitive advantages in technology of biomass processing and its further market promotion. For the needs of individual customers and small biomass heating systems processed to form briquettes or pellets. Briquettes usually do not contain any binding substances - produced by compression of sawdust or wood chips under high pressure. Most commonly, briquettes and pellets are produced from energy willow chips. These plants grow quickly and produce yields as long as 30 years. The estimated crop of wood chips that may be obtained out of an 1 hectare is varied from 25 to 45 tones. Prior to pressing the chips undergo drying to a moisture content of about 15%. Wood shavings are pressed into close, small rollers, containing no additives due to their natural properties [Kowalik 2003]. Besides, straw in the form of briquettes is also a very attractive product used for heating purposes. Its energy value does not significantly differ from calorific value of wood chips or willow [Niedziółka 2006]. Instead, in Ukraine such benefits and experience are still insufficient.

Great importance in the theory of M. Porter is devoted to division of factors into general (transportation network, staff with higher education, etc.), which create competitive advantages for a wide range of industries, and specialized factors (eg. staff with narrow specialization in a particular database field of expertise, etc.), which are generally applicable to a limited number of industries or even to one single area. Such specialized factors, providing a long-term and sustainable competitive advantage to firms involved sectors in the global market, simultaneously require significant and long-term investment.

In the system of competitive advantages Porter also devotes a significant role to random events and the government. Random events are usually not connected with the conditions of the economy, and often neither company nor the government can affect them. The most important events of this kind include new inventions, major technological changes (breaks), abrupt changes of input prices (such as prices for oil and gas), significant changes on global financial markets or exchange rates, global or local spikes in demand, political decisions of governments, wars and other unforeseen circumstances. Random events can change the position of competing countries. They can negate the benefits of powerful old competitors and enhance the export potential of other states.

The role of government in forming of national competitive advantage is to provide significant impact on all major factors, and this impact can be either positive or negative. The parameters of production and demand factors are affected by government through monetary, fiscal and customs policy. In most countries government itself is the buyer of goods for military, transportation, communication, education, healthcare and other

industries. Providing the antitrust regulation, government has an effect on maintenance of optimal competitive environment in key sectors and industries of national economy. Finally, in many countries the government contributes to the development of related industries and communicating, interacting with leading export sectors.

Porter notes that in many companies, successfully acting in the global markets, cover with their activities and determine the level of development of a range of industries, so-called cluster. Reflecting the dynamics of the country's competitive advantages, clusters are formed, expanded, but they also may wind down and fall apart.

Thus, according to the theory of M. Porter, competition, including on the world market, is a dynamic, evolving process, which is based on constant innovation and modernization [Porter 1990]. Therefore, in order to explain the competitive advantage in the global market it is necessary to find out how companies and countries improve quality factors, increase the efficiency of their application and create new ones.

Theories of international trade, both classic and modern, though they cannot provide answers to all the complex issues that arise in the development of trade relations, demonstrate the conditions of uprising of benefits due to which individual countries and companies are gaining strong positions on the global market.

The distribution of benefits between countries depends on changes of domestic prices under the influence of foreign trade. Usually more profit is gained by the country whose prices have changed more significally. This rule reflects the distribution of benefits, which suggests that benefits of foreign trade are distributed in direct proportion to changes in prices in both countries.

Obtaining and increasing of competitive advantages by Ukraine and Poland are possible in the process of efficient use of biomass potential of Ukraine. The main competitive advantage of Poland is the opportunity to reduce dependence on traditional energy. Thus, the use of biomass in Poland will increase due to the adopted European directive on renewable energy share in total energy production in all Member States. To meet these requirements, Poland needs to develop the biomass in the form of surplus straw for the production of grain, the energy crop plant species. The main competitive advantages of Ukraine will be determined largely by biomass energy, and benefits of specific companies on international trade of this production.

Use of biomass has significant government support in many countries. Therefore, one of the first major obstacles for biomass market is national and regional protectionist policies of some countries and custom tariffs. The biggest driving force behind the implementation of this policy is energy independence, improvement of the environment and rural development. Thus, countries, particularly developed, began to introduce the schemes, the outcome of which became protection of domestic producers from foreign competition and impediment of international trade. Overall, the countries support domestic producers by means of three basic tools [Junginger 2010]:

- Measures to promote domestic biomass of energy designation;
- Import tariffs for biomass;
- Export subsidies for domestic biomass.

In Ukraine, where the potential of biomass firm is 25-38 million tons of fuel annually, green energy producers face the problem of raw material acquisition. At present, the specialized trade of bio resources in Ukraine is at its early stages.

Conclusions

Theories of international trade, both classic and modern, cannot provide answers to all the complex issues that arise within development of trade relations, but they demonstrate the conditions of uprising of benefits due to which individual countries and companies are gaining strong positions on the global market.

Models of neotechnological theories more adequately than neoclassical ones reflect the actual processes of modern development of the international labor differentiation, in particular, from the 70's intra-industry exchange between different countries is expanding more rapidly. Supporters of neotechnological direction determine structure of international labor differentiation, they attempt to explain its nature with technological factors.

While the main variables of modern neoclassical models are, like in the Heckscher--Ohlin theory, the availability of productive factors and intensity of cost factors, the main variables in neotechnological approach are expenses on research and development (as a percentage of cost of sales), wages per worker and percentage of skilled labor force.

Among the neotechnological theories, the theory of product life cycle it should be noted. This theory defends the view according to which the development of international trade depends on the life cycle of the product. When considering international trade of biomass as a feedstock for energy production, in the framework of this theory, Poland is currently on the second phase of the product life cycle, and Ukraine is on zero and first stage of the life cycle, and thereby requires clear identification of the need for such resources, as well as forecasting of demand.

Based on our review of the literature, an outcome can be formulated that biomass energy through its properties is an alternative source of energy that may successfully replace the existing heating technologies based on traditional fossil fuels in future.

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Ukrainian prospects in the space of European agro-food trade based on quantitative economic analysis

Abstract. The continuing process of global integration bears implications for the formation of food markets in the global and regional levels. According to the latest estimates, Ukraine is able to feed more than 200 million people currently. But this production should be effective not only from the standpoint of food security but also from a Growth position. Formation of trade policy is the most important way to achieve this one. This paper assessed the current state of the European trade ties of internal agro-food market based on Trade Density Econometric Models. We provide in this paper a comparative evaluation of alternative approaches to possible development scenario for Ukrainian agricultural market based on the European experience. The research includes theoretical modelling foundations, datasets employed and analytical comparison of previous studies. The results can be used to determine government agricultural policies and large agricultural companies.

Key words: agro-food market, world trade network, trade density, association agreement, free trade area

Introduction

The last two decades of global trade is characterized by the rapid proliferation of the regional trade agreements network. Usually regional integration association formed around integration centers, the role of which carry the most developed countries - EU, US, Japan and more recently China and Russia. Currently EU has 28 FTA operating agreements. Changes in the institutional, technological and economic environment raise new challenges to the Ukrainian, European and even World agro-food trade policy. As a result, agro-food trade and its enforcement face new challenges with the worldwide development of regulation and investment liberalization, as well as the widespread changes in technologies and institutions.

In this study we research the number of reasons and patterns which can predetermine the formation of trade networks with economic, geographic and historical perspective.

A threefold objective is pursued here. This paper describes this different context: the first part is the analysis of changes in the world trade conditions and the transformation of the world trade network, based on the previous review of existing research that analysis of complex networks to empirically investigate international trade and countries' trade relation.

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Then it explains how the European agro-food trade policy accounts for this evolving situation. For these purpose applied the three-step model for estimating of European Union Trade Relation Density (EUTRD). It is also important to note that the study of trade relations between the EU countries narrowed down to market agricultural products. Since this World Trade Segment is critical important under conditions of food and energy security balance formation and in terms of resource capacity. Also, the final part of the study is an analysis of condition and prospects of the Ukrainian market development from a position of global integration, for which the agro-food production and trade is leading.

Lastly, in conclusions will be proposed a set of directions which should or could be undertaken in the future.

Material and methods

The present research is based on general scientific methodology. The first issue, which was addressed, concerns the study of the trade microstructure in international trade. Taking into account theory of a network's community (Newman, 2003) and based on the study by Fan was use weighted external optimisation algorithm (WEO) and coarse grain in process to classify countries. They are divided into three groups naturally; these groups also reflect the structure of "core/periphery», like the entire network, that is consistent with the three trading cores: the European Union, the United States, and the East Asian countries: China and Japan, described by the geography of international trade issues (Fan, et al., 2014).

We have applied the three-step model for estimating of European Union Trade Relation Density (EUTRD) in the second part. Initially, the whole array of data was synced in order to preserve cause-and-effect relationships between input and output.

Next, regression analysis was performed using semi-linear and multiple correlation coefficients followed by evaluation of the mean square error.

With the help of semi-linear correlation coefficient (Fig. 1) density of relation between two vectors was measured: import and export groups.

$$r_{x,y} = \frac{\sum_{i=1}^{n}(y_i - y^-)(x_i - x^-)}{\sqrt{\sum_{i=1}^{n}(x_i - x^-)^2 \sum_{i=1}^{n}(y_i - y^-)^2)}} \quad (1)$$

where:

x – factor variable (export/import of the country);

y – resultant variable (export/import of the other country).

The linear correlation coefficient ranges from -1 to 1. Equality coefficient zero indicates the absence of a linear relationship. Equality factor "-1" or "1" indicates the presence of a functional connection. The sign "+" indicates straight connection, the sign "-" on the reverse link.

Multiple correlation coefficients were used to establish the tightness of linear relationship in pair's export-import and import-export between countries.

Multiple correlation coefficient ranges from 0 to 1. Correlation coefficient "zero" indicates no linear relationship. Respectively, equal to one indicates the absolute functional connection. The coefficient does not indicate the direction of the bond.

Mean square error for a pair of linear correlation coefficient is calculated by the formula (Fig. 2) :

$$\sigma_{r=}(1-\rho^2)/\sqrt{n} \quad (2)$$

where:
p - aggregate correlation coefficient;
n -sample size

As a result of calculations, quasi-model matrices were created. Lastly, it was determined the density in selected countries' groups for this one was used the correlation matrices based on the previous results.

System analysis, monographic, abstract and logical, balance and graphs scientific methods were used for third part of study. The current state of World Trade Network and its influence on the feather agro-trade policy development in EU and Ukraine are the main motive of the investigation. Also, they are a major reason for agricultural activities.

Data sources

All studies were based on international trade data that are available from the Direction of Trade Statistics. Trade flows between the countries are unified under current US dollars as a unit. All of the countries included in the data are treated as vertices, with imports and exports as directed links.

For EUTRD Models we used time series data set for Euro Trade according to Ukrainian Commodity Classification for Foreign Economic Activity (Harmonized commodity description and coding system) over the period 2002-2012, per month.

We have created a General Model of EUTRD based on the natural and monetary value (unified in US dollars) of agricultural products exports and imports by 24 commodity groups including 195 sub-groups within the 28 countries of the European Union. All data are continuous. Source of information is the State Statistics Committee of Ukraine (State Statistics Service of Ukraine).

Ways to adapt that have been proposed in the current study are based on leading practices in this field from a regional perspective.

Research and Discussion

World Trade Network

Taking into account that the scientific interest in the development of complex networks grown steadily over the last decade, a considerable amount of work has been devoted to the empirical study of the International Trade Network (ITN) from this new perspective. [Benedictis 2011; Bhattacharya 2008; Newman 2004].

The ITN, also known as the World Trade Web (WTW) and the World Trade Network (WTN), is defined as the network of import/export relationships between world countries in a certain period.

For our work is interesting from the standpoint of the general laws study of global trade network formation and their respective impact on the future opportunities and development of Ukrainian agro-food trade through the EU trade network.

Ying Fan, Suting Ren and other developed a map of International Trade Relations based on the results of quantitative analysis (Fig. 1).

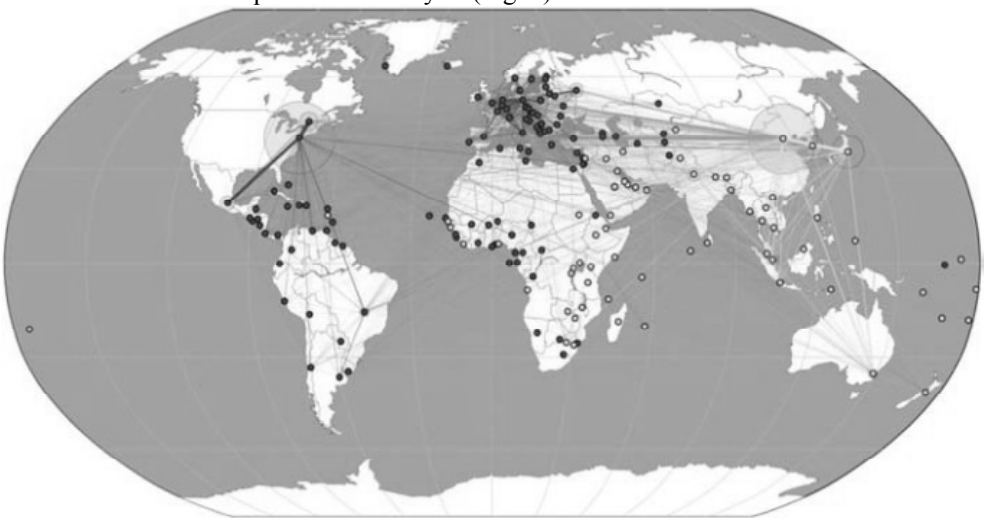


Fig. 1. Communities of the International Trade Network in 2010

Source: Fan Y., Ren S., Cai H, Cui H., 2014. The state's role and position in international trade: A complex network perspective, Economic Modeelling, vol. 39, Issue C.

Points indicate that countries and lines denote the trading relationship between two countries. The size of the orange concentric circles around the points indicates the total volume of trade, and the line width indicates the intensity of flow trade between countries. Different colors (green, mauve and yellow) represent different Groups, and the orange line represents the trading links between Groups.

In this figure we find that the world is clearly divided into three parts: Western on the left, Central in the middle and Eastern on the right. The Western Group contains almost all countries in North and South America and several countries in other continents (such as Nigeria, Congo, Israel and Afghanistan). The Central Group middle community consists of most European countries and their neighboring countries. It also includes many western African States. The vast majority of Asian countries and most east African countries compose the Eastern Group. The results show that there are trading centers in the groups (here trading centers are those countries that have huge flows of imports and exports far greater than other countries).

Central Group most interested us in framework of this research. So based on the results of the Fan, Ren and other study that are based on WEO analyses, we can draw the following conclusions: Central Group is more clustered, which indicates closer trade ties, followed by Eastern Group and Western Group. The Central and Eastern Groups account for 53.9% of all trade; hence, they make important contributions to world trade [Fan, Ren and other 2014].

European Union Trade Relation Density

As shown in previous research, EU trade network relations are extremely wide even outside and it's one of the world's most powerful.

Overall, EU has 27 valid agreements which provide for the creation of a Free Trade Area (FTA) (excluding Syria, agreement is still not implemented) - Table 1.

Table 1. EU Free Trade Area Valid Agreements

Countries	Year of Valid Agreements	Agreements type
Switzerland	1973	EFTA
Liechtenstein	1973	EEA
Andorra	1991	Customs Union
San Marino	1992	Customs Union
Norway	1992	EEA
Iceland	1992	EEA
Turkey	1995	Customs Union
Palestinian Authority	1997	Association Agreement
Faroe Islands	1997	Denmark Autonomous Territory
Tunisia	1998	Association Agreement
South Africa	2000	Agreement on Trade, Development and Cooperation
Morocco	2000	Association Agreement
Mexico	2000	Free Trade Area
Israel	2000	Association Agreement
Jordan	2002	Association Agreement
Lebanon	2003	Association Agreement
Chile	2003	Association Agreement
Macedonia	2004	Stabilization and Association Agreement
Egypt	2004	Association Agreement
Croatia	2005	Stabilization and Association Agreement
Algeria	2005	Association Agreement
Bosnia and Herzegovina	2008	Stabilization and Association Agreement
Albania	2009	Stabilization and Association Agreement
Montenegro	2010	Stabilization and Association Agreement
South Korea	2011	Free Trade Area
Peru	2013	Tripartite Free Trade Area (including Columbia)
Serbia	2010	Stabilization and Association Agreement

Source: EU official website (http://trade.ec.europa.eu)

Also, the EU's largest investor is the Russian economy: the amount of accumulated capital in 1994 was 227 $ U.S. billion, including more than105 $ U.S. billion of direct investment. Russian investments to economies of EU member states are 77.5 $ U.S. billion including 52 $ U.S. of direct investment. The main document that is the legal basis of

cooperation between Russia and the EU is the Partnership and Cooperation Agreement which entered into force in December of the year [Ostashko 2013].

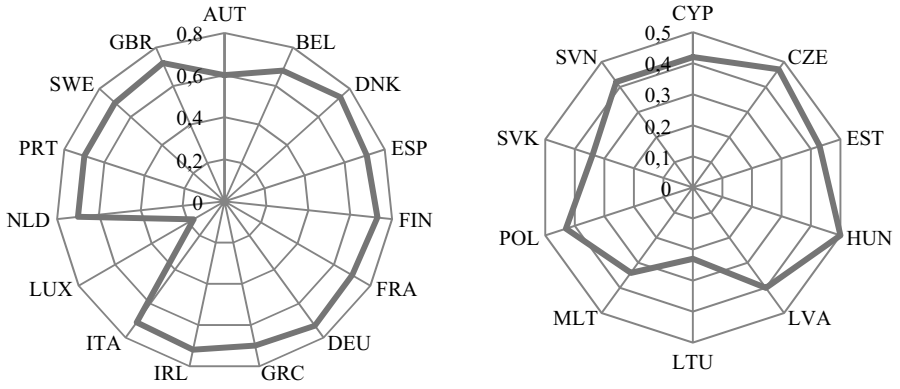
Thus, a strong Central Group trading net is an important influence point on Ukraine's trade policy and defining such relations with Russia.

The main changes inside the integration process in the European Union for new associated countries as well as for neighboring countries are the lower tariffs and increasing of market access. The welfare gains from tariff reduction are the sum of gains to consumer and producer surpluses net of revenue loss.

The next step, is to identify possible reasons that affect the density of trade relations inside the EU. This study focus on the follow features of European market: tariff policy, "historical" and "geographical". We are especially interested in the density of EU Agro-Food Market trade relations as the most important for the Ukrainian economy development.

Geographical location is very important to evaluate the influence for trade intensity. And here we propose to use the following classification: "Old" Europe: France, Germany, United Kingdom, Netherlands, Belgium, Austria, Ireland, and Luxemburg; "Mediterranean" Europe: Italy, Portugal, Spain, Greece, Cyprus, and Malta; "Nordic" Europe: Sweden, Finland, Denmark, Estonia, Latvia, and Lithuania; "Post-Warsaw Agreement" Europe: Bulgaria, Poland, Czech Republic, Slovakia, Slovenia, Hungary, Romania, and Croatia.

In our research we analyzed the density of trade relations in the EU agricultural market (Fig. 2) accordingly to the general historical formation of the European Union. As the result, level of trade density for integrated countries (EU-15) is almost two times higher, than for new member states (EU-10) – Fig. 2 (a) and (b) respectively.



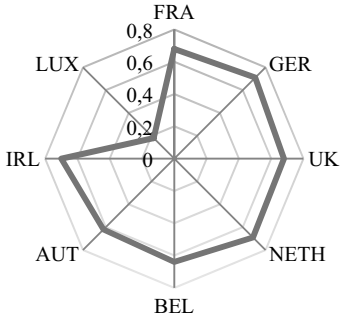
a)EU – 15 b) EU – 10

Fig. 2 - Density of Trade Relations under the EU Agricultural Market

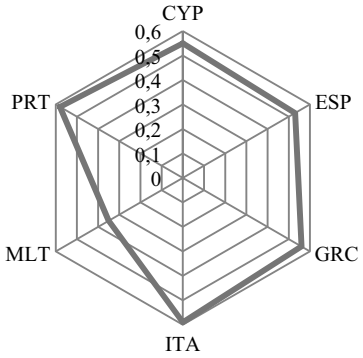
Source: own research.

We can explain such results by historical reasons, deep integrations, and strong trade and production links between all European countries. The Luxemburg example can be interpreted by the relatively low volume of agri-food trade turnover. In contrast to the EU-15 trade we have the results for EU-10 group of countries. Here, as it shown on Fig. 2 (b)

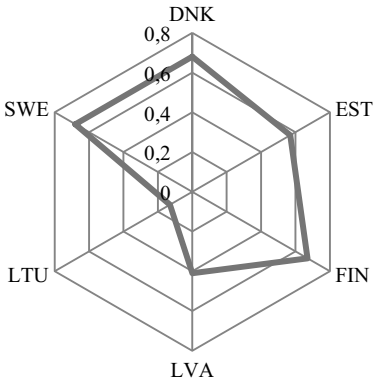
This part of research confirms our hypothesis about dependence of trade density on the level of integration (including the production links, standards, trade accession to the markets and consumer habits). Another part was about "regional" dependencies in trade density of agri-food items.



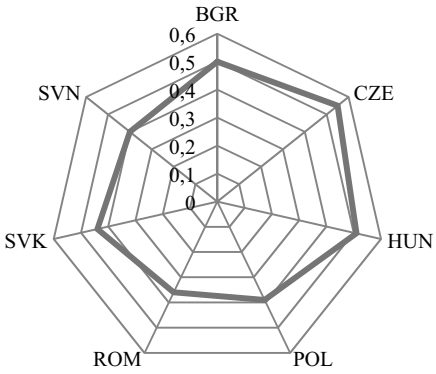
a) "Old Europe" Group



b) "Mediterranean Group"



c) "Nordic" Group



d) "Former SU" Group

Fig. 3 - Density of trade relations under the EU agricultural market

Source: own research

As we can see from Fig. 3, "geographical" position for each country is the strong motivation for trade. Only Luxemburg, Malta and Lithuania shows the low trade density inside the group. This antimony could be explained by the nearness of huge and more capacity markets (predominantly from "Old Europe"). In the group of countries from "Post - Warsaw Agreement" we can observe the middling level of trade density. Bulgaria, Czech Republic and Hungary demonstrates higher level of integration. The main reason here is the higher level of industry development.

Ukrainian Agro-Food Trade Prospects

The domestic market capacity is the average annual consumption of certain products and the average population, and is an important element for making up the demand and supply of food and determination of independence for individual products. Compared with the previous year, in 2010 was a noticeable increase in capacity of the internal market in four groups of food: "meat and meat products" - by 4.1%, "eggs" - by 6.2%, "vegetables and melons" - by 4.3%, "fruits, berries and grapes" - by 4.9%.

Ukrainian Agro-Food Market – Structure and Features

However, the reduction of average consumption has reduced the capacity of the internal market in five major groups of food, namely, by group, "bread and bread products", "milk and milk products", "fish and fish products", "vegetable oil" and "sugar" The negative trend of the past year is a reduction in the diet Ukrainian those types of food consumption which are below the rational norm (dairy and fish products).

Meeting the needs of the population in food, the extent of its purchasing power in 2010 as in previous years, carried out mostly by domestic production. The most vulnerable positions in terms of import dependency positions are "fish and fishery products", "fruits, berries and grapes," "vegetable oil of all kinds," the share of imports from these groups in the total consumption respectively of 71.6, 51.3 and 46,9 percent at a 30-percentage threshold criteria.

It should be noted that a significant percentage of imports in the group "all vegetable oil" due to import of tropical oils, which are not produced in Ukraine (palm, coconut oil, etc.), but widely used in the production of food domestic industry. Meanwhile, the local demand for sunflower oil was provided entirely by domestic production.

Last year, the dependence of the domestic market from imports of fish and fishery products increased by 6.3 percentage points, due to a decrease in fishing and extraction of other aquatic resources in inland waters, the volume of which in 2010 compared with the previous reduced by 14.9 percent.

Effects of Consolidation

The implications of what such a system will mean for farmers can already be seen in the particular parts of industry in Ukraine. For example app 90 percent of chickens produced for meat are grown under production contracts with fewer than 10 companies. The farmer furnishes the land and labor, and is required to invest hundreds of thousands of dollars for buildings and other equipment. The company provides the chicks, feed and medicine and agrees to pay a guaranteed price per kilo. It is similar to US history where in the 1950s there were more than a thousand companies, most poultry farmers benefited from such contracts because they were protected from price fluctuations, but now that four vertically integrated firms control 50% of the market, the terms of the contracts are much more favorable to the companies [Howard 2006].

Grain and vegetable growers may soon find themselves in a similar situation. Genetically engineered (GE) crops are controlled by just six multinational corporations, and

the technology is being used as a tool to consolidate the seed supply. Crop farmers are then being locked into food chain clusters through "bundling," or linking patented seeds with contracts, chemicals and credit.

Consumers are also harmed by consolidation. GE foods, for example, have been introduced into the food system without public consent, or even public knowledge, as recent polls have shown6, thus limiting the freedom to choose non-GE products. Price gouging is another way that food conglomerates may exploit their increasing power. Although farm milk prices are the lowest they have been since the 2000s, prices paid by consumers have not declined. This is somewhat of an exception, however, as most food prices have remained low over the past few decades (except of products like carbonated beverages, snacks and breakfast cereals, which are already dominated).

Production as the Main Food Supply Factor

Concerning the situation in Ukraine, we can note that now big and medium agro-holdings became the main producing power in agricultural sector of economy. According to industry researches which are based on information from individual companies and media reports, large agro-businesses presently lease over 3.5 mln ha of land, or 10.8% of total arable land and 20% of leased arable land, with the smallest companies in this group controlling over 30 thousand ha each.

Over the last five years the term "agro-holding" has emerged and became common for description of agricultural production in Ukraine. This type of production structure having several competitive advantages in production as well as in investment sphere is expanding its influence at nearly every field of agricultural activity, actively consolidating through leasehold the main production resource – agricultural land. Last tendencies in the Ukrainian agro-holdings activities:

- The grain market in 2010/2011 was characterized by a high level of administrative intervention, i.e. quotas (till 31 March 2011 and the export duties to 1 January 2012), which led to the revision of the priorities of export-oriented agricultural holdings specialized in soybean, rape seed and corn.
- Low quotas and high tariff made the barley crop less attractive for growing, while corn has become very attractive due to high economic returns and stable excess demand in foreign markets.
- Sugar segment is characterized by a high degree of consolidation as a result of assets purchase transactions of Kernel and Ukrlandfarming sugar companies. This trend will continue.
- In the dairy sector, the selling price of milk and dairy products increased by 60% as a result of which the profitability of milk production amounted to 17.5%. Moreover, there is a lack of quality raw milk products. Due to such factors, the sector is attractive for investors.
- In livestock, integration processes dominated the poultry industry; however in 2010 they also started to play a notable role in the pig breeding industry. In the near future, consolidation and expansion of production capacity will continue.
- Today, agricultural holdings are paying careful attention to the cultivation of potatoes (Mriya, Svarog, IMC). The barriers faced in this field are as follows: the need in costly investments in the infrastructure, logistics and marketing.

In 2011, 3 mln Ukrainians were working in Ukraine's agricultural industry, or 15% of all labor force. Ukrainian agricultural producers enjoy a number of competitive advantages over their foreign peers, particularly low labor costs. Labor force is inexpensive and highly qualified. Domestic agricultural companies pay farm workers USD 2/hour on average compared to USD 40/hour in Germany, USD 6-10 in CEE countries, and USD 3 in Russia.

Among the popular crops in Ukraine are wheat, corn, sugar beets, sunflowers, legumes, tobacco, vegetables and fruits. Following the Ukrainian club of Agricultural Business in their researches 20 agricultural enterprises produced 9.6% of the total wheat in 2012, while in 2010 and 2011 they made 8.6% and 8.4% respectively, and therefore, the average concentration factor of manufacturers market in the last three years stiffened around 9%. Herewith the production of wheat is growing (22.3 million tons in 2011), and the concentration ratio falls. Conversely, production is falling (15.8 million tons in 2012) - the concentration ratio increases. It can indicate the perfect competition or another effect, because wheat production is largely located in the south, where the concentration of agricultural holdings is lower and in "normal" weather conditions, their share is falling. But even in the top 20 manufacturers only Top Six succeeded relatively far off. But the rearguard is tight enough leg to leg (from 0.44% to 0.27% on the downlink). The rest are likely to deter the "social importance" of wheat and it turns out that we have not profitable to produce wheat for other crops. For example corn trend brought this crop to first place in terms of production during previous years. The share of the top 20 companies rose to 21.7% in 2012 from 19.6% in 2011.

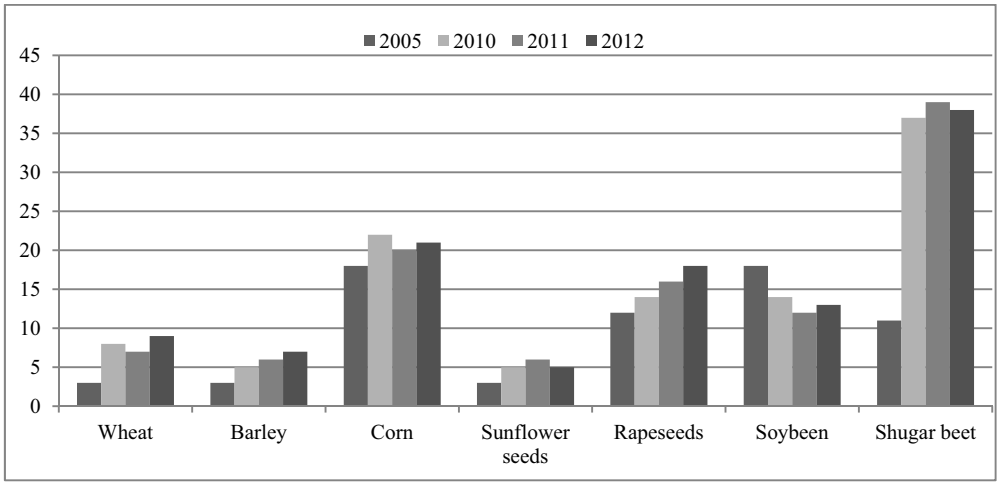


Fig. 4. Share of top-20 Agro-Holding in Crop Production in Ukraine during 2005-2012

Source: AgriSurvey Research «Agrifood Sector of Ukraine-2013: Personal Look».

Discordant trends of consolidation were observed in the oilseeds production. The share of the top 20 enterprises in the production of sunflower in the last three years, virtually unchanged (6.2% in 2010-2012). A soybean demonstrates tendencies similar to corn – due to high profitability of crop we can observe the unprecedented increase in the number of business entities that are engaged in production - from 6.1 thousand in 2011 to 7.4 thousand in 2012. But this does not affect the position of the top 20 companies that increased their

own production and, consequently, market share - from 12.4% to 13.4%. The total production of soybeans in 2011-2012 was at 2.3-2.4 million tons. [*AgriSurvey Research «Agrifood Sector of Ukraine-2013: Personal Look»*]

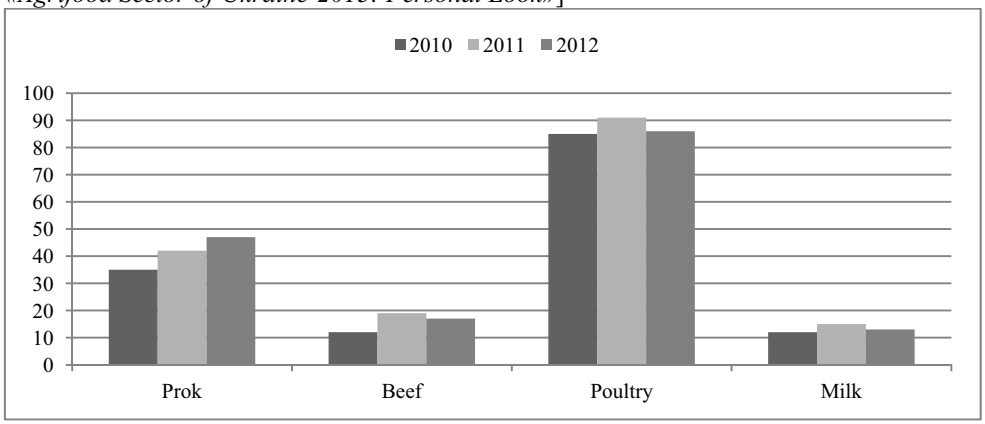


Fig. 5. Share of top-20 Agro-Holding in Animal Production in Ukraine during 2010–2012

Source: AgriSurvey Research «Agrifood Sector of Ukraine-2013: Personal Look».

Note, that corn exports from the Ukraine, following the USDA Agricultural Projection to 2022 rise nearly 6.6 million tons (43 percent) to nearly 22 million tons by 2022. Favorable resource endowments, increasing economic openness, wider use of hybrid seed, and greater investment in agriculture all stimulate corn production in this region. Although FSU feed use of corn rises rapidly in the projections, the region's corn exports increase twice as much as any exporting region other than the United States. The FSU becomes the world's second-largest corn exporter as its shipments surpass Argentina's.

Foreign Trade

The last decade characterized by the tangible increase in the volume of foreign trade in agricultural products, and its share in total turnover, which currently amounts to 18-19%. Exports of agricultural and food products is dominated by commodity grain, oil products and food products. About a one third of agri-food products was exported to the European Union.

Regarding foreign trade balance, the trade group 1-24 HS Ukraine is a net exporter of peremptory. As for the European Union, only in 2010 the import agro-food products in Ukraine exceeded their exports due to high yields of grains and oilseeds in Europe.

The structure of agricultural product's exports in trade between Ukraine and the European Union in 2006 to 2011 basically unchanged. The main share of exports in 2006 to 2011 has the following products: cereals (26%), oils and fats (28%), oilseeds (26%) residues and waste from the food industry (7%), edible fruits and nuts (4.3%), alcoholic and soft drinks (2.5%) – (Table 2).

Table 2 - Structure of main agricultural products exports from Ukraine to EU-27, by 1-24 codes of Ukrainian Classification of Goods for Foreign Economic Activity in 2006-2011 years, it should be stated if it is in thousand or%

Codes	Products	2006	2007	2008	2009	2010	2011
7	Edible vegetables, plants, roots and tubers	39,8	23,1	19,4	23,1	23,4	8,5
8	Edible fruit and nuts; peel of citrus fruit or melons	105,8	100,3	82,1	56,6	75,0	35,3
10	Cereals	202,7	62,4	962,3	454,3	158,1	486,4
12	Oilseeds and oleaginous fruits	210,2	306,6	1189,8	757,5	704,4	228,1
15	Animal or vegetable fats and oils	467,6	808,1	658,7	469,0	631,9	442,5
17	Sugars and sugar confectionery	5,6	20,0	9,4	15,3	17,0	12,0
18	Cocoa and cocoa preparations	15,1	14,9	14,0	20,3	26,2	8,3
19	Preparations of cereals, flour or starch	11,5	13,9	18,3	15,6	14,4	8,0
20	Preparations of vegetables, fruit or nuts	20,4	99,6	17,2	16,8	31,4	8,4
21	Miscellaneous edible preparations	6,1	7,5	11,6	12,6	15,1	8,2
22	Beverages, spirits and vinegar	61,1	61,0	51,9	45,5	32,0	10,3
23	Residues and waste from the food industries	61,4	113,6	118,9	170,3	193,9	159,0
	Total 1-24	1243,8	1663,6	3186,0	2085,0	1946,6	1430,9
	Share of goods 1-24	10%	12%	18%	22%	15%	15%
	Total export	12087,9	13916,4	18128,5	9504,4	13061,6	9702,2

Source: State Statistics Service of Ukraine

During the last years we can observe the very clear tendency to increase the value of imports of European products to Ukraine (Table 3).

The causes of this phenomenon were the general increase in cost of goods in the world and the growth of the Ukrainian population share of people who are willing to pay more money for better quality, including imported goods which are not produced in Ukraine, liberalization of imports in Ukraine (reduced import duty rates) and restore activity of the food industry, which for the finished production of raw material, which is absent in the country.

The major share of imports in 2006 to 2011 take the following products: various food products (15.2%), meat and edible offal (9.5%), cocoa and cocoa preparation (7%), fats and oils (6.0%), and tobacco and tobacco substitutes (6.3%), edible fruits and nuts (5.7%).

Limiting factor of growth in imports was a decrease in product sales in the country due to reduced demand, and problems in importing the credit clearance of goods, obtaining permits and others.

Table 3. Structure of imports of agricultural products from EU-27 to Ukraine, by 1-24 codes of HS in 2006-2011 years

Codes	Products	2006	2007	2008	2009	2010	2011
1	Live animals	38,8	50,9	83,4	73,8	67,0	35,9
2	Meat and edible meat offal	38,8	13,6	465,5	260,7	239,5	75,7
3	Fish and sea products	57,9	60,9	88,1	65,4	95,4	39,7
4	Dairy produce; eggs; natural honey	26,8	31,7	64,9	39,8	61,7	29,3
6	Live plants and floricultural products	32,7	49,0	67,9	42,5	51,6	42,0
7	Edible vegetables, plants, roots and tubers	14,1	17,6	45,6	28,2	55,9	44,9
8	Edible fruit and nuts; peel of citrus fruit or melons	56,2	63,0	132,5	178,9	198,6	86,5
9	Coffee, tea, maté and spices	27,6	36,6	50,3	47,7	47,1	31,0
10	Cereals	22,9	43,6	69,2	27,8	76,2	113,7
12	Oilseeds and oleaginous fruits	47,4	76,0	147,7	66,2	81,8	92,4
13	Lac; gums, resins, other vegetable saps and extracts	16,8	16,9	30,0	27,7	25,2	11,3
15	Animal or vegetable fats and oils	58,4	76,4	121,3	101,2	101,3	49,9
16	Meat preparations	30,8	26,0	35,0	24,9	28,7	14,5
17	Sugars and sugar confectionery	9,8	16,5	17,7	13,9	15,3	6,5
18	Cocoa and cocoa preparations	112,5	115,8	162,0	132,4	139,1	72,9
19	Preparations of cereals, flour or starch	30,5	45,2	65,4	47,7	66,8	41,8
20	Preparations of vegetables, fruit or nuts	76,7	92,0	115,8	80,7	107,2	61,6
21	Miscellaneous edible preparations	206,9	272,1	343,6	253,5	261,5	154,1
22	Beverages, spirits and vinegar	58,3	86,1	134,5	73,4	122,6	78,7
23	Residues and waste from the food industries	93,0	109,5	167,2	156,1	159,6	72,4
24	Tobacco and manufactured tobacco substitutes	103,5	112,9	87,6	74,8	106,4	37,6
	Total 1-24	1181,3	1426,7	2512,5	1832,3	2122,5	1201,6
	Share of goods 1-24	7%	6%	9%	12%	11%	11%
	Total import	16194,6	22218,7	28867,3	15392,7	19099,0	11163,6

Source: State Statistics Service of Ukraine.

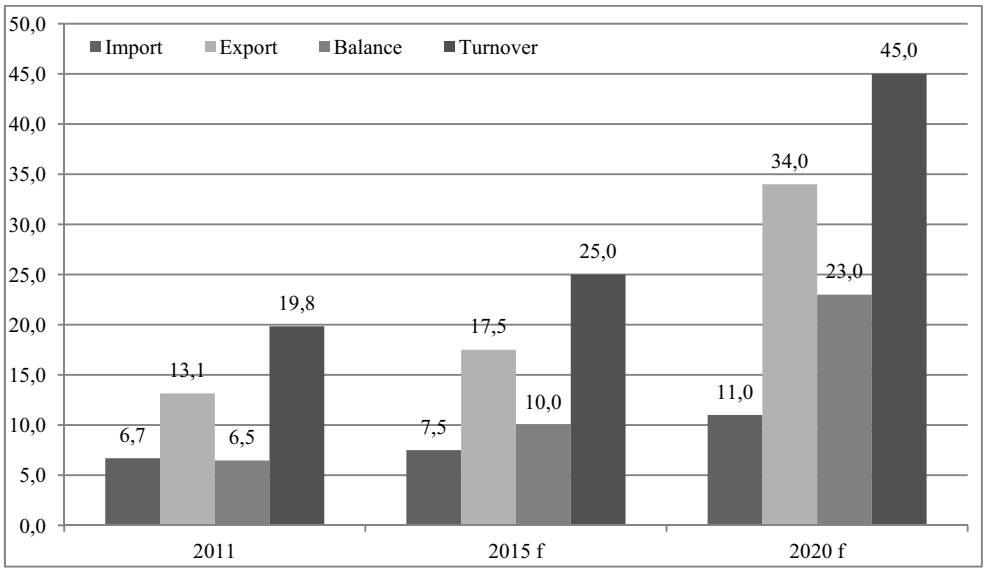


Fig. 6. Agri-Food Products Foreign Trade, bln USD

Source: own research

Current trends in foreign trade in agricultural and food products and the analysis of the current situation on the markets of basic commodities allows to predict a slight increase in their foreign trade in the optimistic scenario of the events and their reduction in pessimistic. Thus the pessimistic development involves low level of exports of cereals, oilseeds and their products as a result of the introduction of quotas, export duties and the introduction of restrictive action by the customs.

Conclusion

Our research demonstrates that between different approaches the level of trade density demonstrates depth of integration inside the EU. We proved that even inside the common market, with common monetary and trade policy the one of the most important factor is the geographical disposition of trading countries, closing of markets as well as historical aspect of integration. In our further researches we are going to analyze the opportunity for Ukraine in the trade of Agro-Food productions and evaluate the potential market shares for particular markets.

Taking into account the facts that based on empirical studies that the density of trade relations depends on the historical background and geographical location from one side, and based on the contention that the Association Agreement (AA) between EU and Ukraine creates some trade regimes asymmetry, from other hand. Therefore AA chapters Four (Trade and Trade Related Rules) and Five (Economic and Sectorial Cooperation) should consider the specific conditions inherent in Ukraine.

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Polish foreign trade in ornamental nursery plants after the accession to the EU

Abstract. The paper presents analyses of changes in direction and dynamics of Polish import and export of the ornamental nursery material in the years 2005-2011 as well as the turnover balance. Apart from the total turnovers these changes were investigated for particular groups of nursery plants separated by the *Combined Nomenclature* (CN) codes. The analysis also included the significance of these groups of plants in the entire import and export of nursery plants and also the geographical structure of import and export of each of these groups, identifying countries which are the biggest suppliers and countries which are the biggest buyers. The investigations showed the worsening of the turnover balance, the decrease of export diversification and the lack of stability in the business contacts.

Key words: ornamental nursery plants, export, import, Poland, foreign trade

Introduction

The effect of economic development, increasing industrialization, and urbanization is the growing significance of ornamental plants in human life. Not only the ornamental and aesthetic values of plants are important but also their influence on human health and well-being by providing peace and safety, reducing tension and stresses, increasing concentration and also improving interpersonal relations. Owing to these facts, plants increase the quality of life and, indirectly, the work output [Stigsdotter, Grahn 2004; Nowak 2005; Stigsdotter 2005; Ulrich 2012]. Greenery sooths the urban environment, making it more attractive. It increases company prestige and attracts customers, and raises property values. [Haydu et al. 2008; Hall, Hodges 2011; Palma et al. 2011]. Greenery also improves the thermal conditions inside and around buildings, reducing energy consumption, and it supplies oxygen which is essential for living and removes carbon dioxide, purifying the air from particulate and gas pollutants [Borowski 2009]. It also extends the biodiversity of the urban environment [Haydu et al. 2008]. Thus ornamental plants, and in particular those growing outside, play a very important role both in the social, environmental and economic sphere.

The ornamental nursery sector is the most dynamically developing flower market both in developed and developing countries. This has been observed in Poland since 1989. Up until 2002, nursery land area increased from 1450 ha to 4393 ha, and in the next 8 years it doubled to 6747 ha [Jabłońska 2007; Jabłońska, Olewnicki 2013]. It makes Poland the fifth producer in Europe [Ilczuk et al. 2013]. At the same time, foreign trade turnover increased, which is an advantageous factor because international trade is one of the stimulators of economic development [Klawe, Makać 1977; Pawlak, Poczta 2011; Smith 2012]. It is

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particularly true in regard to export [Strojny 2013]. As seen from the research by Jabłońska, Olewnicki and Kowalczyk [2013] the volume and value of the Polish export of nursery ornamental plants in the years 1996-2009 increased annually by 12.6% on average, while the volume and value of import by 7.8% and 13.5%, respectively, with simultaneous turnover balance increases. Nursery ornamental material constitutes the basis of the Polish flower export, with a growing share which in the years 2005-2009 amounted to 56% of its volume and 39% of its value. The share in the flower import amounted to about 22% and 11%, respectively. According to the authors, those long-term tendencies should remain, But the turnover growth dynamics decreased after Poland joined the EU. Therefore, the present research undertook a trial to verify that hypothesis. However, nursery material is not a homogeneous group of plants, but a group varying as to the types, genera, utility value, use possibilities or production technology. Thus, questions arise:, apart from studying general changes in the Polish foreign trade in nursery plants in the recent years, what role do the particular groups play in it; what is the aim of diversification (concentration) of export, which according to Misztal [2011] in the years 1995-2009 was one of the most important factors determining the level of Gross Domestic Product/per person and increasing in the countries of its relatively low level, including Poland. In order to assess the chances of further development of nurseries it is also important to investigate the directions of trade, mostly of export, because as many economists stress [Cieślewicz 2012; Kacperska 2012; Kita, Poczta 2012; Wierzejwski 2012; Strojny 2013], significant perspectives of its further growth on the basis of the farm and food articles lie in the Eastern markets, e.g. Russia, Ukraine, Belarus or even China.

The aim of the study was to evaluate the level, direction and dynamics of changes, as well as assortment and geographical diversification in Polish foreign trade of ornamental nursery plants after 2004, in order to assess the chances of further development of the nursery sector.

Material and methods

Our investigations aimed at analyzing the import and export level of the ornamental nursery plants after the accession of Poland to the EU (the years 2005-2011) as well as the turnover balance from the volume and value point of view. The investigations included the direction and dynamics of changes using indexes with a constant base assuming the year 2005 as 100 and linear trend coefficients determined for the absolute and relative values. The latter was determined as a percent in relation to the multiannual average assumed as 100. Apart from turnovers in general, the above changes were investigated for particular groups of plants separated by CN codes, namely: rhododendrons and azaleas, rose bushes, rooted seedlings, ornamental trees and bushes, perennial plants and forest trees. The analyses also included the significance of these groups of plants by determining their percent share in the total turnover and also by the geographical structure of import and export of each of those groups. We identify the countries of the biggest suppliers and countries of the biggest buyers. It should be stressed that forest trees, as a production sector, are not counted among the nursery sector in Poland but as a branch of the national economy, namely forestry. However, they all function under the same CN code, thus comprising the research material. The study was based on unpublished data of the Central

Institute of Foreign Trade (CIHZ) and Analytical Centre of Customs Administration (CAAC).

The changes in total turnover of nursery plants

Analyzing the foreign trade in ornamental nursery plants during the entire period of 2005-2011, a growing tendency was noted both in import and export. In the case of volume, export grew annually by 3098.1 tons in absolute values and import by 2041.1 tons, although in relative values the dynamics were at a similar level of12.6% a year in relation to the average for that period (Table 1).

Table 1. Import, export and balance in the foreign trade in nursery plants in Poland in the years 2005-2010

	Years							Trend coefficient	R^2
	2005	2006	2007	2008	2009	2010	2011		
	Value turnover								
	thousands EUR								
Import	11847.4	14071.0	21562.6	25222.6	25067.2	31790.7	34371.0	3804.1	0.96
Export	23874.7	17258.1	22288.3	29797.3	24856.3	29321.5	32711.7	1900.1	0.61
Balance	12027.3	3187.1	7257	4574.7	-210.9	-2469.2	-1659.3	X	X
	index (2005=100%)							%	
Import	100.0	118.8	182.0	212.9	211.6	268.3	290.1	16.25	0.96
Export	100.0	72.3	93.4	124.8	104.1	122.8	137.0	7.41	0.61
	Volume turnover								
	Tons								
Import	7866.8	9681.2	19964.1	19128.8	15258.6	19619.4	21859.9	2041.1	0.65
Export	25755.8	15786.3	25447.3	36793.7	30585.1	36293.9	47105.9	3935.8	0.71
Balance	17889.0	6105.1	5483.2	17556.9	15326.5	16674.9	25246.0	X	X
	index (2005=100%)							%	
Import	100.0	123.1	253.8	243.2	194.0	249.4	277.9	12,62	0.65
Export	100.0	61.3	98.8	142.9	118.8	140.9	182.9	12.65	0.71

Source: our own research based on Kowalczyk [2013].

In 2011 the import of plants to Poland was 2.8 times bigger than in 2005, and the export was 1.8 times bigger. It is not a favourable fact. Even less favourable is the situation analyzed from the value point of view. Here the rate of growth of the import is much bigger than the export. The import value increased on the average by 16.3% a year and the export value by 7.4% as compared to the long-term average. In 2011 the value of plants brought to Poland was 2.9 times bigger than in 2005 and the value of plants sold was only 1.4 times bigger. It should be stressed that although the growth of imports was systematic, exports noted a breakdown in 2006 when the volume of exported plants was 38.7% smaller than in 2005, for a value which was 27.7% smaller. In the following years export recovered, but the process was too slow to maintain an active balance of the turnover which was characteristic

for the foreign trade in nursery material. The last year of the active balance of the turnover was the year 2008. In 2009 the adverse balance amounted to -210.9 thousand EUR and in 2010 and 2011 up to -2.5 mln and -1.7 mln EUR. As far as volume is concerned, still more plants are exported than imported and that predominance in recent years amounts to 15.3 mln – 25.2 mln tons.

The difference in the dynamics of growth in import volume and value and export volume and value, as well as worsening of the turnover balance with the predominance of volume export over import, reflects the fall in price in the first and the increase of prices in the second. For one ton of imported plants in 2005 and 2011, buyers paid 1.50 thousand and 1.58 thousand EUR while for a sale of one ton they earned 0.93 thousand and 0.69 thousand EUR, respectively. On one hand, these differences may be connected with the direction of import and export and on the other hand, with a varied and changing assortment structure of that group of plants, which are very diversified in prices because of, among other reasons, species, cultivar, age, method of cultivation, sale in containers or with bare roots. Unfortunately, foreign trade statistics do not provide such detailed information, registering only the turnover of the basic types of plants.

Turnover assortment structure

Out of six isolated groups of ornamental nursery plants the most important role in imports is played by ornamental trees and shrubs. In the years 2009-2011 they amounted to over 1/3 of the turnover total value and volume. Their share in value was higher in respect to the past four years by 6.1 percentage points, and in volume the share was lower by 3.2 percentage points (Table 2). In second place, there are perennial plants with a growing share in import value from 23.8% to 30.5% and in volume from 14.6% to 21.4%. This results from the fact that relatively more and more expensive perennial plants are imported. The reverse situation was observed in the import of seedlings, the third in significance of import products. Their share in the total import increased from 14.1% to 18.6% in relation to the volume and decreased from 19.3% to 13.7% in relation to the value which points to a relative price drop of the rooted seedlings. In the years 2005-2008 forest trees took an important place in imports, amounting to 22.4% from the volume point of view. However, in the years 2009-2011 that share decreased to 15.4%. Also the share of forest trees in the import value decreased and due to their relatively lower prices it amounted to 8.4% in the last period. A slight drop of the share of roses import is also observed but from the value point of view it is a little higher (9.4%) than the forest trees and in the volume point of view it is clearly lower (7.0%). The smallest role in imports is played by rhododendrons and azaleas although their share in import slightly grows.

Table 2. The share of particular groups of plants in the total import and export of nursery plants in the years 2005-2008 and 2009-2011 (in %)

Groups of plants	Import				Export			
	Volume		Value		Volume		Value	
	2005-2008	2009-2011	2005-2008	2009-2011	2005-2008	2009-2011	2005-2008	2009-2011
	%				%			
Rhododendrons and azaleas	2.5	3.0	4.6	4.4	1.6	1.3	3.1	3.7
Rose bushes	8.6	7.0	11.6	9.4	14.1	12.5	26.1	29.5
Forest trees	22.4	15.4	13.2	8.4	1.9	4.1	1.4	2.7
Rooted seedlings	14.1	18.6	19.3	13.7	22.8	10.0	27.9	22.8
Trees, shrubs	37.8	34.6	27.5	33.6	53.4	68.1	33.0	34.6
Perennial plants[1]	14.6	21.4	23.8	30.5	6.2	4.0	8.5	6.7

[1] including heathers, heaths, water plants, ect.

Source: our own research based on Kowalczyk [2013].

As far as Polish export is concerned ornamental trees and shrubs play the most important role. In the value point of view their share in the entire export also amounts to 1/3 of the turnover but volume is much higher, with the simultaneous growth from 53.4% to 68.1% (Table 2). Thus the conclusion is that cheaper plants are exported and more expensive plants are imported. It should be stressed that such a significant role in both export and import of that group of plants results from an extreme assortment scope and diversity. The second place in the export is taken by rose bushes with their share in its value in the successive subperiods 26.1% and 29.5% but only 14.1% and 12.5% in its volume. Similar relations are observed in the export of rooted seedlings. Their share amounting to 27.9% and 22.8% in the export value and 22.8% and 10.0% in the volume place them third. The remaining three groups of plants play a small role in the Polish export.

Changes in the import and export of particular groups of nursery plants

An observed growth tendency in the import characterized all groups of the nursery plants, with the biggest dynamics in the case of perennial plants and rhododendrons and azaleas. Import of both groups grew every year by about 20.0-21.0% in the point of view of both value and volume (Table 3). Only the growth of the volume of imported rooted seedlings was slightly quicker. However, its value grew about 12.2% on the average per year, which points to importing cheaper and cheaper initial material. Import of the remaining three groups of plants grew clearly slower and the smallest dynamics were observed in the case of rose bushes.

As far as export was concerned, the growing tendency of the biggest dynamics was characteristic for forest trees. However, it should be remembered that in the absolute values they play a small role in the Polish export. A relatively high export increase was also observed in ornamental trees and shrubs which, due to their important position, is a

favourable fact. The only disadvantageous fact was that this group of plants was sold abroad at relatively lower and lower prices because with the annual growth of the export volume by 21.0% its value increased only by 10.2%. The low dynamics of the growth of rose bushes export, the second Polish export product, also cannot be assessed positively although they are sold at a relatively higher and higher prices. The volume of rose export increases every year by 3.9% and the value by 8.6%. In the investigated period, much worse was the situation in the seedling export, although they were also sold at higher and higher prices. However, their export decreases by 10.5% a year and export value increases by only 2.3%. The drop in the Polish export is also observed in relation to perennial plants. However it concerns only the volume and amounts to only 1.15% on the average year

Table 3. The dynamics of import and export changes in particular groups of ornamental nursery plants in the years 2005-2011

Groups of plants	Trend coefficient b				Standard deviation		R^2	
	absolute values		relative values					
	volume	value	volume	value	volume	value	volume	Value
	tons	thous. EUR	%		%			
				Import				
Rhododendrons and azaleas	109.2	183.2	20.8	19.6	57.5	48.2	0.61	0.77
Rose bushes	52.7	227.3	4.2	9.3	23.0	20.7	0.15	0.94
Forest trees	275.6	284.1	9.1	11.4	84.3	59.5	0.05	0.17
Rooted seedlings	580.4	464.3	22.1	12.2	59.3	40.0	0.64	0.43
Trees, shrubs	412.7	1252.8	7.1	17.2	29.0	41.9	0.28	0.79
Perennial plants	608.6	1390.1	21.0	21.5	54.9	47.8	0.68	0.95
				Export				
Rhododendrons and azaleas	29.4	95.7	6.5	11.1	23.9	27.8	0.35	0.74
Rose bushes	159.3	609.3	3.9	8.6	19.4	21.1	0.19	0.77
Forest trees	304.2	128.6	32.3	24.9	100.3	78.8	0.49	0.46
Rooted seedlings	-525.3	148.5	-10.5	2.3	25.7	14.8	0.78	0.11
Trees, shrubs	3986.3	885.8	21.0	10.2	50.9	32.7	0.79	0.46
Perennial plants	-18.3	32.4	-1.15	1.7	20.8	21.8	0.02	0.03

Source: our own research based on Kowalczyk [2013].

The value of perennial plants export increases by 1.7% a year. Such a direction of changes results, on one hand, from the fact that domestic production is too small and on the other hand, that we lose competition on the foreign markets due to the cheaper import from African and Asiatic countries and, in the case of rose bushes, also because of a fall in demand. It was shown in research by Bońkowska [2012] that in 2010 the value of the rose bushes import to the EU from Poland was lower by 64.3% than in 2003 while from China and South Africa it was higher by 2.0 and 1.7%, respectively. In 2010 the EU imported 10.0% fewere shrubs than in 2008 – this was 15.4% fewer from Poland but 17.5% more

from China. Thus we have lost a position as one of the leading producers and suppliers of both groups of ornamental nursery plants.

Various direction and dynamics of the import and export changes of particular groups of plants with differences in their absolute level is reflected in the turnover balance. Adverse balance with significant fluctuations is characteristic for foreign trade in forest trees (Table 4). However, as has already been mentioned, that group of plants is not important from the point of view of the development of the ornamental nursery plant sector in Poland. Out of the ornamental nursery plants, the highest adverse balance is observed in the case of perennial plants. That group, above all, shapes the adverse total balance. Additionally, every year the predominance of perennial plants' import value over their export value increases. For the last 4 years, there is also a high adverse balance in the volume. This shows that domestic production is falling behind the growing demand, although Poland has production potential in the form of soil and human potential in the form of well-educated nursery staff. They should be used for the increase of production of not only well known plants but mainly to widening production by new species and cultivars adapted for Polish climatic conditions, as imported perennial plants are not always able to survive Polish winters.

Table 4. The turnover balance of particular groups of ornamental nursery plants

Items	Years						
	2005	2006	2007	2008	2009	2010	2011
	Balance from the value point of view (thous. EUR)						
Rhododendrons and azaleas	48	-161	204	245	187	-425	-586
Rose bushes	4457	4045	3712	3502	4935	5434	6688
Forest trees	-404	-1381	-4366	-2268	-730	-1935	-2698
Rooted seedlings	4836	2896	2096	2079	2955	2614	1790
Trees, shrubs	3943	30	1805	4740	-2205	-846	2438
Perennial plants and others	874	-2243	-2725	-3721	-5353	-7311	-9291
	Balance from the volume point of view (tons)						
Rhododendrons and azaleas	121	-127	69	136	-21	-109	-607
Rose bushes	3316	2680	1745	1982	3987	3007	3327
Forest trees	-402	-181	-6971	-1518	204	-1475	2751
Rooted seedlings	6599	3796	4269	1020	1300	-557	171
Trees, shrubs	7345	1668	5858	19180	12854	17798	27613
Perennial plants and others	910	-99	514	-3138	-2996	-1990	-2508

Source: our own research based on Kowalczyk [2013].

The increasing adverse balance of the turnover is also characteristic for the rhododendron trade, which also points to increasing domestic demand and to losing a lot of business on the Eastern European markets with their direct import. Poland is not a major rhododendron producing country and the basis for export is the re-export of plants bought by local nurserymen from Holland, Belgium or Germany. It is seen from the analyses that

more and more imported plants get to the domestic market. The worsening turnover balance, although still active, is noted in the rooted seedlings trade as the effect of a decreasing export with an increasing import. The explanation of that fact should be looked for in the increasing demand of nurserymen for the initial material caused by the production development of mature nursery material of ornamental trees and shrubs both for domestic and foreign markets. Trees and shrubs comprise a group of plants with a high growing active balance in regard to volume, which is a favourable fact. On the other hand, from the value point of view this balance is subjected to significant fluctuation and in 2009 and 2010 it was even adverse. The only group with a constant, active turnover balance on a relatively high level are rose bushes. Similar export and import growth rate show that this situation will remain in the next years.

Geographical structure of the Polish import and export of ornamental nursery plants

In the export of ornamental nursery plants two countries predominate – Holland and Germany. Holland is the country of origin for 50.0-80.0% forest trees, 60.0-70.0% ornamental trees, shrubs and perennial plants, about 50.0% rhododendrons and seedlings and nearly 30.0% rose bushes (Table 5). Germany takes second place, mostly in the import of rooted seedlings (about 40.0% share), then ornamental trees and shrubs (about 20.0%) and forest trees (about 15.0%). However, the role of Germany as a supplier of rose bushes decreased (from about 20.0% to over 7.0%) and its place was taken by China. In the years 2009-2011 the import from China amounted on average to 43.6% a year of the entire Polish import of roses by volume and 38.1% by value. However, as was seen from the observations of the domestic market this was mainly the import of the rose rootstocks for grafting and not grafted rose bushes. Also Belgium has been known for many years as a plant supplier but only as the supplier of rhododendrons and azaleas.

The direction of nursery plant export are more diversified, depending on the group of plants, and export is more diffused, without the clear predominance of 2-3 countries. The buyer of each of the analysed groups is Russia, which buys 40.0-60.0% ornamental trees and shrubs, nearly 30.0% rhododendrons, about 15.0% rooted seedlings, 11.0-16.0% perennial plants but only about 9.0% rose bushes. The biggest buyer of the latter as well as rhododendrons are Germany, which bought over 40.0% rose bushes and over 45.0% rhododendrons and azaleas. The second buyer of roses was Holland with a share of export of 20.0-32.0%. Germany, Holland and Denmark are also the buyers of Polish perennial plants but with varied share. For example, in the years 2005-2008, 30.4% and 3.8% of the Polish perennial plants were sold to Germany and Denmark and in the years 2009-2011 – 23.1% and 1.2%, respectively. This shows the lack of regular trade relations and the instability of the Polish position on particular markets. Apart from the above mentioned 3 countries and Russia, major buyers of Polish perennial plants are the Slovac Republic, Ukraine and Belorussia. The two latter ones, and in particular Ukraine, are also important markets for the remaining groups of nursery plants. Ukraine took third place in buying rhododendrons, first in buying rooted seedlings and second in buying trees and shrubs.

Table 5. The biggest suppliers and buyers of ornamental nursery plants in Poland (with the share of over 1%)

Country of Origin	The share in the total import (%)				Country of destination	The share in the total export (%)			
	volume		Value			volume		value	
	2005-2008	2009-2011	2005-2008	2009-2011		2005-2008	2009-2011	2005-2008	2009-2011
Rhododendrons and azalease									
Holland	50.5	53.7	53.6	56.3	Germany	45.6	47.4	70.1	73.1
Belgium	28.1	18.4	28.0	19.8	Russia	29.1	29.8	17.0	15.6
Germany	17.8	26.0	15.1	21.4	Ukraine	12.8	5.8	6.0	2.6
Luxemburg	2.9	0.8	2.2	0.7	Belorussia	4.7	5.4	2.7	2.7
Others	*6 countries*				Others	*22 countries*			
Rose bushes									
Holland	28.9	27.4	33.5	33.4	Germany	51.9	41.1	50.0	32.4
China	27.3	43.6	32.1	38.1	Holland	20.7	32.1	23.1	36.0
Germany	21.3	7.7	17.5	7.4	Russia	8.0	9.6	5.1	8.8
Italy	10.8	-	5.7	-	Great Britain	2.0	5.8	2.7	6.7
Bulgaria	4.2	9.6	2.3	5.8	Belorussia	2.7	3.0	2.7	3.4
Others	*12 countries*				Others	*30 countries*			
Rooted seedlings									
Holland	41.3	52.6	47.0	58.1	Ukraine	39.1	26.8	17.7	7.6
Germany	49.6	37.9	37.7	22.6	Russia	17.5	12.8	11.1	12.6
Belgium	3.7	2.8	5.5	4.7	Holland	11.8	21.1	30.9	34.8
Italy	1.5	2.5	0.9	5.0	Latvia	8.8	5.9	5.4	4.0
Denmark	1.2	0.7	5.8	2.1	Belorussia	5.9	9.9	4.0	4.5
Others	*18 countries*				Others	*35 countries*			
Ornamental trees and shrubs									
Holland	68.0	71.0	65.4	76.3	Russia	37.1	61.3	31.7	39.5
Germany	21.7	16.8	22.7	15.3	Ukraine	17.5	8.5	15.7	10.1
Italy	4.1	4.0	4.5	2.1	Latvia	9.0	6.0	11.3	9.5
Belgium	2.8	0.6	3.6	0.6	Slovac Republic	2.9	7.3	2.9	9.7
Denmark	1.2	6.5	1.5	4.7	Belorussia	4.8	4.3	5.2	6.4
-					Germany	7.5	1.6	6.4	4.3
Others	*19 countries*				Others	*28 countries*			
Perennial plants									
Holland	69.5	63.4	65.9	60.5	Russia	11.2	16.1	9.3	7.4
Germany	17.3	19.6	22.2	25.5	Denmark	3.8	23.1	5.1	15.5
Great Britain	8.5	9.6	5.9	5.2	Holland	11.6	16.3	9.9	12.6
Italy	2.6	4.8	2.5	5.1	Germany	30.4	1.2	19.8	3.2
-					Slovak Republic	5.7	10.9	8.3	10.2
-					Ukraine	10.5	5.6	15.5	6.6
-					Belorussia	2.3	2.9	1.9	3.4
Others	*28 countries*				Others	*31 countries*			

Source: our own research based on Kowalczyk [2013].

Apart from the above mentioned major buyers, nursery plants are sold to several dozen other countries, but the share of each in trade is much less than 1%. For example, there were 35 countries buying seedlings, 31, 30 and 28 countries in the case of perennial plants, rose bushes and trees and shrubs. At the same time no tendencies were noticed of enhancing the position of some countries and weakening the position of others. It proves the lack of regular, wide range of trade contacts, which makes efficient development of nursery production in Poland difficult.

Conclusions

The results of the analyses did not fully confirm the earlier predictions concerning the stay in ornamental nursery plants foreign trade with the tendency of the turn of centuries. Although the turnover still increases, but with the same growth dynamics of import and export volume, the import value grows much quicker than the export value. A turnover balance which was active until 2008, in the last three years shows adverse values, although the export volume is still twice that of import. The adverse turnover is affected by the adverse perennial plant trade which results from the quick growth of their import with the dropping export tendency and the adverse balance of the forest trees and rhododendrons trade. The drop of export with the growth of import is also characteristic for rooted seedlings and in the case of the remaining groups of plants, the growth of import is quicker than export, with the exception of trees and shrubs by volume. It is a group with a growing active volume turnover balance but with a highly variable value balance (including even the adverse balance). Thus one can observe the disadvantageous changes – the increase of the export of relatively cheaper plants and the growth of import of relatively more expensive plants. The export diversification also decreased, which as seen from the research does not favour its development. It would be profitable to widen the export scope with perennial plants and seedlings. A significant geographical scattering of export with the simultaneous significant variability of the supply level which points to the lack of regular trade contacts does not favour further development. Apart from the major countries such as Russia, Holland, Germany, Slovac Republic Ukraine and Belorussia, the Polish plants are bought by about thirty other countries whose share in the export is much less than 1% each.

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The regional variation of foreign direct investment in Poland

Abstract. In this paper, an analysis of foreign direct investment in terms of regional differences was conducted. The analysis covered the period 2005-2013. The analysis shows that the distribution of investors in Poland is varied regionally. Regions particularly attractive for foreign investors were Mazovia, Silesia, Lower Silesia and Greater Poland. In contrast, Lublin Province, Podlasie Province, Warmia-Masuria Province are regions where foreign investors are the least.

Key words: foreign direct investment, foreign investment in the food industry, foreign investment in the provinces

Introduction

Since the early 90s we see a dynamic inflow of foreign direct investments in Poland. These investments were initially located in strategic industries and mostly in the largest cities in the country. Poland despite the passage of years, it is still an attractive place to do business by foreign entities. Estimated share of companies with foreign capital in the Polish economy in 2005-2012 was about 40% [Inwestycja 2013]. Every year, new investments come to Poland, and their location varies regionally. It is important to know the location of foreign direct investments, to determine the motives of their choice and to determine the impact of their activities on the changes in the region.

Research methodology

The aim of the study was to present the inflow of foreign direct investments in Polish regions. The study contains the annual accounts and the cumulative data of foreign investments' inflow in terms of a Polish national, regional and sectoral (including the food industry). Effect of foreign investors in the region was examined by analysis of employment and volume of export and import.

Foreign direct investments (FDI), base on capital location by the company or individual of one country in the company of another country in order to achieve a permanent impact on its business and reap the profits. The company transferring kind or cash capital abroad can become the sole owner or co-owner of companies which operate in the deposit country [Bożyk, Misala & Puławski 2002].

Capital flows in the form of foreign direct investments have been the subject of many analyses and scientific researches as an important factor in economic growth. A number of theories to explain the motives of investments, types of investments, as well as the effects

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of investment for the host country and the investing entity has been created so far. Summary of the most important theories are presented in Table 1.

Table 1. Selected theories of foreign direct investment flows

Theory	Scientists	The essence of the theory
Eclectic teory of international production OLI paradigm	Dunning`a	Theory is based on 3 groups of KTN advantages: The first group production resulted from the ownership of assets, they are ownership specific advantages. They can include: the size of the company, technology and trademarks, management and organizational systems, access to spare capacity, better access to markets and knowledge about them, international opportunities, eg. risk diversification. The second group consists of KTN advantages due to the specific nature of their economic activity location (location specific advantages). These advantages include: the cost of labor, materials, and transportation costs between countries, language, culture and customs, legal structures and government policy and interventions. The third group belongs to the specific advantages associated with the internalization of KTN (internalization incentive advantages) - ie: reducing the costs of exploration, negotiation and monitoring, cost avoidance
Technological gap theory	Posner	Theory assumes that there is a technological gap between countries. Innovative countries produce products that undergo the life cycle phase and investments move the products from innovative countries to imitating countries.
Theory of internationalization	Coase	According to the theory more profitable for the enterprise can be the use of its advantage alone than to make it available to other companies. Such company makes internationalization advantage through the extension of its own activity, which has been carried out through the market so far.
The theory of relative offsets of the capital and labor costs	Koijima	The essence of the theory is the use of the comparative advantages (cheaper labor) of less developed host country.

Source: own research.

Listed in Table 1 The theories suggest the positive effects on the transfer of capital, contributing to the socio-economic development of countries/regions. The basic elements of the regional development are economic and employment growth, prosperity, quality of life, attractiveness of regions for investments, innovation, human capital development, etc. [Woźniak-Miszewska 2012]. Foreign direct investments have an impact on regional development through the transfer of technics, technology, increased competition in the region, strengthening cooperation with subcontractors, creation of new companies, hiring employees, breaking monopolies, the creation of new standards contribute to improvement of the quality of life. However, be aware of the negative impact of FDI, i.e.: about the import of outdated technologies, acquired national entities liquidation, competition liquidation, overexploitation of natural resources, etc.

An important element in determining the location of the investment is the attractiveness of the region and created investment climate. Investment attractiveness consists of many factors among others: technical and economic infrastructure, labor resources, market capacity, availability of transport, location, level of economic development, legislation, investment security or investment incentives.

This paper presents an analysis of foreign direct investments (FDI) invested in Poland in the years 2005-2013. The analysis was based on CSO data.

Entities with foreign capital in Poland

Entities with foreign capital invest in Poland since the early 90s. In the years 2000-2013 the number of entities investing in Poland dynamically increased. In 2013. In Poland 26121 companies with foreign capital had been registered and invested capital amounted to 188 billion PLN (Figure 1, Table 2). In order to attract foreign investors Poland applied various incentives including tax breaks.

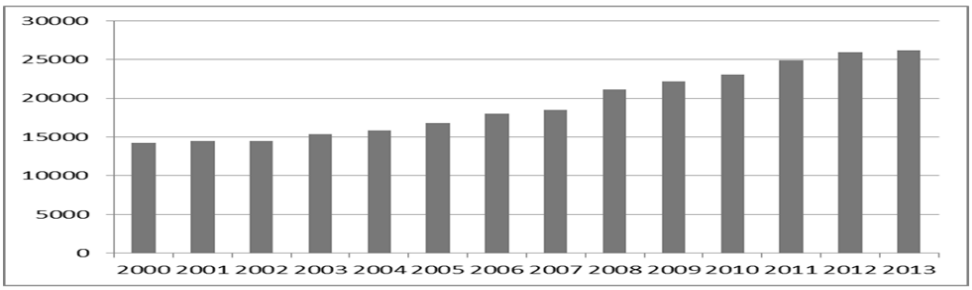

Figure 1. Number of companies with foreign capital in Poland in the years 2000-2013

Source: Own calculations based on data from The economic activities of entities with foreign capital in 2000 - 2013 Central Statistical Office, Warsaw 2001 -2014.

As can be seen from the graph 2 in the analyzed period, the value of foreign capital invested in Poland increased dynamically. Foreign capital was approximately 3-fold higher in 2013 in comparison to 2000. In relation to entities with foreign capital in the share capital, more than 90% of shares have foreign entities. Domestic capital accounted for more than 20% in 2000 and gradually decreased to 10 /% in 2013.

By 2008, the number of employees in companies with foreign capital increased dynamically in 2009. As a result of the global crisis, there was a decrease of 71 thousand employees but in 2010 there was an increase in employment. In 2013 there were more than 1.62 million people who worked in companies with foreign capital (Table 2).

Entities with foreign capital invested in the country. Since 2005, expenditures on new assets were observed. In 2013,. the amount of expenditures amounted to more than 51 billion PLN.

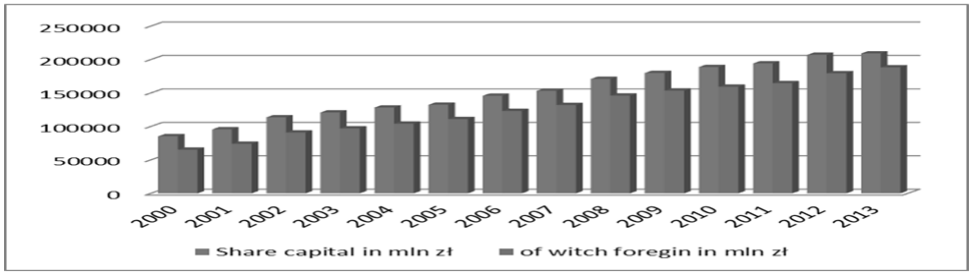

Figure 2. The value of capital, including foreign entities with foreign capital in the years 2000-2013

Source: Own calculations based on data from The economic activities of entities with foreign capital in 2000 - 2013 Central Statistical Office, Warsaw 2001 -2014.

Table 2. Entities with foreign capital in Poland in the years 2005-2013

Year								
2005	2006	2007	2008	2009	2010	2011	2012	2013
The number of companies with foreign capital in Poland								
16837	18015	18515	21092	22176	23078	24910	25914	26128
Share capital million PLN								
132398.0	145852.0	153243.8	170997.1	179877.8	188812.4	194160.6	206992.3	209130.0
including foreign millon PLN								
111028.3	123196.6	131856.9	145996.9	153577.8	159267.2	164559.4	179372.3	188243.1
Number of employees								
1186148	1313359	1453733	1531668	1460650	1518398	1566533	1571235	1628516
Expenditure on new assets in Poland million PLN								
37105.6	46783.9	54944.4	65198.3	50938.4	46868.8	54996.0	53062.7	51303.6

Source: Own calculations based on data from The economic activities of entities with foreign capital in 2000 - 2013 Central Statistical Office, Warsaw 2001 -2014.

Table 3. Entities with foreign capital by shareholders and NACE sections in 2013

NACE Sections	Number of entities		Total number of shareholders of which		Foreign capital	
	Total	Share (in %)	Total	Legal persons located abroad	Total in mln zł	Share (in %)
Total	26128	100	36395	18494	188243.1	100
Agriculture, forestry and fishing	719	2.8	1051	287	1080.2	0.6
Mining and quarrying	153	0.6	198	137	1661.4	0.9
Manufacturing	5103	19.5	6828	3994	67609.7	35.9
Electricity, gas, steam and air conditioning supply	697	2.7	929	640	8567.6	4.6
Water supply; sewerage, waste management and remediation activities	169	0.6	216	131	888.1	0.5
Construction	2250	8.6	3199	1825	9030.3	4.8
Trade; repair of motor vehicles	7409	28.4	10588	4184	40045.0	21.3
Transportation and storage	1030	3.9	1419	682	2766.7	1.5
Accommodation and catering	551	2,1	838	191	1831,9	1,0
Information and communication	1297	5,0	1695	1081	23580,3	12,5
Financial and insurance activities	561	2.1	722	522	8466.7	4.5
Real estate activities	2342	9.0	3619	2006	12931.4	6.9
Professional, scientific and technical activities	2371	9.1	3075	1886	6136.0	3.3
Administrative and support service activities	942	3.6	1253	609	2444.2	1.3
Education	118	0.5	175	60	62.6	0.0
Human health and social work activities	163	0.6	231	96	871.3	0.5
Arts, entertainment and recreation	144	0.6	210	92	165.0	0.1
Other service activities	109	0.4	149	71	104.7	0.1

Source: Economic activity of entities with foreign capital in 2013. [2014] Statistical information and reports. GUS, Warsaw and own calculations.

Structure of foreign direct investors' activities in Poland

In 2013, the most entities - 28.4% worked in the trade and vehicles repair. On the second place was the industrial processing, where there were 19.5% of companies with foreign capital, including 9.6 entities engaged in the production of food and beverages (Table 3). On another place was real estate services, construction and professional, scientific and technical activity- for these sections accounted for about 9% of the subjects (Table 3). An analysis of the structure of foreign investors' activities for the years 2005-2013 shows that the largest share in total had industrial activity.

Table 4. Foreign capital and the production of food and beverages in 2013

Years	Number of entities	Number of employees	Share capital in million PLN	Foreign Capital in million PLN
2005	510	88879	9913.3	9235.8
2006	518	88616	10151.9	9447.8
2007	495	88846	10303.0	9573.1
2008	480	89240	10161.3	9493.8
2009	438	89006	10530.9	9945.1
2010	461	88042	8904.9	8322.5
2011	500	95403	9819.7	9182.2
2012	505	93502	11189.4	10594.8
2013	491	91064	10519.2	9964.4

Source: as in Table 2.

In the structure of the activities of foreign entities the smallest share in 2013 showed: educational activities, activities related to the entertainment, culture and health care.

In the years 2005 - 2013 there was an increase of invested capital in agriculture, forestry, hunting and fishing (Table 3). In the structure of industrial production the most foreign investment in this period was in the production of industrial goods and beverages. In this sector, more than 10.5 billion PLN was invested, including foreign capital accounted for 95%. In the period 2005-2013 the value of foreign invested capital increased more than 7-fold. In 2013 there were 491 entities that employed more than 91 thousand workers (Table 4).

The regional variation of foreign direct investment in Poland

Poland is a country with regional diversity in terms of economic development. Developed regions include Mazovia and the southwestern Poland. Eastern regions are less developed. By analyzing the distribution of entities with foreign capital in Poland, most of them exist in large conurbations, i.e.: Warsaw, Poznan, Katowice, as well as in the most developed regions – Mazovia (38.6% of all companies with foreign capital in 2013.), Silesia (9.1%), Lower Silesia (9.1%) and Greater Poland (8.8%). In these provinces more than 55% of the total operating foreign investors were operating. The lowest percentage of registered entities was in Podlasie Province (0.7%), Świętokrzyskie Province (0.7%) and Lublin Province (1.5%) (Table 5). Since foreign investments contribute to economic

growth, capital resources and complement the national capital resources and modernize production technologies, local authorities seek their influx, creating the right conditions.

The Institute's Research (IBnGR) showed that the most attractive regions are Silesia, Mazovia, Lower Silesia and Greater Poland. The least attractive regions are Świętokrzyskie Province, Lublin Province and Podlasie Province which confirms the above analyses [Nowicki 2010].

Table 5. Basic data on entities with foreign capital in the regional in 2013

Voivodships	Number of entities		Persons employed		Share capital in mln zł			
	Total	Share (in %)	Total	Share (in %)	Total	Share (in %)	Including foreign	Share (in %)
Total	26128	100	1628516	100	209130.0	100	188243.1	100
Dolnośląskie	2370	9.1	155514	9.5	17365.2	8.3	16136.3	8.6
Kujawsko-pomorskie	589	2.3	37289	2.3	3100.9	1.5	2989.7	1.6
Lubelskie	400	1.5	22813	1.4	1547.3	0.7	1310.5	0.7
Lubuskie	731	2.8	34601	2.1	1957.0	0.9	1898.5	1.0
Łódzkie	1086	4.2	81907	5.0	5115.6	2.4	4892.3	2.6
Małopolskie	1651	6.3	104006	6.4	13592.3	6.5	12471.7	6.6
Mazowieckie	10098	38.6	548107	33.7	102572.7	49.0	93014.6	49.4
Opolskie	488	1.9	26170	1.6	2234.5	1.1	2092.9	1.1
Podkarpackie	461	1.8	41533	2.6	5981.7	2.9	5422.0	2.9
Podlaskie	183	0.7	10251	0.6	771.8	0.4	636.2	0.3
Pomorskie	1430	5.5	61821	3.8	8957.3	4.3	6734.9	3.6
Śląskie	2388	9.1	181177	11.1	19067.4	9.1	15634.8	8.3
Świętokrzyskie	184	0.7	20667	1.3	2984.7	1.4	2801.8	1.5
Warmińsko-mazurskie	302	1.2	13890	0.9	1580.4	0.8	1479.6	0.8
Wielkopolskie	2302	8.8	233591	14.3	16889.1	8.1	15648.0	8.3
Zachodniopomorskie	1465	5.6	55179	3.4	5412.2	2.6	5079.3	2.7

Source: as in Table 2.

One of the criteria for assessing the impact of foreign investment on the economy of the host country and in the region, is the number of employees in companies with foreign capital. In 2013 in companies with foreign capital were employed over 1.6 million workers. The largest share of employed persons was in Mazovia - 33%, Greater Poland - 14.3% and the Silesia - 11.1% - the trend still remained located in the last few years. The lowest employment was in the Podlasie and Warmia and Mazuria (Table 5).

Analyzing the regions in terms of invested capital again emerges Mazovia Province - 49.4% of total invested capital, Lower Silesia, Silesia and Greater Poland. Particularly noteworthy is the Mazovia province, where almost half of the capital invested in Poland - 93 billion PLN was located (Table 5).

Capital expenditures in entities with foreign capital since 2005 until 2008 were characterized by a growing trend. In 2009 there has been a decline in investments. In 2013.the capital expenditures amounted to 75 billion PLN including new investments amounted to over 51 billion zł. The largest share in the structure of expenditures showed Mazovia, Greater Poland and Silesia (Table 6).

Table 6. Investments' cost and total revenues in companies with foreign capital in the regions in 2013

Voivodships	Investment outlays		Fixed assets outlays in Poland		Revenues from total activity	
	Total	Share (in %)	Total	Share (in %)	Total	Share (in %)
Total	75105	100	51303,6	100	1241930	100
Dolnośląskie	5295,6	7,1	4445,1	8,7	98427,9	7,9
Kujawsko-pomorskie	1372,3	1,8	886,4	1,7	31178,7	2,5
Lubelskie	1602,1	2,1	595,4	1,2	14132,9	1,1
Lubuskie	914,6	1,2	863,5	1,7	19516,1	1,6
Łódzkie	2509,6	3,3	2330,9	4,5	45476,7	3,7
Małopolskie	2873,6	3,8	2209,4	4,3	69022,5	5,6
Mazowieckie	34491,1	45,9	21129,7	41,2	481519,6	38,8
Opolskie	834,8	1,1	673,9	1,3	16612,9	1,3
Podkarpackie	1390,3	1,9	1166,5	2,3	23137,9	1,9
Podlaskie	270,8	0,4	218,5	0,4	7050,5	0,6
Pomorskie	3004,8	4,0	2499,5	4,9	48724,1	3,9
Śląskie	7906,5	10,5	5056,4	9,9	138326,6	11,1
Świętokrzyskie	1120,6	1,5	983,6	1,9	15913,4	1,3
Warmińsko-mazurskie	354,7	0,5	303,8	0,6	8848	0,7
Wielkopolskie	8633	11,5	5720,5	11,2	190703,8	15,4
Zachodniopomorskie	2530,7	3,4	2220,6	4,3	33337,9	2,7

Source: as in Table 2.

In the period 2005-2013 the entities with foreign investment were engaged in export and import. In 2013 the balance was negative, amounted to 3.7 billion zł. Analyzing the particular regions it can be concluded that the negative balance occurred in Mazovia and Greater Poland. In other provinces balance was positive (Table 7). The largest share in the import side (33.8%) and exports (21.6) showed entities from Mazovia. On the second place was Silesia and Greater Poland and Lower Silesia occupied the next places. The smallest share in imports and exports showed entities of Podlasie Świętokrzyskie and Lublin Province (Table 7).

Table 7. The value of export and import by region in 2013

Voivodships	Imports total		Exports total	
	Total	Share (in %)	Total	Share (in %)
Total	379296.8	100	375612,1	100
Dolnośląskie	39735.2	10.5	46197.5	12.3
Kujawsko-pomorskie	8560.4	2.3	12062.7	3.2
Lubelskie	2717.0	0.7	4218.0	1.1
Lubuskie	8526.2	2.2	10733.6	2.9
Łódzkie	16757.0	4.4	16487.2	4.4
Małopolskie	20221.5	5.3	20730.9	5.5
Mazowieckie	128091.5	33.8	81120.3	21.6
Opolskie	5639.3	1.5	6153.8	1.6
Podkarpackie	9630.3	2.5	13903.9	3.7
Podlaskie	2279.4	0.6	2722.7	0.7
Pomorskie	15134.2	4.0	17534.6	4.7
Śląskie	49972.1	13.2	67047.5	17.9
Świętokrzyskie	2188.0	0.6	4033.5	1.1
Warmińsko-mazurskie	4011.2	1.1	5859.2	1.6
Wielkopolskie	54152.1	14.3	51058.2	13.6
Zachodniopomorskie	11681.3	3.1	15748.5	4.2

Source: as in Table 2.

Table 8. Foreign capital by the shareholder origin in the regional calculation

Voivodship	Country						
	Netherlands	France	Germany	Luxembourg	Sweden	USA	Cyprus
Total	32207.3	31295.2	30881.4	21718.2	8845.8	7727.5	7085.8
Dolnośląskie	2348.4	1191.3	6111.5	419.5	136.4	146.3	180.7
Kujawsko-pomorskie	709.1	264.4	749.3	96.7	10.8	8.8	#
Lubelskie	412.4	101.3	61.3	168.7	#	148.4	34.3
Lubuskie	67.8	81.0	345.8	93.9	#	#	27.5
Łódzkie	1187.6	277.7	733.0	415.0	#	62.1	58.9
Małopolskie	1314.4	470.3	781.7	#	28.6	128.1	148.9
Mazowieckie	17478.1	24955.5	11003.5	8642.7	5061.3	2314.7	3455.7
Opolskie	670.8	#	783.2	#	#	#	106.7
Podkarpackie	288.8	472,1	602.6	169.4	25.0	3111.0	#
Podlaskie	230.4	#	#	#	6.4	#	17.5
Pomorskie	940.0	274.9	1019.2	498.2	#	50.8	344.4
Śląskie	1646.4	768.1	3407.7	3372.1	329.0	115.3	709.6
Świętokrzyskie	#	#	#	68.4	#	0.1	351.7
Warmińsko-mazurskie	#	108.6	117.4	5.7	#	#	5.8
Wielkopolskie	3848.7	1293.5	4072.6	307.2	502.8	#	310.0
Zachodniopomorskie	177.7	7.0	916.7	74.0	312.1	17.7	#
	Country						
	Spain	Belgium	Italy	United Kingdom	Denmark	Austria	Switzerland
Total	5969.0	5905.8	5360.6	5343.1	4979.0	3268.7	3219.3
Dolnośląskie	342.3	1401.7	404.8	490.7	50.5	180.2	422.4
Kujawsko-pomorskie	35.5	14.0	9.1	9.7	152.2	73.1	#
Lubelskie	#	13.8	111.3	#	2.9	#	#
Lubuskie	#	89.6	165.4	#	240.0	#	98.9
Łódzkie	141.2	30.2	786.0	111.2	177.6	165.0	110.0
Małopolskie	95.6	138.2	145.8	323.8	19.7	306.8	225.6
Mazowieckie	3833.4	1891.4	933.1	2570.6	2141.2	1468.2	730.6
Opolskie	-	#	160.1	31.2	#	54.0	0.2
Podkarpackie	7.3	#	#	185.4	#	#	5.4
Podlaskie	-	#	#	#	35.0	#	#
Pomorskie	59.4	87.9	48.4	225.4	465.7	351.3	82.9
Śląskie	865.8	613.1	2375.2	77.3	168.9	232.3	229.8
Świętokrzyskie	#	0.7	23.2	252.2	8.7	#	#
Warmińsko-mazurskie	0.2	24.3	19.3	4.0	7.2	20.2	#
Wielkopolskie	376.5	936.1	74.1	678.5	584.0	243.9	126.6
Zachodniopomorskie	87.1	#	21.3	230.7	906.0	76.7	6.3

Symbols # - data may not be published due to the necessity of maintaining statistical confidentiality in accordance with the Law on Official Statistics.
Symbols (-) - Magnitude zero.

Source: as in Table 2.

The geographical structure of foreign investors is dominated by the Dutch before French and Germans. Investors from Holland locate their investments in all regions, but the dominant advantage attributes to Mazovia Province and then to the Greater Poland, Lower Silesia and Silesia. The same trend is observed for investors from France and Germany (Table 8).

Summary

In the years 2005-2013 a significant role in the dynamic development of the Polish economy had inflow of foreign direct investments. However, not all regions could use the dynamic growth stimulated by foreign investments. Investments in Poland are unevenly spread. Most investments and the capital are located in the Mazovia Province. It prevails over the other regions, nearly 50% of total investments are located here. This region develops the fastest. Investments in this region stimulate economic growth, create jobs, new technologies, followed by the modernization of regional structures. These investments through competition stimulate domestic companies to introduce a number of positive changes. Similar situation occurs in Lower Silesia, Silesia and Greater Poland. Least developed are Podlasie, Warmia and Mazuria, Lublin and Świętokrzyskie Province - there is a lack of investment stimulating economic development.

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Changes in Polish agriculture in the period 2002-2010 in the light of Central Statistical Office census data

Abstract. According to the latest National Agricultural Census 2010, in comparison with the previous one of 2002, the number of farms decreased by almost one fourth but is still very big, which results from a large number of small farms. For this reason, more than half of land resources belong to small and medium-sized farms. This translates into the efficiency of land, labour and capital in agriculture. It has impact on the competitiveness of our agriculture, because large and very large farms are more competitive in terms of bargaining power on the agri-food market. In the period between censuses, the number of people working in agriculture increased, which is a consequence of the difficult situation on the labour market, especially in rural areas. The excessive labour resources in agriculture hamper the change of farm size structure. Advantageous changes obtained during this period are the improvement of agricultural equipment of farms and an increase in the scale of production of each of the products produced on farms, which undoubtedly improves the competitiveness of our farms.

Key words: agriculture, production resources in agriculture, farm production scale, competitiveness of farms

Introduction

Changes that took place in Polish agriculture in the years before as well as after the accession to the European Union led to substantial changes in this sector of the economy. The introduction of the Common Agricultural Policy softened the negative effects of the unequal pace of changes in the prices of agricultural products and of the means of agricultural production. There was an increase in farmer income and an increase in the percentage of farms capable of competing with farms in other European Union countries [Józwiak, Mirkowska 2011]. Despite advantageous changes in our agriculture as well as in the agriculture of other countries that joined the European Union, the differences between the situation in agriculture and rural areas of particular member states will not disappear. Quite the contrary, the competitiveness capability of countries with strong farms will be rising, and the competitiveness capability of countries with small farms will be decreasing [Michna 2011]. Thus, countries with fragmented agriculture must strive to create strong farms able to sustain the production potential and to develop farms.

The article aims to present the changes that took place in Polish agriculture in the period 2002-2010 based on the outcomes of the National Agricultural Censuses conducted by the Central Statistical Office in 2002 and 2010.

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Production resources

Land resources

Production resources in agriculture are the factors of production utilised in production processes on farms, i.e. land, labour and capital. A land resource is the quantity of land utilised for agriculture, thus it is the acreage of agricultural land for good agriculture. The labour resource is the number of people able to work in agriculture. And capital refers to tangible assets used as farm equipment and working assets used in the production processes. Production resources in agriculture are located in particular farms and the efficiency of land as well as labour and capital depends mainly on the size of a farm. In a particular state's agriculture as a whole, the efficiency of resource management depends mainly on the farm size structure.

A problem with the farm size structure occurs in agriculture when the share of small farms in the total number of farms is too high, they do not generate income sufficient for a farmer and his family to make a living, and when a small farm whose main income source is outside agriculture concentrates too many land resources that are not efficiently utilised and it hampers the growth of market-oriented farms [Zegar 2009]. Undoubtedly, such a situation occurs in Polish agriculture. Although the number of farms is continually decreasing, there are still too many farms. And small farms are prevailing.

According to the latest National Agricultural Census 2010, the total number of farms was 2,278 thousand. In comparison with the former census in 2002, the number of farms decreased by 656 thousand, i.e. by 22.4%. The biggest decrease was observed in the number of the smallest farms covering the area of up to 1 ha and from 1 to 5 ha of agricultural land (AL), where the number of farms decreased by 26.8% and 24.8% respectively. The number of farms covering 5-10 and 10-20 ha of AL decreased by 17.6% and 16.1% respectively (Table 1). The number of farms covering 20-50 ha of AL rose slightly (by 0.8%) while the number of large farms covering the area of 50 ha and more increased considerably (by 34.4%). This is undoubtedly an advantageous change in the number of farms in particular size groups, especially in the context of improving resource management efficiency and farm competitiveness.

Table 1. Number of farms with respect to agricultural land acreage in 2002 and 2010 [thousands]

Year	Total	Size of the agricultural land area [ha]					
		up to 1	1-5	5-10	10-20	20-50	above 50
2002	2 933	977	1 147	427	267	96	20
2010	2 278	715	863	352	224	97	27

Source: [Raport z wyników… 2011].

However, the number of farms in our agriculture is still big and even very big in comparison with other EU countries, which results from the large number of small farms. In 2010, the number of farms involved in agricultural activities in Poland (1,891 thousand farms)[2] constituted 12.5% of the total number of farms involved in agricultural activities in

[2] The existence of farms that are not involved in agricultural activities, i.e. inactive ones, is the curiosity of Polish agriculture. They are most often small farms covering up to 1 ha of AL.

the EU countries. There were more farms than in Poland only in Romania and Italy (31.9% and 13.5% respectively). In other EU countries, there were definitely fewer farms (Fig. 1).

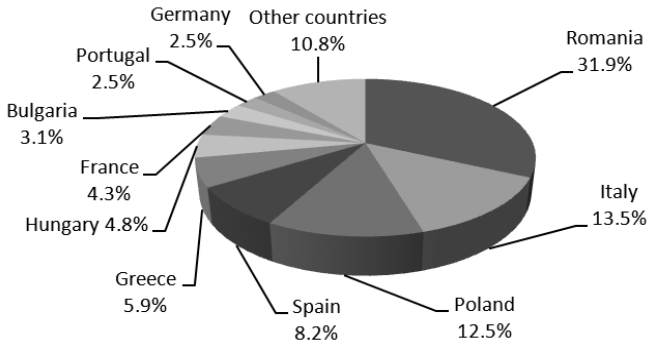

Figure 1. Share of the number of farms in particular countries in the total number of farms in the EU in 2010

Source: [Poczta et al… 2013].

Having many small farms in Poland translates into the structure of farm size. In 2010, the smallest farms covering up to 5 ha of AL constituted 70% of all the farms, and farms covering more than 20 ha – only a little more than 5% (Fig. 2). Because of that, over 15% of land resources in our agriculture belong to small farms covering up to 5 ha (Fig. 3). In the EU countries where the structure of farm size is the most advantageous – Denmark, Ireland and Germany – the share of the smallest farms does not exceed 10% and these farms possess not more than 1% of agricultural land in a given country. At the same time, large farms in these countries, covering more than 50 ha of AL, use more than half of land resources in a given country (80.3%, 50.9% and 76.8% respectively). The countries where large farms use most land resources are Slovakia, the Czech Republic and Great Britain – about 90% of land resources in those countries [Poczta et al. 2013]. In Poland, large farms covering more than 50 ha of AL use less than 30% of agricultural land acreage.

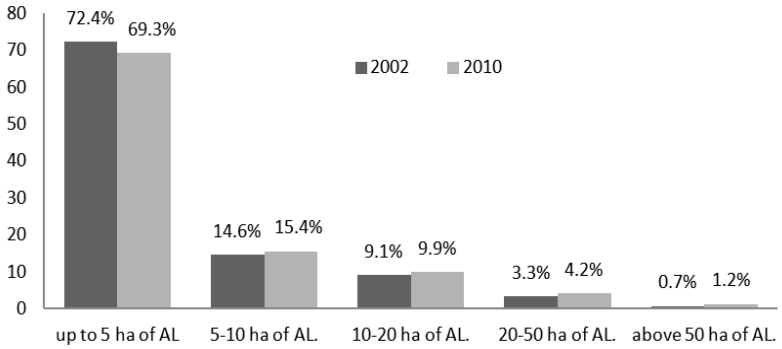

Figure 2. Farm structure with regard to the acreage of agricultural land in 2002 and 2010

Source: [Raport z wyników… 2011].

As farm size structure results in the percentage of land resources owned by small, medium sized and big farms, more than half of the land resources in our country (51.8%)

within the total acreage of agricultural land (15,503 thousand ha) are owned by small and medium sized farms (up to 20 ha of AL). This translates into the efficiency of land, labour and capital resources management in agriculture. It has impact on the competitiveness of our agriculture because large and very large farms are more competitive with regard to their bargaining power on the agro-food market. Vegetable farms, orchards and highly specialised poultry and pig farms are an exception. The research shows that farms covering more than 20 ha of AL are competitive and capable of sustaining their production potential and developing [Dzun 2011]. That is why the development and improvement of the competitiveness of Polish agriculture depends on changes to the structure of farm size.

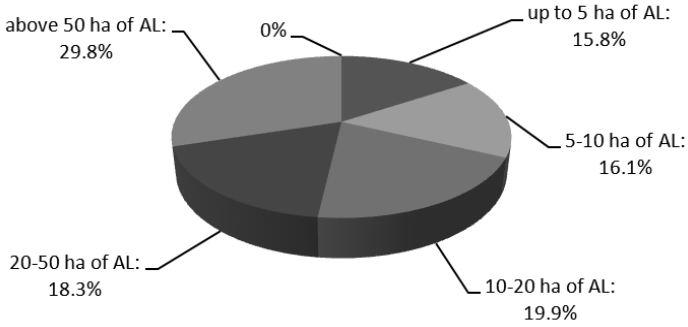

Figure 3. Structure of agricultural land acreage owned by farms with different size in 2010

Source: [Użytkowanie gruntów… 2011].

The census data show that the structure of farm size and the structure of agricultural land owned by farms of different size are changing. As a result, the average acreage of agricultural land per farm in 2010 increased by over 1 ha, i.e. 18% and was 6.82 ha of AL in comparison with 5.76 ha of AL in 2002. However, in comparison with other EU countries, an average farm in Poland is one of the smallest. For example, the acreage of agricultural land per farm in the Czech Republic was 152.4 ha, in Slovakia 77.5 ha, in Great Britain 70.8 ha, in Denmark 59.7 ha, in Germany 55.8 ha and in France 53.9 ha. In such countries as the Czech Republic, Slovakia, Lithuania, Latvia, Estonia or Hungary before the political transformation, state-owned farms and agricultural cooperatives used agricultural land. As a result of changes in the political system, de-collectivisation processes and privatisation, new ownership structures developed in agriculture. In the Czech Republic and Slovakia large area farms were maintained to some extent, but the owners or users changed [Poczta et al. 2013]. That is why the average land resource size of a farm in these countries is bigger.

In Western European countries, the development of industry was the driving force behind the change of the farm size structure in agriculture. Its fast development created work places and was the reason for the outflow of workforce from agriculture. Tthe shrinking workforce was replaced by technical measures [Stańko 1991]. The introduction of more and more modern and expensive technical measures is generally possible in farms that are bigger in size and that is why there was a fast growth in the number of large and very large farms in those countries. The changes took place very quickly because appropriate agricultural policy supported them. It included subsidising investment in

enlargement, provision of equipment and modernisation of farms. In Poland, despite the economic development and outflow of labour force from agriculture to other sectors of the economy and the support of agricultural development[3], there are still big labour resources in agriculture. This means there is much farming fragmentation and that a big percentage of the population is living from agriculture.

Labour resources

For centuries, the size of farms in each country has determined the manpower resources located in agriculture. According to the National Agricultural Census in 2010, 4,537 thousand people were worked in Polish agriculture, including 4,495 thousand on farms owned by individual farmers and 42 thousand in holdings of legal persons and organisational units without legal personality. In comparison with the former census of 2002, the number of people working in our agriculture increased by 179 thousand people, i.e. 4% (Table 2), although the number of farms in that period decreased (Table 1). Due to that, the number of farmers – farm users and their spouses – decreased. The number of people employed on farms, i.e. permanent employees, did not change (88 thousand in 2002 and 2010). However, the number of other family members contributing labour to their family farms rose from 981 thousand in 2002 to 1,517 thousand in 2010, i.e. by 55%. It results from the situation on the labour market, namely a high level of unemployment, especially in rural areas.

Table 2. Number of people working on farms in 2002 and 2010 [thousands]

Year	Total	Farms owned by individual farmers				Farms owned by juridical persons
		users	spouses	other family members	permanent employees	
2002	4358	2165	1114	981	42	46
2010	4537	1854	1078	1517	46	42

Source: [Raport z wyników… 2011].

In 2010, the employment rate in rural areas was three times lower than in the urban areas – out of 1000 inhabitants of rural areas it accounted for 100 workers, while in the urban areas, 303 workers [Obszary wiejskie… 2013]. The situation in the labour market has been clearly reflected in both the structure of the population working only or mainly on family-owned farms as well as in the structure of the population contributing any work to farms during a year.

The census data show that the biggest group of all the people working in agriculture were farm users and their family members working only on their farm – 2,847.2 thousand (64%). People working mainly on their own farms and additionally somewhere else constituted a relatively small group – only 134.2 thousand (3%). And people working mainly outside their farms but constituted their farms' collectivity accounted for 1,468.2

[3] Historical conditions and a substantially different political and economic situation, including a lack of comparable financial possibilities of supporting the development of agriculture in Poland, created different conditions for the development of agriculture in our country in comparison with Western European countries.

thousand (33%) [Pracujący… 2012]. Thus, most people working in our fragmented agriculture work only on their farms. This translates into poor utilisation of labour resources that are located in this part of the economy.

In 2010, about 46% of farmers and their family members working on family-owned farms worked not longer than 530 hours per year. This means that almost a half of family labour force worked for less than a quarter of full-time (2,120 hours of work per year). Only about one fifth of the people working in agriculture worked full-time and more [Pracujący… 2012]. Thus, the census data clearly depict the size of excessive labour resources in our agriculture. The consequences of that situation include the inhibition of the transformation of the area structure of farms in the direction of enlarging farms and the further development of agriculture, which in the era of strengthening processes of globalisation and international trade liberalisation becomes particularly important.

Capital resources

Capital resources in agriculture are tangible and working assets used in the production processes. Tangible assets constitute farms equipped with buildings, machinery and other facilities. Working assets are materials that are processed in the course of production. The National Agricultural Censuses gather information about means of production used on farms involved in agricultural activities. The information refers to the number of basic means of transport and machines used in the production processes as well as the use of fertilizers and pesticides.

The 2002-2010 changes in the farm size structure, technical progress, economic conditions for agricultural production and the process of farm modernisation connected with the accession of Poland to the European Union, including the support for our agriculture within the Common Agricultural Policy, had impact on the amount of tangible assets that farms are equipped with.

In 2010, more than half of the farms involved in agricultural activities were equipped with tractors (53.7%). In comparison with 2002, the number of tractor rose by 9.5% (Table 3). The increase in the number of tractors was observed on small, medium sized and big farms, however, the biggest growth was noticed on the farms covering the area above 20 ha of AL (by 24.3%), especially those covering the area of 50-100 ha of AL (by 52.2%), followed by farms covering the area of up to 5 ha of AL (by 11.7%), despite a substantial decrease in the number of small farms in the period (by ca. 25%).

In the period between the two censuses, there was a considerable growth in the number of combine harvesters (by 23.6%), round balers (by 34.7%) and soil cultivation aggregates (by 82%). Soil cultivation aggregates, as multi-function machines, allow for efficient combination of agricultural operations and a reduction of vehicle mileage. On the other hand, the downward trend in the acreage of sugar beet and potato cultivation and a decrease in the number of farms growing them caused a reduction of beet and potato harvesters (by 14.2% and 1.7% respectively). At the same time, a considerable growth in the acreage of orchards caused a clear increase in the number of sprayers for orchards (by 14.0%). In addition, there was an increase in the number of field sprayers (by 5.1%), broadcast spreaders of fertilizers and lime (by 7.0%) and grapple loaders (by 16.0%). Thus, the compared data of 2002 and 2010 clearly show the increase in agricultural equipment

possessed by farms, which to a large extent reflects the effects of the EU countries' policy in the field of agriculture modernisation.

Table 3. Selected types of equipment owned by farms involved in agricultural activities in 2002 and 2010

Equipment	2002	2010	2002=100%
Tractors	1 338 720	1 466 334	109.5
Combine harvesters	123 119	152 140	123.6
Potato harvesters	81 288	79 885	98.3
Beet harvesters	32 449	27 829	85.8
Round balers	147 147	198 239	134.7
Soil cultivation aggregates	283 647	767 587	270.6
Broadcast spreaders of fertilizers and lime	537 925	575 452	107.0
Grapple loaders	208 556	241 948	116.0
Collecting trailers	95 752	96 298	100.6
Trail sprayers for fields	471 688	495 742	105.1
Trail sprayers for orchards	45 464	51 836	114.0

Source: [Środki produkcji… 2011].

In 2010, for the first time ever, the National Agricultural Census gathered information about the amount of mineral fertilizers (nitrogen, phosphates, potassium and compound fertilizers), agricultural lime and organic fertilizers of animal source. The obtained data show that 72.9% of farms used mineral fertilizers, lime and organic fertilizers. The most popular mineral fertilizers were nitrogen and compound fertilizers. Respectively, 83.0% and 53.0% of farms using fertilizers used them. Organic fertilizers were used by 64% of those farms. The share of farms using phosphorites, potassium and agricultural lime in the total number of farms using fertilizers was much lower and constituted about 12-13%.

The level of fertilizer usage in Poland in general meets the environmental requirements and is lower than the average in the EU countries [Zegar et al. 2013]. But the level of agricultural lime usage in our country is dramatically low and contributes to the rise of acidity and the growth of the share of acidic or very acidic soil in the total soil acreage. This share exceeds 50% [Krasowicz 2009], which is why half of the area requires liming. Excessive soil acidity worsens its productivity.

The census results in the field of pesticide usage show that in 2010 over half of the farms involved in agricultural activities used them (58.4%). Herbicides were commonly used. Most farms also used insecticides, fungicides and seed protection.

Farm production scale

Undoubtedly, Polish agriculture is characterized by excessively fragmented farm area structure and the structure of agricultural land in the hands of individual farm area groups, and these limits include the scale of production of individual products, i.e. the size of the production of various products produced on farms [Manteuffel 1984]. In the era of globalisation and liberalisation of international trade in food products and resources, market powers inevitably lead to increased competitiveness, which exacts an increase in farm

competitiveness. That is why it is difficult to match a fragmented structure of farms with the requirements of competitiveness, because competition exacts an increase in the scale of production [Zegar 2009].

As the census data show, with the extension of farm size and an increase in the number of large farms and a decrease in the number of small ones, the scale of production of particular products on farms is also growing. At the same time, the number of farms involved in a given production is falling, i.e. a concentration of production on a large scale on a smaller number of farms is taking place. In the case of products for which the demand remains at more or less the same level, the total scale of production, i.e. acreage of the given crop or head of the given livestock, is decreasing because larger scale production is in general more efficient.

In plant production in 2010 in comparison with 2002, there was a decrease in the total acreage of sown land by 3.1%, and an increase in an average acreage of sown land from 5.36 ha to 7.2 ha, i.e. by 1.84 ha, or by 34.3% [Uprawy rolne… 2011]. The decrease occurred in the acreage of all basic crops except seed corn, rapeseed and agrimony. The acreage of rapeseed and agrimony cultivation increased by 115% due to growing demand in the biofuel sector for seed as raw material for the production of esters – bio-components added to diesel fuel [Rosiak 2014]. There was an increase in the average acreage of all agricultural crop cultivation.

In comparison with 2002, in 2010 there was also a substantial increase in the acreage of orchards – by 38.1%, but the number of orchard farms decreased by 10.2%. As a result, the average orchard area increased from 0.86 ha to 1.31 ha, i.e. by 0.45 ha, or by 52%. The average area of fruit tree plantations increased from 0.79 ha to 1.35 ha, i.e. by 0.56 ha, or by 71% [Uprawy ogrodnicze… 2012]. The share of fruit tree plantations in the total acreage of orchards is dominating (71.3%). The rest of the area is covered in fruit shrubs (24.3%) and tree and shrub nurseries (4.4%). Their average acreage also increased.

As far as the animal production in 2010 is concerned, in comparison with 2002, the total head of cattle increased by 4.3%, which resulted from the increase in the head of beef cattle because after the accession of Poland to the EU, the price of beef cattle fit for slaughter and their production profitability rose. The head of milk cattle decreased by 7.5% in the same period. At the same time, the total number of cattle farms decreased, which resulted in a substantial increase in the average head of cattle per farm – by 43.6% [Zwierzęta gospodarskie… 2011]. Milk production during this period remained at a similar level, which is the result of increased productivity production on a larger scale.

Big fluctuation of pig production profitability in the examined period made many pig farmers give up this production or reduce its size. In consequence, the number of head of pigs fell by 18% and the average head of pigs per farm rose by 46%. The situation in poultry husbandry was similar: the total head of poultry decreased (by over 10%) with the simultaneous increase in concentration of production of particular species.

Conclusions

The development and improvement of the competitiveness of Polish agriculture are connected with the change in farm size structure. According to the results of the National Agricultural Census 2010, in comparison with the previous one of 2002, the total number of farms decreased by nearly one fourth. The biggest decrease was observed in the number of

the smallest farms while the number of large farms covering more than 50 ha of AL increased substantially. It is undoubtedly an advantageous change. However, the number of farms in our agriculture is still too big in comparison with other European Union countries, which results from a large number of small farms. For this reason, more than half of land resources belong to small and medium-sized farms. This translates into the efficiency of land, labour and capital in agriculture. It has impact on the competitiveness of our agriculture, because large and very large farms are more competitive in terms of bargaining power on the agricultural-food market. An inhibitory factor to changes in the structure of farms in our country is an excess of labour resources in the agricultural sector. In the period between censuses, the number of people working in agriculture rose, which is a consequence of the difficult situation on the labour market, especially in rural areas. Advantageous changes obtained during this period is improvement in the agricultural equipment of farms and an increase in the scale of production of each of the products produced on farms, which undoubtedly improves the competitiveness of our farms.

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Characteristics determining a market value of an agricultural real estate with use of Multiple Correspondence Analysis

Abstract. The paper consider a problem of identify a variables affecting market value of agricultural real estate. Furthermore, in the paper was discussed a problem of identify a homogenous group of agricultural real estate. The purpose of this paper is to determine the possibilities of using of the Multiple Correspondence Analysis in terms of agriculture real estate. This method has a special relevance in situations with a lack of information, large numbers of possible variables, unknown market and a limited number of transactions, as is often in the case with agricultural real estate.

Key words: agricultural real estate, Multiple Correspondence Analysis, valuation

Introduction

In real estate it is important to precisely determine their market value, i.e. the price most likely to be concluded by both buyers and sellers of a property that is available for purchase. Definition of the market value of property is regulated by Real Estate Management Act (Act of 21.08.1997) and Council of Ministers on the valuation property and preparing the appraisal (Act of 21.08.2004). It is also based on recommendation of The International Valuation Standards, European Valuation Standards and EU directives. The market value of real estate is estimated during the valuation process. Rules of valuation of properties are also regulated by Real Estate Management Act (Act of 21.08.1997) and Council of Ministers on the valuation property and preparing the appraisal (Act of 21.08.2004). There are also based on recommendation of The International Valuation Standards, European Valuation Standards and EU directives [Trojanek 2010].

The accuracy in valuation of property (including agricultural property) requires a number of conditions. There is an extensive set of technical, legal and methodological factors which should to be included in the valuation process [Bryx 2006, Dydenko 2006].

First of all, proper estate valuation is executed within local market and it is based on information and transactions from that market. It means that it is based on set of information of properties which were traded on mentioned market during the recent two years [Bryx 2006, Dydenko 2006].

Secondly, each valuation of estate is executed on the basis of the information of properties which are similar to the valued one. The similar agricultural property means, that it is comparable due to the type, shape, soil, location, legal status, method of use, and lots of other characteristics that affect its value [Kucharska–Stasiak 2006, Trojanek 2010].

Moreover, the market value of real estate is determined by a comprehensive set of physical, economic, legal, technical and social attributes (i.e. the characteristics of property). In valuation process, there is not possible (not also necessary) to use all of these

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characteristics of property. However, a prerequisite for correct valuation of real estate is the use of these characteristics that most strongly determine its market value. To carry out such a task, it is needed a large and detailed set of data on properties, which were the subject of the transaction on local real estate market. Unfortunately, in the case of farmland, on the local market there is not always sufficient numbers of transactions that can be used for valuation. Further, values of characteristics of property mostly are intangible. It also does not facilitate the valuation of real estate [Kozioł–Kaczorek 2012].

The purpose of this paper is to determine the possibilities of using of the Multiple Correspondence Analysis (MCA) in terms of agriculture real estate. The Multiple Correspondence Analysis was used to identify relevant explanatory features (i.e. variables) of market value of farmland. Moreover, it was used to identify properties which are similar.

There are several reasons justifying the choice of this method. Firstly, the MCA enables to reduce the large amount of information about objects to the most important category. Let assume that objects are agricultural real estate. In the paper, both terms are used interchangeably. Moreover, the use of MCA enables to obtain homogeneous groups of objects in terms of characteristics. It helps to determine their basic features. Proposed technique allows also to explain the structure of the relationship between the characteristics of the objects [Panek 2009].

The problems with identification of variables affecting the market value of agricultural real estate does not occur, of course, exclusively on the Polish agricultural real estate market. Appraisers in Spain are dealing with the same. Garcia T. and Grande I. presented in their paper such a problem. They also draw attention to the problem of accuracy in valuation and methodological objectivity. The solutions proposed by them is just the use of Multiple Correspondence Analysis. They applied MCA to identify explanatory variables of farmlands located in the two specific localities within the autonomous region of Navarre. One of them was Lerin, second one was Viana. The basic set of variables contained 14 different variables (such as: district, type and class of plot, crop, motive, leasing and rental agreements, soil, climate, geometry, unevenness, access, plot combinations, walls, agricultural buildings). The final set of data, after using of MCA, contained only 3 relevant explanatory variables (district, type and class of plot and crop). Their did not try to identify homogeneous groups in the analyzed set of farmlands.

In the present paper, the use of MCA is presented on the example of analysis of characteristics of agricultural real estate located in the Lublin Province. The set of data contains information about 21 farmlands located in two municipalities in this region. The time range of research data includes the second half of 2014 year.

Agricultural property and its attributes

Agricultural real estate (farmland) are properties that are or may be used for the agricultural production in the field of crop and livestock, horticultural production, orchard production and fish production [The Civil Code, Act of 23.04.1964]. The components of agricultural land involves buildings and facilities of agricultural, residential buildings forming part of farms, sowing and cultivation of crops, perennial crops, trees and shrubs on agricultural land [Dydenko 2006].

Factors determining the market value of agricultural property are divided into two groups depending on the type of agricultural real estate. One of them are features of

undeveloped agricultural land and not intended for development. This group of factors includes, inter alia, location and position, the diversity of the types of ground area (diversity of arable land), soil types, diversity of soil types, the difficulty of cultivation, suitability for the production of certain plants, the possibility of other than agricultural use [Dydenko 2006].

The second group of factors contains, inter alia, shape (geometry), access (distance to the road and quality of the road), the variety of existing buildings and condition of this buildings, possibility of installation new buildings, the occurrence of land suitability for installation, equipment in the network infrastructure, surface area. Although the set of fundamental characteristics is quite extensive, it is sometimes necessary to use a complementary set of characteristics. For agricultural land may be, inter alia, the characteristics such as: the shape of the plot, the distance from the building, the quality of the roads, the risk of soil erosion, the difficulty of the cultivation of soils [Kozioł – Kaczorek at al. 2009]. The set of characteristics of agricultural real estate is very extensive. There is also heterogeneity of the measuring values of these features. This is due to the fact that most of the features are intangible (descriptive).

Therefore, the problem is the identification of such characteristics of the real estate, which substantially determine its market value. The problem is also to determine the impact on market value of descriptive features. For this task, it is needed a large and detailed set of data on properties, which were the subject of the transaction. As mentioned earlier, the real estate market is local, so all the information should come from the local real estate market. In the case of agricultural real estate is quite confusing, as the number of transactions on the local market is often not sufficient.

Multiple Correspondence Analysis

Multiple Correspondence Analysis (MCA) is an extension of correspondence analysis (CA). It is a descriptive and exploration technique that allows studying the association between several qualitative variables. The patterns of relationships of two or more categorical variables is presented in graphical form. MCA enables to put both points representing variables and points representing objects in a same factorial reference system. Thanks to this, it is possible to detect structural relationships between variables, objects, and also variables and objects. The use of the MCA allows to reduce the large amount of information about objects (observations) to the most important category, which may be a subject to further detailed analysis. It also allows to obtain homogeneous groups of objects in terms of characteristics [Greenacre 1984, Panek 2009].

From a technical point of view, MCA is technique of analysis of crosstabulation tables which provides information on the nature of the links between its columns and rows. Its main purpose is to replicate the distance between points which represents the rows and columns of the analysed table within the space with fewer dimensions while preserving as much of the original information. So it is the method of dimension reduction. It quantifies categorical data by assigning numerical values to the objects and categories. Objects within the same category are close together. Objects in different categories are far apart. Each object is as close as possible to the category points of categories that apply to the object. In this way, the categories divide the objects into homogeneous subgroups. Variables are

considered homogeneous when they classify objects in the same categories into the same subgroups [Greenacre 1984, Panek 2009].

The analysis of homogeneity can provide a solution for several dimensions. The maximum number of dimensions equals either the number of categories minus the number of variables or the number of observations minus one. It depends whichever is smaller. A solution with a smaller number of dimensions is easier to interpret, but there is a risk to loss part of information of basic data [Greenacre 1984, Panek 2009].

The main notion of MCA is inertia which is a measure of dispersion of points in multidimensional space. It takes values from 0 to 1. If inertia is equal zero, then the points are close together. It means that there is no relationship between categories of variables. Other words, the categories of variables are not significantly different. If inertia is higher than 0.7 it means that points are not located close to each other. It means that there could be relationship between categories of variables. Other words, the categories of variables are significantly different. The total inertia is decomposed on every final dimension. If inertia of dimension is high it means that this dimension is important in interpreting final results. If inertia is low that this dimension is not important in interpreting final results and can be removed [Greenacre 1984, Panek 2009].

In the paper, the MCA was used to choose the relevant explanatory characteristics of farmland. It was also used to determine the set of properties that may be considered as similar one. The set of data contains information about 21 farmlands located in two municipalities in the Lublin Province. All properties are undeveloped agricultural real estate with an area below 1.5 ha. The original set of features (variables) included such features as: the diversity of the types of ground area (DAL), soil types (SOIL), diversity of soil types (DST), shape of plot (SHAPE), distance to the road and quality of this road (ROAD), the distance from the buildings (ACCESS), surface area (AREA), price per one hectare (PRICE). All of variables are treated as categorical variables.

The result obtained as a result of MCA are as follows. The original number of dimensions is reduced to two dimensions. Its provide an interpretation in terms of distance.

In the Table 1 are presented values of a Cronbach's alpha for all final dimensions. The Cronbach's alpha is a statistic which is generally used as a measure of internal consistency. It is considered to be a measure of scale reliability. Cronbach's alpha takes value between 0 and 1. The higher the value, the greater the reliability of the scale. It is understood that the values above 0.7 indicate the correct scale reliability. In analyzed case, values of Cronbach's alpha for both dimensions are above 0.83. It means that both dimension 1 and dimension 2 has relatively high internal consistency.

Table 1. Model summary

Dimension	Cronbach's Alpha	Inertia
1	0.861	0.506
2	0.839	0.470
Total		0.976

Source: own calculation in IBM SPSS Statistics.

In the Table 1 are also values of inertia. The total inertia (0.976) is a sum of inertia of each dimension. It is easily to see, that the loss of inertia is slight, so the loss of information from basic data is also slight. Moreover, proposed two dimension explain total inertia so there is no need to use more than two dimensions. Other words, nearly all of the variance in

the data is accounted for by the solution, 50.6% by the first dimension and 47.0% by the second dimension.

In the Table 2 and on the Figure 1 are presented discrimination measures, which can be regarded as a squared component loading. The discrimination measures were computed for each variable and for each dimension. It is the variance of the quantified variable in each dimension. The maximal value of discrimination measure is 1. It is in situation, in which the object scores fall into mutually exclusive groups and all object scores within a category are identical. Large discrimination measures correspond to a large spread among the categories of the variable and, consequently, indicate a high degree of discrimination between the categories of a variable along that dimension.

Table 2. Discrimination measures

	Dimension 1	Dimension 2	Mean
ACCES	0.132	0.275	0.204
SHAPE	0.256	0.448	0.352
PRICE	0.338	0.408	0.373
DST	0.493	0.401	0.447
AREA	0.576	0.439	0.508
ROAD	0.602	0.213	0.407
SOIL	0.758	0.725	0.742
DAL	0.894	0.848	0.871

Source: own calculation in IBM SPSS Statistics.

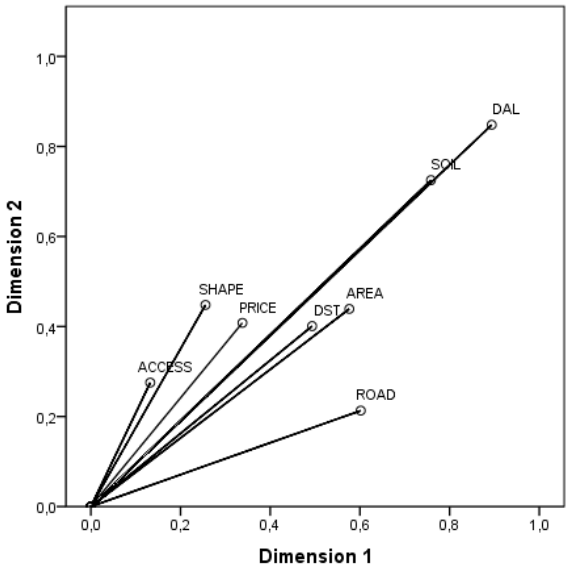

Fig. 1. Discrimination measures

Source: own calculation in IBM SPSS Statistics.

The lowest discrimination measure is for ACCESS on both dimensions. It means that, there is small dispersion of the categories of this variable and low degree of discrimination

between the categories of a variable along these dimensions. ROAD has a larger value of discrimination measure on the second dimension then on the first dimension. Thus, the categories of ROAD are spread a little further apart along the first dimension than the second dimension. The variables SHAPE, PRICE, DST and AREA have similar values of discrimination measure on second dimension, so there is similar dispersion of the categories of these variables. SOIL and DAL have large values on both dimensions, indicating discrimination in both the first and second dimensions.

On the Figure 2 are presented object scores plot labelled by object. The distance from an object (farmland) to the origin reflects variation from the average pattern of results. It means, that the pattern of results is the pattern of values of variables. This average results pattern corresponds to the most frequent category for each variable. Objects (farmlands) with many characteristics corresponding to the most frequent categories lie near the origin. In contrast, objects with unique characteristics are located far from the origin. Objects which are located nearby each other has the similar categories of characteristics. Those objects can be treated as similar and they belong to the same homogenous group.

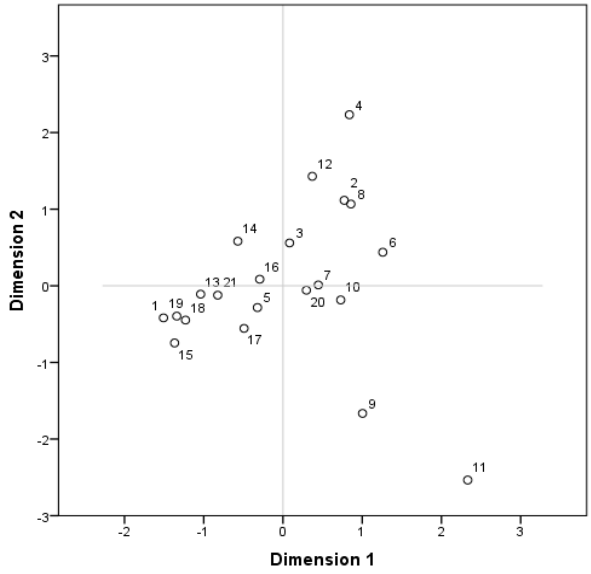

Fig. 2. Object scores plot labelled by object

Source: own calculation in IBM SPSS Statistics.

It is easily to see, that two objects (no. 9 and no.11) are outliers. Both of them lies far from origin, so they are the objects with the unique characteristics. The object no. 11 is discriminated in same way by the two dimensions. The object no. 9 is also discriminated by the two dimensions although somewhat lesser degree. Another outlier is the object no.4 which is discriminated mostly by the dimension 2.

On the other hand, there are also homogeneity groups of objects in terms of characteristics. One of such group formed, for example, objects no. 1, 18, 19, 13, 21, 15. The objects no. 7, 20, 10 formed another homogenous group.

Conclusions

The Multiple Correspondence Analysis was presented in the paper. This method has a special relevance in situations with a lack of information, unknown market and a limited number of transactions, as is often in the case with agricultural valuation. The using of MCA enable to choose relevant explanatory variables. It also allows to find homogeneous groups of analyzed objects. Moreover, MCA avoids the problem of the appraiser subjectivity with selection of real estate's features used in the valuation of the property and in establishing a set of similar properties.

In the example described shortly below were 21 farmlands located in Lublin Province. The basic set of characteristics of agricultural real estate included such characteristics as: the diversity of the types of ground area (DAL), soil types (SOIL), diversity of soil types (DST), shape of plot (SHAPE), distance to the road and quality of this road (ROAD), the distance from the buildings (ACCESS), surface area (AREA), price per one hectare (PRICE). All of variables are categorical variables.

After applying MCA it turned out that there is small dispersion of the categories of the distance from the buildings and of distance to the road and quality of this road. Middle dispersion is of the categories of diversity of soil types, shape of plot, price per hectare and surface area. The largest dispersion is of the categories of soil types and the diversity of the types of ground area. In summary, all variables are important. However, the greatest significance should be attributed to soil types and the diversity of the types of ground area. The smallest significance should be attributed to the distance from the buildings and of distance to the road and quality of this road.

The use of MCA allowed also to isolate both subsets of similar farmlands and individual significantly different farmlands.

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The developments and trends of the agricultural sector in Greece

Abstract. The purpose of this paper is to analyse the changes in the efficiency of Greek agriculture production in the period 1911-2011, and to estimate the trends that emerged, especially after the country joined the E.U. in 1981. The applied methodology uses both quantitative methods (econometric approach), as well as the social-historical interpretation of rural policy, as established in the last hundred years.
The paper is organized as follows: in the first section we review the evolutions in the accumulation of wealth and the income. In the second section we describe our methodology and data sources used in the analysis. Next, we present and discuss the results. We conclude with some proposals which stem from the analysis.

Key words: agricultural policy, subsidies policy, capital accumulation, savings behaviour, efficiency, Greece.

Introduction

In the period between 1830 and 1870 many institutions were established in Greece (introduced from Western Europe). However, the economic potential of the newly formed small state and the chronic hangovers from the long-lasting Ottoman Rule resulted in a delay in modernization. The agricultural sector, across the coastal areas, was dominated by the cultivation of raisins, which together with the cultivation of tobacco, until 1960, were the main exported products (Table 1).

Table 1. Exports (millions $)

Agricultural exports	1937	1950
Tobacco	40,0	38,0
Currants	9,0	12,0
Raisins (sultanas)	4,0	14,0
Olive oil	2,0	0,5
Olives	2,3	3,3
Total country exports	86,0	90,0

Source: Varvaresos K. [1952].

In the agricultural sector, across the coastal areas, the cultivation of raisins dominated, and raisins and tobacco were the main export products until 1960. The expansion of the country after 1920 and the inflow of refugees forced the state to apply a more systematic

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policy. In the 1920s the expropriation of Manors began and land was given to the landless. Also, the Ministry of Agriculture and the Agricultural Bank were established.

In the next decade, through an extensive program of land improvement projects, the agricultural land increased (with flood protection and drainage networks) and the irrigated areas were multiplied. The Second World War and the subsequent Civil War interrupted the effort, which continued strongly after 1950 (initially aided by the Marshall Plan).

This development seemed to be terminated in early 1980s. The accession to EU (1981) misquoted the terms of trade. Due to the Common Agricultural Policy (CAP), tariffs to third countries were increased while trade exchanges among member states were expanded which resulted in a negative[4] balance of trade in regard to agricultural produce. The Community subsidies were channeled mainly to maintain a rather problematic model, i.e. they were geared to consumption increase rather than to structural changes. This policy, with slight variations, has been maintained until today.

The evolutions in the accumulation of wealth and income

The effort for the industrialization of the country led to a rapid decline of the agricultural sector and its importance. As shown in Table 1 while the agricultural produce in 1950 was 28% of total GDP, sixty years later (2010) the contribution is rather insignificant, amounting to about 3%.

The progress of industrialization seems to have failed, because after the country's accession to the EU, the tariff abolition and the gradual rise in wages (and salaries) shrank the manufacturing sector. It is the large size of the construction sector that maintains the declining percentage at these moderate levels.

Table 2. Structure of Gross Domestic Product (GDP) by sectors (%)

Sectors	1950	1960	1970	1980	1990	2000	2010
Primary	27,8	23,1	18,2	14,9	11,0	6,6	3,3
Secondary	20,1	25,9	31,4	32,4	30,4	21,0	17,9
Tertiary	52,1	51,0	50,4	53,1	58,6	72,4	78,8
GDP	100,0	100,0	100,0	100,0	100,0	100,0	100,0

Source: Papailias [2014].

Table 3 shows the contribution of the agricultural sector to the economic growth in the period 1950-1995. It is obvious that the role of the rural sector in the whole economy is diminishing as regards its contribution to capital accumulation, its increasing inability to cover the deficit in the balance of trade, and in general its declining contribution to the national income.

The decline of the Greek agricultural sector continues in the 21st century. Greece in 2007 presented, on the base 2000=100, the worst development in Europe, with the exception of Italy (Table 4). The causes behind these developments derive from a combination of political, economic and geographical constraints.

[4] CAP protected more effectively the "north" products, i.e. livestock, compared with the "south" products of plant origin ((i.e. vegetable, olive, fruit).

Table 3. Contribution of the agricultural sector to the growth rates of variables that characterized the growth of the postwar period (averages)

Contribution of agricultural variables to variable rates of change of corresponding variables of the national economy	Pre-accession period			Post-accession period	
	1950-1960	1960-1970	1970-1980	1980-1990	1990-1994
1. Capital accumulation	12,1%	13,6%	9,5%	1,9%	5,4%
2. Creation of product (GDP)	27,1%	21,4%	15,1%	13,4%	12,7%
3. Value of imports	20,2%	14,5%	10,0%	12,5%	21,6%
4. Value of exports	66,9%	55,2%	30,2%	28,2%	20,7%
5. Available goods	47,0%	34,2%	24,2%	27,9%	23,6%
6. Import penetration	24,7%	26,1%	28,1%	34,2%	45,9%
7. Labor supply	51,3%	46,9%	34,0%	26,0%	22,0%
8. Performed national income	32,8%	23,0%	18,1%	17,4%	15,9%

Source: Sapounas [1991].

Firstly, Greece is fundamentally different from almost all countries of Europe (Eastern and Western), but also from other Mediterranean countries (Spain, Italy, the Balkans). It combines the most geographical handicaps when compared to other countries. The many high mountains, the great number of islands and the large semi-arid areas result in many negative economies.

Table 4. Evolution of agricultural income

Change in real agricultural income per worker in 2007			
	Indicators 2007 (2000=100)		Indicators 2007 (2000=100)
EU 27	115,9	Slovenia	147,3
Lithuania	250,2	France	105,6
Esthonia	285,2	United Kingdom	133,4
Czech Republic	186,2	Holland	99,3
Sweden	123,1	Denmark	107,5
Finland	114,7	Belgium	89,5
Luxemburg	104,9	*Greece*	83,1
Poland	213,2	Cyprus	100,3
Germany	132,9	Hungary	144,8
Spain	105,3	Malta	103,8
Latvia	308,8	Italy	81,8
Ireland	89,9	Portugal	118,9
Slovakia	161,5	Bulgaria	95,4
Austria	129,7	Romania	123,5

Source: Bank of Piraeus [2008].

In the first hundred years (1828-1923) the pursuit to resolve the national question was absorbing all the efforts. With the exception of other Balkan countries, in Greece, the

starting point for reconstruction was much lower in relation with other European countries. Due to the Ottoman Rule, structures were more retrogressive than those of the West and North. At the time, in these areas of Europe, industrial capitalism and bourgeois democracy prevailed. Therefore, the elite, which had western manners and perception, after the seizure of power in Greece gave more importance to trade, crafts and industry and less to the rural sector. In 1880 the western spirit and the institutions (laws, etc.) dominated, but the potential of the small country was limited.

The "take off", in the meaning that the prerequisites existed, took place after 1923. The country had doubled and acquired fertile areas, while the cheap labor force (recruited mainly from refugees) and the rapid landing at the existing social and economic situation, which coincides with the completion of national integration, triggered off a fuse towards economic growth.

The major production projects (land reclamation) in the plains of Macedonia gave a great impulse to economic growth. [Stefanidis 1948]. Gradually the double developmental squeeze model began to be implemented. The State through the establishment of the Agricultural Bank, which in fact constituted an agricultural fund, managed to penetrate all small communities. The establishment of a huge number of cooperatives, most of which functioned as carriers of state loans, gave the state further opportunities to intervene even in the most remote village. Soon lending from other banks to farmers was banned and the state subsidized the interest rates of the Agricultural Bank in order to safeguard this policy.

Furthermore, particularly after World War II, the Bank traded seeds, pesticides, and offered strong incentives for the purchase of machinery (especially tractors).

In this way after 1950 a more intensive capital accumulation began.

According to one of the few measurements that have been made on the subject [Momferatos 1954], in 1938 agriculture accounted for 3% of total fixed capital, while in 1952 the percentage was 4.7 %. Excluding the housing sector from these measurements the percentages are 10.2% and 15.1% respectively.

According to our measurements, in 1911 the fixed capital of public investment and private investment amounted to 4.5 million drachmas at constant 1970 prices. In 1923, despite the growth of the country it remained at 5.3 million drachmas, but in 1940 it increased by 3.5 times (18.5 million drachmas).

In the 1950s, the fixed capital was slightly higher than that registered in the 1940s, but in the 1980s it exceeded 100 million drachmas in 1970 prices. During the nineties it fluctuated at about the same levels while in 2000s it was estimated slightly higher (Table 5).

It can be concluded that the accumulation of capital had been brought to completion by 1980. This is not a random fact. Taking into consideration the size of the average holding (3 hectares or 30 'stremmas', consisting of numerous parcels) it was expected that the evolution had ended. In 1950 there were five thousand tractors while in 1983 there were over 280 thousand. It is difficult to find anywhere else such a spectacular case of mechanization. This rapid capital accumulation, the increase in the use of fertilizers and use of improved seeds had as a result an increase in the volume of production by seven times in the period 1950-1980. However, the income of farmers increased only by three times in this period. This is due to the fact that, because of the deterioration of the internal terms of trade (Model *Mill-Marshall*), the prices of agricultural products increased slowly compared with those of the urban sector.

Table 5. Evolution of main variables (1911-1970)

YEARS	Fix capital	Plant	Livestock	Stock	Land	Labor	Income
	In '000 drachmas (at 1970 prices)				'000 acres	'000	'000 drachmas (at 1970 prices)
1	*2*	*3*	*4*	*5=2+3+4*	*6*	*7*	*8*
1911	4500	20493	6225	31218	9913	850	9985
1923	5479	28438	12200	46117	14490	1686	11273
1930	9067	31307	15806	56180	19823	1723	9935
1940	18528	49654	16845	85027	27380	1949	17013
1950	19288	47982	14490	81760	27253	1892	20683
1960	28713	76035	19413	124161	35630	2039	29863
1970	61774	90116	16562	168452	34463	1658	47058

Source: own calculations.

The increasing competition forced farmers to modernize, but the control of prices by the Ministry of Commerce (i.e. double developmental squeeze) resulted in the agricultural income rising at a slower pace than the volume of production [Papailias 2014].

This policy had as a consequence the depopulation of rural areas and subsequent migration to urban areas or abroad (mainly to Germany, Australia, USA).

From other evidence, we can note significant stagnation in livestock capital. It increased slowly until the 1960s and then began to decline. It is unlikely – it would be almost a miracle – that livestock will rise again in the following period. Therefore, the country will show a permanent deficit in animal products.

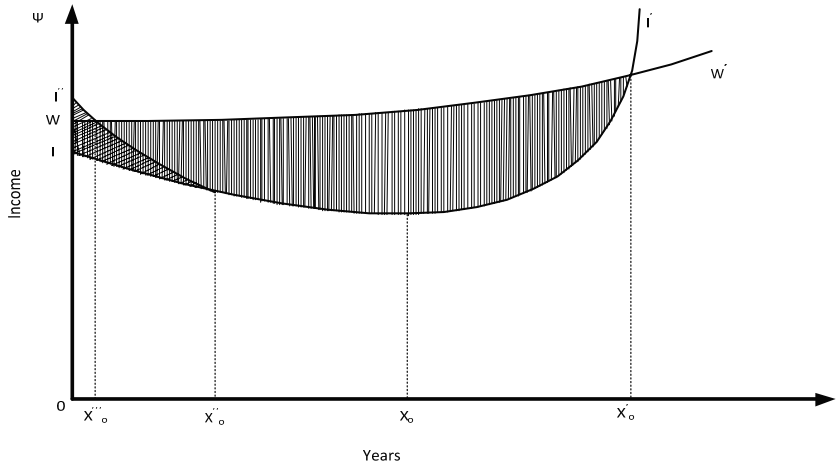

Fig. 1. The evolution of agricultural income and the subsistence minimum

Source: Papailias T. [2014].

Conversely, plantations are on the rise. The increase in olive tree plantations allows us to forecast that soon the country will be the second biggest olive oil producer following Spain. However, harvesting problems due to extensive migration, together with marketing

inefficiency to penetrate new markets put limitations that aggravate the situation. The size of arable land reached the upper limits (35 million "stremmas"). Nevertheless, irrigation problems exist, with irrigated land already covering 40%.

The labour force decreases steadily. In 2010 it reached 510 thousand people. Immigrants and mechanization cover the labour shortage.

It has been estimated that, due to family farming – dominated by small holdings – the rural income ranged at subsistence minimum. The Mill-Marshal model (development of the urban sector through internal deterioration of terms of trade) worked in the country as shown in the following figure. The curve I I' reflects the level of farming income, while the curve W'W' shows the level of subsistence minimum in rural areas.

Firstly – during the period 1923-1935 – the agricultural produce was higher than the subsistence minimum (axis point before X_0''''). Between X_0'''' and X'_0, the appropriation surplus resulted in the maintenance of incomes below the socially tolerable living standards (period 1959-1977). After 1977 (pro-accession period in E.U.), the prices of agricultural products increased. Simultaneously, a large portion of the population had migrated, which led to the rise of household income. However, the pressure for modernization during those years led to substantial growth in the accumulation of capital.

Methodology and results

In this section of the paper we will try to estimate the linear and logarithmic form of functions using statistical data and implementing statistical package *stata*. Specifically we will try to correlate agricultural incomes with each one of the following variables: soil, labour, capital assets, livestock, and plantations. Subsequently, in each independent variable we add the next one.

Table 6. Linear function

Source	SS	df	MS	Number of obs = 74
				F(5, 68) = 812.24
Model	2.6381e+10	5	5.2762e+09	Prob > F = 0.0000
Residual	441716199	68	6495826.45	R-squared = 0.9835
				Adj R-squared = 0.9823
Total	2.6823e+10	73	367432133	Root MSE = 2548.7

Income	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Fixed capital	.0967826	.0453635	2.13	0.036	.0062612	.187304

Source: own calculations.

From 79 observations (1911-1990) five (5) were removed since they were related to the period of the German occupation, during which production had collapsed. The coefficient of multiple determination is very high approaching the unit. The student's "t" is relatively high for two variables: land and livestock.

When the 1950s decade is removed we have 69 observations and the estimated function appears as the better. In this estimation the coefficient of multiple determination is approaching 99%, and "t" for the "fixed capital" and "plantations" increased and for

"livestock", "cultivated land" and "labor" decreased. The value of Durbin-Watson is satisfactory.

Table 7. Regression analysis

Source	SS	df	MS	Number of obs = 69
Model	2.5172e+10	5	5.0344e+09	F(5, 63) = 964.60
Residual	328806880	63	5219156.83	Prob > F = 0.0000
Total	2.5501e+10	68	375013567	R-squared = 0.9871
				Adj R-squared = 0.9861
				Root MSE = 2284.5

Income	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fix_capital	.1334456	.0433918	3.08	0.003	.046734	.2201571
plant	.4464176	.0693928	6.43	0.000	.307747	.5850881
livestock	.0343061	.2417579	0.14	0.888	-.448809	.5174207
land	.1119732	.1904139	0.59	0.559	-.268539	.4924851
labor	-5.771168	3.132408	-1.84	0.070	-12.03079	.4884494
_cons	4070.37	2890.836	1.40	0.164	-1706.504	9847.245

Durbin-Watson d-statistic (6, 69) = 1.362628

Source: own calculations.

Similar calculations were made after the segmentation of the period 1911-1990. We have distinguished three sub-periods. The first covered the years 1923 to 1940, the second the years 1950-1980, and the third the years 1977-1990.

The period segmentation was based on the following criteria: the first period covers the years of efforts to create a specific rural policy, which was interrupted by the war. The second one involves the post-war period up to accession to the EU, while the third period covers the negotiations for EU accession until 1990. For the estimation of the regressions on the basis of variable logarithms we followed the same procedure. We arrived at the following result:

Y = -21.47778 + 0.0527282 lnK + 0.9135719 lnPlant +0.011323 lnlivestock -0.3532739 lnland + 0.1071219 lnlabor

$R^2 = 0.9623$

Durbin-Watson = 1.352631

The criterion Cochrane-Orcutt AR(1)

Conclusion

The momentum developed in the Greek territory in the period 1923-1940 seemed to pay off in the years 1950-1980. The accumulation of capital was impressive, as well as the number of plantations. In contrast, livestock decreased due to geographical constraints and the abandonment of rural areas. Cropland has reached it's highest levels and therefore further exploitation of land seems to be impossible.

The continuous decline in population rates was overcome to some extent by immigrants and the intensive use of machinery. The survival of the majority of farmers is achieved due to non-agricultural income and subsidies from the EU. The discontinuation of

subsidies is expected to aggravate the situation. Considering the above-mentioned reasons and the existing technology we conclude that it is difficult to increase the income.

During the same period, crop restructuring was partially achieved, but the results are mediocre. It seems that it is difficult to realize a further accumulation of capital. By the end of 2005, production grew slightly due to the growth of plantations and land improvements. However, it is estimated that such reserves are missing now from the Greek agricultural sector. Because of international competition the probability of price increases is very low. The same applies to community protectionist measures.

Consequently, the Greek rural economy remains trapped in crisis and for the majority of farmers income will continue to move down. A further restructuring of crops and the successful marketing of products would be a solution.

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Research on the social and economic differentiations in the Greek rural sector during the period 1830-2030

Abstract. In 1830 farmers constituted the majority of the Greek population. Part of these was small landowners or small livestock farmers, while the largest part of them was landless. The large farms were few. In the 1920s the entrance of 1.5 million refugees from Asia Minor and the departure of 600 thousands Muslims (with the exchange of populations) had as a result the dissolution of the manors, which were in the hands of the Turks. In the year 1950 due to the German occupation (1941-1944) and civil war (1946-1949) the agriculture returned in the level of the 1930s. In 2000, almost twenty years from the Greece's accession to the EU (in 1981), the massive subsidies and the clear agricultural policy, led to disruption of productivity of rural sector.
The estimates for 2030 are formulated both from the changes that have occurred over time and from the consequences of the accession of Greece in the support mechanism (2010), after the silent bankruptcy of the country. The purpose of this paper is to reflect the changes in the social structure of agriculture from independence (1830) until today and to make estimations for 2030. The Greek case differs from that of European countries, as it has not developed the institution of manor and similar as extensive feudal relations. It also differs from the countries of the Balkans as it maintained the institution of the small private property.
The methodology of this study uses the historical approach and is based on evaluation of secondary sources, but also in primary research by the author for the economic efficiency of agriculture. It uses also comparative analysis interpreting the social relations that existed in Greece and in the rest of the Balkans.
The paper is structured in four parts. The first refers to the history of the research objective. In the second and the third, economic and social differentiations are presented. In the fourth the above findings are evaluated.

Key words: Social structure, manor, individual exploitation, supplementary incomes, Greece

Introduction

Generally speaking, the behavior and beliefs of farmers who own land is more conservative compared to the beliefs of farmers who do not own a piece of land. This behavior seems reasonable. It is a common practice that radical changes are sought by people who do not own land. Property, basically, contrasts with radicalism.

In the late Middle Ages, Jackerie in France, the rebellion of Tyler in England and the War of villagers (Bauernkrieg) in Germany derived from complex reasons. In the first two cases, the causes related with the plague, the transition from feudalism to the small ownership and generally in the long term economic and social depression of the feudal system. These two reasons, likewise the teachings of Luther, explain part of the rebellion in Germany.

In France, despite the constant disapproval towards the ancient regime, significant proportion of farmers (as in the Vendée) will move towards the side of the ancient regime.

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After the 19th century, the shift to the conservative policy was all over Europe, elsewhere less pronounced elsewhere obvious.

The independence of a small part of the Greek provinces and the violent and abrupt removal of the Turks created significantly a mass of small farmers. The first governor (Kapodistrias 1828-1831) and the subsequent (Bavarian regency, King Otto 1832-1862) held on behalf of the state the land of Turks.

The causes were: first to generate revenue (for a long time was an important part of public revenues), and second because they did not want to create a class of landowners (with the inevitable social consequences). The trend that prevailed was that of the bourgeois establishment of the state.

In 1871, when the government distributed the "national land" to small farmers strengthened the model of family based exploitation of the farm land. After the Balkan wars and the First World, the size of the land which belonged to Greece was doubled. The new regions, however, were dominated by the manor. The entry of 1.5 million refugees (1923) reinforced the decision of the State to dissolve the manors and so Greece was the country of smallholders.

Economic differentiations

In the period 1830-1930, the proportion of the rural population was decreased[2] (Table 1). Especially, based on the criterion of employment in the early 20th century, the percentage of the farmers to the total employment dropped to 50% (Table 2).

For instance, the distribution of population by residence is mentioned. Between 1830 and 1860 approximately 85% of the population were farmers.

Table 1. Distribution of population by residence

Years	Rural	Suburban	Urban
1879	72%	10%	18%
1908	67%	9%	24%

Source: Population census.

The rural income grew slowly, although not in a uniform manner in all regions. In coastal areas of the Peloponnese, due to the cultivation of raisins, the rise was faster than that in the rest of the country. Throughout most of the period 1850-1910, even though there was protectionism in crafts and industry, the agriculture tariff protection was not tense [Vergopoulos 1975; Mouzelis 1977].

Table 2. Distribution of working population (%)

Sector	1861	1870	1907
Primary	62,6%	62,2%	50,1%
Secondary	18,3%	18,1%	24,2%
Tertiary	19,1%	19,7%	26,6%

Source: Tsoukalas (1977), p. 182.

[2] For instance, the distribution of population by residence is mentioned. Between 1830 and 1860 approximately 85% of the population were farmers.

The small farm holders, after the reforms of 1871 and 1923, have prevailed fully. The typical Greek rural field had less than 30 acres (3 hectares) farm, which employed the leader of the family and members (spouse and children). The worst was the parcelisation of land into small units. Usually, thirty acres accounted for 5-7 parcels.

Cultures remained traditional: wheat, which was not sufficient for domestic consumption, raisins and tobacco, most of which was being exported and livestock (goats and sheep, chickens and pigs). The gradual rise in the standard of living, therefore the rise in demand, made almost all livestock products (beef meat, milk and working animals) deficient and non self-sustaining country.

Table 3. Net Profit/(Loss) by region 1950-2000

In 000' $	Decades					
Region	1950	1960	1970	1980	1990	2000
Attiki	-16,29	5,55	41,53	43,94	119,49	-124,09
Central Greece	98,63	2,92	42,88	101,14	-29,67	-44,17
Peloponnissos	8,10	-17,00	18,38	-143,88	-152,38	-251,88
Western Greece	50,37	-3,20	2,56	-157,99	-203,49	-237,73
Ionian Islands	-23,28	-14,10	-8,37	-134,56	-162,45	-88,62
Ipiros	-8,57	-21,59	-14,60	-115,56	-282,04	-159,13
Thessalia	24,70	-12,95	27,63	-96,11	121,67	-146,12
Western Macedonia	80,54	3,66	7,74	-67,68	-152,32	65,75
Central Macedonia	-41,75	-48,53	51,34	-85,38	-247,15	-309,55
Eastern Macedonia	-21,93	-40,40	-20,47	-259,61	-292,46	-162,41
South Egeo	5,43	-0,88	6,16	-52,67	-55,30	45,01
Northen Egeo	16,27	-3,46	1,55	-90,64	-96,78	-11,16
Kriti	13,43	-24,03	-9,71	-216,27	164,06	-187,43
Total Country	181,63	-174,02	146,63	-1.275,27	-1.268,84	-1.611,52

Source: Papailias [2014].

In the period after 1950, the extensive program of land improvement projects undertaken by the State and the increased lending by the Agricultural Bank of Greece to farmers for the fixed assets and use of improved seeds, fertilizers and pesticides increased the production of agriculture. However, due to the dual developmental squeeze, the surplus was transferred to the urban sector, and the indebtedness of farmers was increased. After canceling the debts (haircut) by the dictatorship in 1968, the situation seemed stabilized and partially inhibited the rate of internal migration. During the period after the fall of dictatorship (1974), the prices of agricultural products rose. However, it was for the subsidies from the EEC Agricultural Fund after accession, which increased the income of farmers.

In order to assess the impact of family model farm agriculture, the gains and losses in the half-century 1950-2000 were estimated [Papailias 2014]. Table 3 shows that, with few exceptions, in all regions of the country farmers suffer losses. The result was between 1951-1971 1.6 million farmers or 1 in 3 to migrate either to the cities or abroad. Between 1971-1981, 1 person in 5 gave up agriculture (Table 4).

Table 4. The number of farmers and agricultural area in Greece

Years	Farmers (thousand)	Agricultural land (thousand acres)
1950	1.860	27.253
1960	1.960	35.630
1970	1.330	34.463
1980	1.108	34.917
1990	889	35.100
2000	630	35.200
2010	510	34.900
2020*	450	34.300

Source: Papailias [2014].
* estimations

Specifically:
The number of farmers was estimated per region during the fifty years, from 1950 to 2000. Also, on the basis of the Agricultural Bank the average wage has been estimated. The latter varied between seasons and between regions (due to the morphology of the country). Based on the assumption that the days of employment in agriculture are 250 (compared to 300 in the urban areas), the annual labor cost per region has been calculated. Adding interest[3] (source was the Agricultural Bank of Greece) and calculating the depreciation[4] estimated the total cost of production. Subtracting the costs (labor + interest + depreciation) of the net value of production (which had removed intermediate inputs[5]) resulted gains[6] or losses[7].

Table 5. Agricultural transactions in 2011

Product category	Total value of transactions millions €	Transaction with EU millions €	Transaction except EU millions €
Exports			
Total agricultural product	3.979,5	2.621,0	1.358,5
% of the total exports	17,5%	23,1%	12,0%
Imports			
Total agricultural product	5.966,8	4.762,5	1.204,3
% of the total imports	13,7%	21,0%	5,8%
Trade balance			
Total agricultural product	- 1.987,3	- 2.141,5	154,2

Source: PASEGES,July 2012, p.11.

It seems that the current rural development remains problematic. The outcome is that the balance of trade in agricultural products remains negative (Table 5).

[3] Interest is allocated by region depending on the amount of loans
[4] For capital formed by public investment depreciation rates ranged between 2-4%, while that of private investment between 3-10% (Papailias, 1992)
[5] They involved expenses for seed, fertilizer, pesticides, fuel, etc
[6] The collection of data and the analysis lasted more than 2 years. See also Papailias (2014)
[7] For better comparability data were evaluated both in drachmas and US dollars

Social differentiations

Social conditions that were formed in the period after the independence war showed that the pressure to acquire land lasted and had as a consequence the distribution of "national" land distribution in 1871 in small shares, mostly to small property farmers.

In the period 1828-1870 seemed to create a dynamic embedding of the model[8] of family farm land to such an extent that the manors did not match to the philosophy of both farmers and a large section of the bourgeoisie. The fact that the manors survived until the reform of 1917, is partly due to the influence the big capital had on the political system (political patronage in political parties) and partly to the small weight that had crofters (workers in the farms who did not owned the land) of Thessaly throughout the rural areas.

Moreover, for a time period, it was claimed that the concentration of land (see the American model), in order to produce grain, would increase the volume, helping to achieve self-sufficiency (solving the food problem), pursued by the country. This did not happen, and this is why the low profits which were received in the long term by the landowners - through land rent - imposed a pressure upon them to seek the land redistribution rather than remaining in agricultural sector. The lack of resources – in a state that had gone bankrupt (1893) – was the main reason for the non-expropriation of manors during the early 20th century.

In the world of the 19th century, who constantly put high priority on the release of the other Greeks, the agrarian question was always secondary in the first fifty years 1830-1880. Therefore, the structure of the cultivation, the low educational level, the fatalism that had prevailed did not allow the creation of a mass peasant movement or agricultural party. This lack of cooperation, in the sense that not even the farmers were able to overcome their own benefit, in conjunction to the fact that there was none help from the outside (some leadership), resulted in the stagnation or the low intensity, or the harmless protest of farmers to the existed political system and ultimately to the non creation of a mass peasant movement. So the slogan - albeit implicit - appeared to be: each for himself.

After 1922 and the entry of refugees, coordinated movements were created [Sakellaropoulos 2006], but any peasant parties remained on the sidelines. Now industrialization, or more precisely the goal of industrialization was seen as a panacea, and any innovations were focused on the guidance of the emerging working class.

Further, as demonstrated by the reform of 1922, it was considered that only large partisan formations (i.e. parties that actually put in the margin the rural world, as the Liberals, the Folk etc) could solve the issues. The major production projects of Macedonia (with high costs) made this fact understandable and digestible. Therefore any voices in favor of the peasant movement declined significantly ahead of the wider objective.

After 1950 the situation that had developed before the war, continued. After a brutal civil war (1946-1949) was unthinkable activity against the purpose of a class, they identified primarily to the rise of commerce, industry and construction (industrial dogmatism). The dual development Crushing removed vast masses of the rural world, after most target, every single government, defined industrialization.

Rural areas therefore inevitably cleared by the young and dynamic executives (Table 6). Two million farmers in 1950 remained around 500,000 in 2010. Shrinkage would be much wider, if not been for two facts essential.

[8] With the meaning of Kuhn [1962].

Table 6. Age structure of farmers in EEC-12 (% of total)

Country members	Less than 35 years	From 35 to 44 years	From 45 to 54 years	From 55 to 64 years	65 years and more
Germany	14,8	20,5	34,9	23,3	6,5
France	10,0	14,5	28,8	31,7	15,0
Italy	7,5	13,4	25,2	26,9	27,0
Netherlands	10,7	21,6	29,0	27,0	11,7
Belgium	11,6	17,2	30,2	29,8	11,2
Luxemburg	11,2	15,2	28,8	24,5	20,4
United Kingdom	8,1	18,9	25,6	27,0	20,4
Ireland	6,5	17,9	25,7	27,3	2,7
Denmark	9,7	19,0	25,0	27,0	19,2
Greece	*5,5*	*15,0*	*26,1*	*25,5*	*27,9*
Portugal	8,7	16,4	25,5	24,8	24,6
Spain	0,8	-	46,1	27,4	25,7

Source: Athanasiou [1994], p. 18.

Ideologically, between 1828 and 1922, farmers moved in conservative bastions - determinant role played as specify small property. The events of the interwar period showed a slight mobility in the rural world. However, if the period 1828-1922 national targets sidesteps any rural claims, in the interwar sharp contrast, political and state, manifested by attitudes, coups and dictatorships, guardianship any agrarian radicalism.

It is essential to note that the number of agricultural workers and bystanders peasant allotments were insignificant. The dominance of small property, thus, compromising any action while the unsettled political unrest aimed at urban modernization, did not allow broad peasant movement.

After the war, every action of farmers was considered by the ruling classes as unthinkable. The political, the social institutions and organizations threw a secondary agricultural issue (primary labor). This long inability to create goals or methods of viewing requests resulted throughout the session Greek state, not presented a coherent rural party or movement with all the attendant[9].

In the future (after 2010) are obviously no longer a prerequisite for such policy or social action by farmers. Half of them and most are age over 45 years. Therefore, in fifteen to twenty years or rural mass will shrink to less than 6% of the active population. The country from the late Middle Ages, Ottoman formula will be found with a jump in postindustrial society.

Conclusions

The agricultural sector in Greece, in contrast to the rest of Europe (East and West) based on the model of individual farm land and small property. These trends are reinforced

[9] A related, in some way, exception was the KKE. The peasant parties except the party of radicals shortly incorporated in the power of the urban field

by the distribution of land in 1871 and 1923. Consequence was by double development squeeze to transfer the economic surplus from agriculture to the urban sector. Throughout the period the average farmer survived thanks to non-agricultural income, such as tourism, shipping, work in the city etc [Papailias, Papageorgiou, Panagos 2007].

The migration that followed drove the majority of farmers. While in 1960 there were 2 million farmers in 2010 amounted to 510,000 in 2030 and estimated that it would reduce their number to 330 000 people (not because of immigration this time, but since I stayed at the elderly).

Social prevailed individualistic organization and despite the number of cooperatives created not developed in the country valued peasant movement. The peasant parties were almost insignificant and absorbed by the urban or labor.

The farmer throughout the period remained attached to to tradition and had conservative political views. The entrance to the EU resulted in large input financial subsidies. But these subsidies were not used as investments funds but were consumed. As a consequence after the reduction of the EU subsidies the rural income was narrowed down (given that the structure of cultivation has slightly changed).

The continuing decrease of the rural population, will lead Greece to a convergence with the rest of Europe. According to our estimations, the eventual concentration of land will be accelerated. If there was not a wave of migrants (mainly from Albania, Bulgaria, Pakistan) the rural depopulation would be significantly greater. Therefore, part of the land continues to be cultivated mainly by the contribution, via the employment, of immigrants. Additionally, there is a small part of land cultivation carried out by people who work in the urban sector and supplementary work to the field. However, it does not seem easy for the American model (with very large farms) to prevail in Greece due to geographical restrictions.

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Changes in the EU and global milk and dairy products market in view of multilateral trade liberalisation[2]

Abstract. The aim of this article is to present the situation of the milk and dairy products market in the EU countries and in the countries which are the world's major milk producers in view of changes caused by the potential liberalisation of the global milk trade. The volume of trade in milk and dairy products, as well as production, demand and prices paid by consumers were analysed. The study uses the general equilibrium model of the Global Trade Analysis Project (GTAP). Projections were made according to the propositions included in the modalities negotiated at the World Trade Organisation forum in December 2008. It was proved that the progressing liberalisation of foreign trade may increase the competitive pressure both on regional markets and on the global market. In consequence, the dairy producers and processors from the EU countries may lose part of the market to the suppliers from the countries with lower costs of production. Such countries as New Zealand, the USA, Brazil and China may benefit from the liberalization.

Key words: milk and dairy products, export, import, production, demand, prices, trade liberalisation

Introduction

Milk production is one of major areas in animal production both in the EU and all over the world. In recent decades the global milk market has undergone considerable changes. Between 1961 and 2012 the global milk production doubled, reaching the amount of nearly 754.0 million tonnes. The value of export of dairy products grew from almost 1.6 billion dollars in 1961 to 76.7 billion dollars in 2011 and the consumption increased from 75.3 kg per head in 1961 to 87.3 kg per head in 2009. There were also significant transformations observed in this sector of the market in the EU countries. Over more than 60 years the volume of milk production increased by nearly 30% in the EU countries, reaching the amount of 155.9 million tonnes and making about 20% of the global production. The value of income from the export of dairy products increased almost 57 times, exceeding the amount of 51.9 billion dollars in 2011 and giving the EU a share of more than 67% in the global export. The consumption also increased by about 33% and it reached 239.0 kg per head in 2009, which was almost 2.5 times more than the average global consumption of this group of products [FAOSTAT 2014].

These changes were caused by numerous factors, including demographic changes and more rapid economic growth in the developing countries of Asia and South America, which resulted in consumers' increased purchasing power and pursuit of improvement in the quality of nutrition. Other factors included liberalisation of the capital flow and facilitation of transfer of technologies to the countries with lower costs of production, as well as the

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development of information and telecommunication technologies and modern forms of trade, facilitating the exchange of agri-food products [Baer-Nawrocka et al. 2012]. Changes in the agricultural and trade policies leading to gradual limitation of protectionism in milk and dairy products trade are also one of major determinants of transformations on the regional and global milk markets. The production and export potential and the degree of import penetration of the dairy sector in the EU countries develop according to the limitations set by the amount of milk quotas. Apart from that, they also depend on the degree of demand and the prices of dairy products on the EU and global markets. In the nearest years the volume of production, trade turnover, demand and prices of dairy products may be significantly affected by the abolition of the quota system in milk production in the EU in 2015[3] and by the progressing processes of liberalisation of the global agricultural trade. Therefore, the aim of this article is to present the situation of the milk and dairy products market in the EU countries and in the countries which are the world's major milk producers in view of changes caused by the potential liberalisation of the global milk trade.

Research method

The study uses the general equilibrium model of the Global Trade Analysis Project (GTAP). On the one hand, the GTAP general equilibrium model is based on specially adapted Leontief's inter-branch flow (input-output) matrix, and on the other hand, it is based on the assumptions of Walrasian equilibrium[4]. From the mathematical point of view it is a collection of equations describing the behaviour of economic entities, i.e. producers, consumers and governments of individual countries/regions of the world, on the domestic markets of production factors and on the domestic and international markets of final goods. On each market the demand and supply are balanced by the price, which is referred to as the market clearing price – the equilibrium price[5].

The use of the model to forecast the consequences of changes in the agricultural and trade policies consists in building scenarios of simulated disturbances in the economic policy and in determining the influence of selected variables on the level of economic welfare and the sphere of production, consumption and trade on the global, regional or sectorial scale. Depending whether the study is supposed to identify the short-term or long-term consequences of changes in the economic policy it is important to make an appropriate closure of the model. A standard short-term closure is a classic closure, which is characterised by full employment, flexible prices and exogenous supply of production factors.

Projections of the consequences of multilateral liberalisation of the global dairy trade were made according to the propositions included in the modalities negotiated at the WTO forum in December 2008. They assumed a band formula of reduction of customs tariffs[6].

[3] For the consequences of the abolition of milk quotas for milk producers in Poland see Baer-Nawrocka & Kiryluk-Dryjska [2010A] and Szajner [2012], for the EU countries see Baer-Nawrocka & Kiryluk-Dryjska [2010B] and Guba & Dąbrowski [2012].

[4] For more information on the essence of the general equilibrium model see Shoven & Whalley [1984], Robinson & Roland-Holst [1988], Robinson [1989, 1991], Bergman [1990], Devarajan & Go [1998]; for more information about the GTAP model see Pawlak [2013].

[5] Cf. Berck & Dabalen [1995].

[6] The reductions apply to the tariffs of the Most Favoured Nation (MFN) clause.

According to the formula, depending on the amount all tariffs will be divided into four reduction bands and a different reduction coefficient will be applied to each of the bands – the higher the customs tariff, the higher the coefficient[7]. Apart from that, it was agreed that export would not be subsidised [8].

The current GTAP database (The GTAP 8 Data Base) includes 129 countries/regions of the world and 57 sectors (groups of products or products) of national economies. In order to achieve the aim of the research the standard aggregation of the model database was modified and adapted to the needs of the research. 33 individual countries were identified in a regional arrangement, i.e. the EU countries and the world's greatest milk producers, and a group of the other countries of the world. The aggregation of the agri-food sector was modified, placing milk and dairy products among the most important groups of products. Gragg's non-linear estimation was the method applied to extrapolate changes in trade turnover, production, demand and prices paid by consumers[9].

Results of the potential liberalisation of the global milk trade

As was proved by the results of simulation analyses using the GTAP model, the potential liberalisation of global trade in milk and dairy products may cause changes in the volume of trade turnover in the countries under study. The implemented changes in the trade policy may lead to limitation of the value of export of milk and dairy products from all of the EU countries except Bulgaria, Greece, Romania and Italy. The greatest loss of income from export can be expected in such countries as Finland, Lithuania and Malta. In comparison with the reference amounts from the GTAP database they might decrease by more than 32%, 22% and 20% respectively, reaching the amounts of 337 million dollars, 367 million dollars and 3.9 million dollars (Table 1). It is noteworthy that none of those countries is an important EU or global exporter of dairy products. In the countries which are the greatest exporters of this group of products in the EU the income from export would probably be limited to a lesser extent. In Ireland, Belgium, Holland and Germany the decrease in export might range from 9% to 14%, whereas in France and Denmark it might reach about 2-3%. In spite of the fact that the EU market would be less protected by customs tariffs, Germany, France and Holland could remain the largest exporters of dairy products in the EU, because their income from the sales of this group of products abroad would reach nearly 8.1 billion dollars, 6.8 billion dollars and 4.7 billion dollars respectively. The potential reduction in the value of export of dairy products from Poland can be estimated at about 6.5% (to 1.5 billion dollars).

[7] The amounts of customs tariffs to be reduced were taken from the database of the WTO Tariff Profiles, [Available at:] http://stat.wto.org/TariffProfile/WSDBTariffPFHome.aspx?Language=E. [Access: February 2014].

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[9] Nonlinear estimation is a general adjustment procedure which is used for the estimation of any type of dependence between the dependent variable (being discussed) and independent variables. Estimation errors in this method are smaller than in the case of linear estimation.

Table 1. Changes in the values of export and import of milk and dairy products in the EU countries and in the countries which are the world's major milk producers in view of the potential liberalisation of the global milk trade (changes in comparison with the base values from the GTAP model)

Countries	Export			Import		
	The base value [a]	The projection	Change (%)	The base value [a]	The projection	Change (%)
	expressed in world prices (million dollars)			expressed in market prices (million dollars)		
Austria	1 251,98	1 188,75	-5,05	817,34	842,82	3,12
Belgium	3 008,20	2 639,27	-12,26	3 130,43	3 184,55	1,73
Bulgaria	76,53	94,89	23,99	86,05	90,97	5,72
Cyprus	57,51	49,88	-13,27	88,45	89,22	0,87
Czech Republic	749,50	683,31	-8,83	536,46	537,15	0,13
Denmark	2 189,15	2 130,82	-2,66	763,41	963,40	26,20
Estonia	183,53	149,45	-18,57	49,74	50,78	2,09
Finland	498,85	337,45	-32,35	306,54	308,28	0,57
France	7 081,53	6 835,11	-3,48	3 679,49	4 052,68	10,14
Germany	8 863,84	8 063,81	-9,03	7 125,81	7 379,99	3,57
Greece	389,20	451,16	15,92	993,68	1 013,60	2,00
Holland	5 259,37	4 662,70	-11,34	2 782,23	3 023,16	8,66
Hungary	284,77	268,32	-5,78	384,30	385,99	0,44
Ireland	2 544,49	2 193,43	-13,80	866,67	836,76	-3,45
Italy	2 390,89	2 672,17	11,76	4 754,37	4 947,36	4,06
Latvia	201,80	184,23	-8,71	94,97	95,38	0,43
Lithuania	474,18	366,59	-22,69	146,47	150,47	2,73
Luxembourg	313,31	290,54	-7,27	337,90	335,23	-0,79
Malta	4,82	3,85	-20,12	44,83	46,28	3,23
Poland	1 562,28	1 460,88	-6,49	470,67	487,47	3,57
Portugal	399,69	366,82	-8,22	671,32	674,73	0,51
Romania	17,38	18,10	4,14	204,93	207,24	1,13
Slovakia	326,12	312,45	-4,19	254,29	254,96	0,26
Slovenia	140,13	125,96	-10,11	143,48	143,53	0,03
Spain	1 210,63	1 159,43	-4,23	2 768,99	2 828,18	2,14
Sweden	370,00	319,90	-13,54	721,21	733,10	1,65
United Kingdom	1 574,71	1 437,63	-8,71	3 994,73	4 180,11	4,64
Brazil	264,16	354,86	34,34	229,75	246,69	7,37
China	293,69	377,06	28,39	993,34	1 046,18	5,32
India	387,05	435,51	12,52	85,30	116,48	36,55
New Zealand	6 124,08	7 843,00	28,07	106,83	117,17	9,68
Russian Federation	388,96	450,30	15,77	2 527,40	2 200,41	-12,94
USA	2 605,24	4 178,08	60,37	2 794,47	3 566,34	27,62
Rest of World	9 754,94	12 996,38	33,23	26 311,00	29 509,81	12,16

a – The base values in the GTAP 8 Data Base refer to the year of 2007.

Source: GTAP simulation.

The world's main exporters of dairy products might turn out to be the beneficiaries of liberalisation. For example, in the USA a 60% increase in the export of milk and dairy products would result in the export value increasing nearly up to 4.2 billion dollars. New Zealand could retain its strong position in the world trade in dairy products, because after the implementation of the liberalisation propositions of 2008 the value of its export would amount to 7.8 billion dollars, which would be nearly 30% greater than the base value of its export in 2007. Also China and Brazil might expect their export value to rise by about 28% and 34% respectively, which would amount to 377 million dollars and 355 million dollars. It is worth noting that the GTAP simulation results are consistent with the predictions made by Baer-Nawrocka et al. [2012], who suggest that in 2020 Oceania, the EU, the USA and South America will still remain the major exporters of dairy products, but the position of some developing countries, such as China, Brazil and India, will be stronger.

Apart from Ireland, Luxembourg and Russia, the reduction of customs protection of the markets in all of the countries under study might cause an increase in the import of milk and dairy products. However, the scale of observed changes would be diversified. It is noticeable that the potential increase in import expenditures in the EU countries might be lower than the increase observed in the world's largest milk producers. Apart from Slovenia, where no significant changes have been noted in this area, the increase in the value of import of dairy products might range from 0.3% (Slovakia) to 10% (France). Only in Denmark it might be greater and exceed the base value of the GTAP model by 26%, which would mean that the import expenditures would amount to 963 million dollars. The largest importers of dairy products in the EU would still be Germany (7.4 billion dollars), Italy (4.9 billion dollars), the United Kingdom (4.2 billion dollars) and France (4.1 billion dollars). In the countries which are the world's largest milk producers the forecast of the increase in the import value could range from slightly more than 5% in China to 36% in India, where the amounts of money spent on foreign purchase of this group of products would range from 116 million dollars (India) to 3.6 billion dollars (USA), so they would still be lower than the amounts spent by the countries which are the leading importers of dairy products in the EU.

Table 2. Changes in volume of production, households' demand and consumer prices of milk and dairy products in the EU countries and in the countries which are the world's major milk producers in view of the potential liberalisation of the global milk trade (changes in comparison with the base values from the GTAP model)

Countries	Production[a]			Households' demand[a]			Consumer prices (change in %)
	The base value[b]	The projection	Change (%)	The base value[b]	The projection	Change (%)	
	expressed in market prices (million dollars)			expressed in market prices (million dollars)			
Austria	6 263,12	6 116,74	-2,34	2 239,98	2 246,09	0,27	-0,39
Belgium	8 536,93	7 901,92	-7,44	3 194,09	3 217,63	0,74	-1,04
Bulgaria	1 892,66	1 919,64	1,43	748,97	748,78	-0,03	0,08
Cyprus	916,46	901,96	-1,58	351,90	352,06	0,05	-0,10
Czech Republic	6 655,88	6 546,17	-1,65	3 136,59	3 138,00	0,04	-0,11
Denmark	9 595,05	9 199,38	-4,12	2 092,05	2 121,15	1,39	-1,57
Estonia	2 073,75	2 018,98	-2,64	1 211,35	1 212,03	0,06	-0,10
Finland	6 027,13	5 669,68	-5,93	2 054,61	2 059,60	0,24	-0,31

Countries	Production[a]			Households' demand[a]			Consumer prices (change in %)
	The base value[b]	The projection	Change (%)	The base value[b]	The projection	Change (%)	
	expressed in market prices (million dollars)			expressed in market prices (million dollars)			
France	55 906,00	54 958,14	-1,70	20 719,03	20 783,22	0,31	-0,44
Germany	57 181,41	55 410,11	-3,10	22 200,66	22 274,02	0,33	-0,49
Greece	8 611,64	8 707,64	1,11	3 608,14	3 610,16	0,06	-0,09
Holland	29 345,87	27 681,62	-5,67	7 665,01	7 720,64	0,73	-0,98
Hungary	7 035,50	7 006,70	-0,41	3 744,46	3 745,00	0,01	-0,04
Ireland	10 788,11	10 067,18	-6,68	2 083,83	2 089,07	0,25	-0,32
Italy	39 122,47	39 317,99	0,50	19 546,38	19 574,84	0,15	-0,22
Latvia	1 944,84	1 919,33	-1,31	1 000,23	1 000,54	0,03	-0,12
Lithuania	3 218,94	3 045,38	-5,39	1 612,71	1 614,75	0,13	-0,28
Luxembourg	898,98	860,76	-4,25	383,53	384,70	0,31	-0,32
Malta	109,41	106,57	-2,60	119,65	119,94	0,24	-0,50
Poland	32 038,54	31 877,36	-0,50	17 931,08	17 933,98	0,02	-0,05
Portugal	5 389,77	5 323,66	-1,23	2 522,13	2 523,20	0,04	-0,09
Romania	7 535,61	7 532,83	-0,04	2 555,74	2 555,90	0,01	-0,03
Slovakia	4 764,91	4 745,55	-0,41	2 792,33	2 792,66	0,01	-0,04
Slovenia	1 407,43	1 385,68	-1,55	735,41	735,60	0,03	-0,06
Spain	20 597,90	20 426,47	-0,83	10 466,07	10 476,82	0,10	-0,18
Sweden	7 594,39	7 487,38	-1,41	3 643,68	3 647,09	0,09	-0,13
United Kingdom	29 867,62	29 388,68	-1,60	14 282,62	14 322,02	0,28	-0,38
Brazil	22 599,92	22 714,75	0,51	13 270,55	13 271,23	0,01	-0,01
China	23 902,19	23 939,87	0,16	14 158,79	14 154,99	-0,03	-0,09
India	66 575,32	66 593,69	0,03	57 322,97	57 321,99	0,00	0,00
New Zealand	14 906,03	17 687,55	18,66	1 270,66	1 264,57	-0,48	2,09
Russian Federation	47 225,82	47 684,34	0,97	34 167,43	34 169,00	0,00	0,38
USA	125 381,73	126 829,52	1,15	49 426,28	49 529,07	0,21	-0,24
Rest of World	280 778,31	281 267,56	0,17	176 489,63	176 773,48	0,16	-0,41

a – The volume of production and demand from the GTAP model may be different than the real values in a particular year. The GTAP database is not a repository of the input-output matrix. The process of making a database affects the contents of input-output tables and they are different from the source data. The underlying input-output tables are heterogeneous in sources, base years, and sectoral detail, thus for achieving consistency, substantial efforts are made to make the disparate sources comparable. For these reasons, the objective of the GTAP Data Base is not to provide input-output tables, but to facilitate the operation of economic simulation models ensuring users a consistent set of economic facts [Available at:] https://www.gtap.agecon.purdue.edu/databases/v8/default.asp. [Access: March.2014]. Apart from that, it is necessary to note the fact that there are three types of prices in the GTAP model. The economic entities whose behaviour is described by the model do not make direct transactions, but they make transactions on markets. This means that in fact, each transaction consists of two interconnected contracts: seller-market and market-purchaser, and the model includes agent's prices, i.e. the prices the seller receives or the purchaser pays, and market prices. These prices are not equal and taxes make the difference between them. Transactions on international markets are made at world prices.
b – The base values in the GTAP 8 Data Base refer to the year of 2007.

Source: GTAP simulation.

The reduction of export subsidies and customs tariffs in the global milk trade might also cause changes in the volume of production of milk and dairy products in the countries under analysis. In the EU countries, where the import of milk products might increase in consequence of reduction of the current level of market protection, the dairy production can be expected to remain stable or to decrease. In comparison with 2007 the greatest decrease by about 3-7% could be expected in Germany, Denmark, Luxembourg, Lithuania, Holland, Finland, Ireland and Belgium, which are the countries that play an important role in milk production in the EU (Table 2). In Poland the expected decrease in the production of milk and dairy products may reach about 0.5%. The estimated value of production expressed in market prices would reach 31.9 billion dollars and thus, Poland would be the third largest dairy producer in the EU, following Germany (55.4 billion dollars) and France (55.0 billion dollars), and coming before the United Kingdom (29.4 billion dollars) and Holland (27.7 billion dollars). In the countries which will benefit from free access to the markets of other countries and which will probably increase the volume of export of milk and dairy products an increase in production could be expected. It will be the highest in New Zealand, where the production of milk and dairy products may increase by even as much as 19% and reach the value of 17.7 billion dollars. This value would still be lower than in the countries which are the world's other leading producers. The USA could still remain the largest producer. In view of the implementation of the new agricultural agreement the US dairy production could reach the value of 127 billion dollars. Therefore it can be concluded that the decrease in the production of dairy products is possible in countries which highly support their dairy sector, while countries producing at low prices and supporting the dairy sector at low level, thanks to the liberalization of the world market and increasing their trade values, may gain[10].

The increase in the supply of dairy products on the markets of the countries under study caused by a dynamic increase in import may lead to a decrease in the prices of these products paid by consumers. As a result, households' demand for the products may increase (the increase may be less than proportional to the decrease in prices). Such changes might be the greatest in Belgium, Denmark and Holland, where the prices may decrease by about 1.0-1.6%, causing a smaller increase in the demand by 0.2 percentage point or 0.3 percentage point if the global dairy trade is liberated according to the draft modalities of December 2008. Similar trends in the prices and demand may also take place in China, the USA and Brazil. Only in New Zealand, where part of the increased domestic production will be 'drained' by export, the prices paid by consumers may increase, thus causing limitation of the demand. In absolute categories, the greatest demand for dairy products may be expected in India (57.3 billion dollars), the USA (49.5 billion dollars) and Russia (34.2 billion dollars), i.e. in the countries with a large population or with high disposable income. In addition, the growing popularity of dairy products in developing countries, advertising and facilitating the access to dairy products by distribution networks developed within foreign direct investments will determine the increase in global demand [Baer-Nawrocka et al. 2012]. As far as the EU countries are concerned, the highest demand for dairy products may be noted in Germany, France and Italy, although it would still be nearly or more than two times lower than in the countries with the greatest demand.

[10] Cf. Baer-Nawrocka et al. [2012].

Concluding remarks

The multilateral trade liberalisation according to the rules of the draft modalities of December 2008 may lead to an increase in the import of milk and dairy products both in the EU countries and in the countries which are the world's greatest milk producers and it may cause a decrease in the cost-effectiveness of export from the EU countries to the markets with low prices. In the EU countries the liberalisation of the dairy market may also be accompanied by limited production of milk and dairy products and by increased demand resulting from the drop in consumer prices. The demand would be satisfied with a supply of imported products. In view of those facts we can say that the progressing liberalisation of foreign trade may increase the competitive pressure both on regional markets and on the global market. In consequence, the dairy producers and processors from the EU countries may lose part of the market to the suppliers from the countries with lower costs of production. Such countries as New Zealand, the USA, Brazil and China may benefit from the liberalisation. Taking advantage of freer access to the markets of the countries which used to have a high level of protection they may increase the volume of export and in consequence, they may also increase the volume of production which is necessary to develop their export.

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Sustainable diet and changes in food consumption in chosen European Union countries

Abstract. The most important challenges of food policy and public health in the 21st Century include fighting high levels of obesity and food waste. Both issues are linked to the necessity of reducing greenhouse gas emissions and inhibiting climate change. Diet modification towards a more sustainable and healthy model, based in greater extent on plant-derived (vegetal) food and not animal products is seen as a chance to improve this situation. Taking these aspects into consideration, an analysis of consumption trends (1991-2011) of 6 food groups, known as markers of sustainable diet, was carried out in 7 EU countries. The study was based on FAO Food Balance Sheet statistical data. The current consumption structures in the selected countries was compared to recommended, sustainable and healthy diets. It was shown that in general homogenization of food consumption, a decrease of pulses and increase of fruit consumption had taken place. In each country the share of cereals & potatoes, fruit & vegetables, milk & dairy products, and meat did not meet the recommendations. The consumption of the first two groups was too low, the remaining two – too high.

Key words: sustainability, food, consumption trends, sustainable diet, EU countries

Introduction

In 1972 the "The Limits to Growth" report commissioned by the Club of Rome think tank presented a model of world economic growth based on the demographic and resource depletion trends of that time[Meadows et al. 1973]. Its authors predicted that, due to environmental pollution and excess population growth, the global system could collapse by the mid or latter part of the 21st Century. This theory of limited growth, although much discussed and controversial, had a significant impact on the conception of environmental issues and lead to a search of alternative growth routes, especially as, at that time, the world faced a major energy crisis. The concept of sustainable development, including different goods consumption processes occurred, in the 1980s. Regardless, the continued world economic growth during the next decades caused natural environmental imbalance, resulting in climate changes due to excessive greenhouse gas (GHG) emission. Intensive development of the world agri-food system aimed at meeting increasing demand for food, especially diet westernization and higher animal products consumption in developing countries, significantly contributed to environmental pollution. The research undertaken in the frame of the European Commission Project EIPRO (2006) showed that food and drink consumption in general accounts for 20-30% of the ecological footprint of individuals in EU25, and in the case of eutrophication for even more than 50%. Meat and meat products (incl. meat, poultry, sausages etc.) have the greatest environmental impact, followed by

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milk and dairy products. The second global economic burden and challenge for public health and nutrition became obesity and other diet-related diseases. Their worldwide prevalence results from increasing consumption of animal products and highly processed foods containing excessive amount of fat, especially saturated fatty acids, added sugars, and sodium, and failure to meet minimum recommendations for fibre. In this scope, achieving sustainable agricultural production and food processing remains one of the main world development issues to lessen food-related GHG emissions. The role of consumers is to change their food consumption patterns towards a more healthy and sustainable diet.

Concept of sustainable diet and its rules

According to FAO definitions, sustainable diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable. They are nutritionally adequate, safe and healthy, while optimizing natural and human resources [FAO 2011]. Sustainable diets - in other terms - are healthy for both consumers and planet Earth as a whole and come down to five rules of consumer sustainable food choices and consumption [WWF-UK 2011]:

1. Eat less meat. Replace part of consumed meat amounts by protein-rich vegetal products such as whole grain, pulses, nuts and seeds.

2. Eat more plants. Enjoy more fruit and vegetables, as the WHO [2003] population dietary goal and recommendation is minimum 400g daily, but has not been reached in many countries, even among well developed and educated communities.

3. Waste less food. FAO [2011] estimates that global food losses and waste amounts to 1/3 of total world production and equals 1.3 billion tonnes of food. Guyomard et al. [2011] calculations showed that from 4600 kcal of vegetal agricultural raw materials which are globally daily produced, only 2000 kcal is consumed by people (1200 kcal is wasted, 1700 kcal is set apart for animal breeding and returns to the consumer as 500 kcal of animal foods). Poland, after joining the group of mature market economies, became the fifth EU27 Member State in terms of food wastage (9 million tonnes yearly excl. losses in agriculture) and constitutes 10% of total EU amount [European Commission DG ENV - Directorate C 2011]. According to British research [WRAP 2009] up to 30% of food brought home is wasted.

4. Eat less processed food. Such foods tend to be more resource-intensive to produce and often contain high levels of ingredients recognized as the main diet-related risk factors of obesity and other non-communicable diseases. So the advice is to choose more natural, fresh, seasonal and locally produced food.

5. Eat better food or buy food that meets a credible certified standard. Certification standards help consumers make conscious choices of the food produced with respect to the sustainable development goals: economic, social, and environmental. These include e.g. Fairtrade, Rainforest Alliance, Marine Stewardship Council certification. This rule regards also free range meat products and eggs, and regional and traditional products registered or not in EU good quality food certification schemes.

It is clear that in many countries governments and the "third" sector (NGOs) are aware of the need to transform the food chain into a more sustainable system in order for it to

cause less pressure on crucial resources (i.e. energy, water, and biodiversity), human health and animal welfare. At the same time the issue of sustainability is also more and more used as a tool by food producers and processing companies, which aim to provide value to customers by implementing a growing number of ethical standards and quality certificates.

Despite growing public interest in sustainability, scientific analysis shows that there is a gap between consumer attitude and behavioral intention [Vermeir and Verbeke 2006]. The challenge is therefore - on one hand - to further increase awareness of the issue, but also – on the other hand – to make sustainable food choices easier for consumers. The aim of sustainability may require, for example, that people in Western countries choose to eat smaller quantities of meat as well as types of meat that are produced in a more responsible way.

Aim and methodology of study

The aim of the presented study was to analyze changes in food consumption (kg per capita supply) of six selected food product groups – the so-called markers of sustainable diet. These were 3 plant-derived (vegetal) product categories: fruits, vegetables and pulses as well as 3 groups of animal products: meat, eggs, and milk and dairy products.

The methodology focused on analyzing FAOSTAT Food Balance Sheet data from 7 European countries: France, Germany, Poland, Czech Republic, Sweden, UK, and Italy during a 20-year period (1991-2011) and showing trends. Due to editing issues only odd years of the analyzed period are presented in this paper in the form of tables - however the calculations and results comprise all years. The current (2011) food consumption levels in the selected countries was compared to the UK-recommended diet structure which assigns a sustainable and healthy diet [WWF-UK 2011].

Study results

Consumption of vegetal products 1991-2011

The consumption of vegetal products fluctuates significantly depending on supply and prices, which are related to (among others) weather and trade conditions. In the analyzed period. Italy had the highest consumption of vegetables (max. 188 kg in 1992), followed by Poland and France. However disturbing falling trends can be noticed in all three countries (Table 1).

The lowest consumption of vegetables was in the Czech Republic (only about 74 kg/capita/year in 2011), but showing a 12% growth since 1992.

In most of the selected countries, excl. Germany and the Czech Republic, growing trends in fruit consumption were observed. Throughout the whole period the highest consumption of fruits was found in Italy (max. 163.6 kg/capita/year in 2009), the UK and Sweden. Poland and the Czech Republic had the lowest level of fruit consumption compared to all other described countries (Table 2). In five of the analyzed countries fruit consumption has a growing trend, but in the Czech Republic and in Sweden it is decreasing.

Table 1. Consumption of vegetables in selected EU countries (1991-2011) [kg/capita/year]

Country/year	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011
France	129.0	123.6	106.6	103.2	109	107.6	106.6	103.7	97.8	105.2	103.6
Germany	76.9	71.0	77.7	83.0	88.6	91.2	88.9	86.1	88.7	91.7	94.3
Poland	129.7	131.9	134.3	137.7	130.7	133.2	122.8	114.9	127.2	126.1	129.3
Czech Republic*	n.a.	70.5	74.0	75.3	82.0	75.2	71.0	79.0	75.5	72.0	74.1
Sweden	61.5	66.2	64.7	70.1	74.8	77.1	79.7	85.6	86.9	91.8	93.9
United Kingdom	88.9	89.3	76.9	84.4	92.3	90.9	92.3	95.9	91.6	88.7	94.1
Italy	181.1	161.2	177.9	178.1	184.8	160.4	174.3	183.4	157.7	174.8	144.5

*n.a. - data for Czech Republic are available since 1993
Source: [FAOSTAT 2014]

Table 2. Consumption of fruits in selected EU countries (1991-2011) [kg/capita/year]

Country/year	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011
France	78.2	84.3	94.0	83.5	89.1	96.6	95.8	112.1	116.2	115.8	110.1
Germany	102.9	88.5	80.2	88.1	83.5	88.6	90.2	84.7	81.0	79.1	80.4
Poland	38.8	46.0	41.7	44.7	50.5	54.0	48.8	51.2	45.3	54.7	54.3
Czech Republic	n.a.	66.5	78.3	74.3	73.7	63.3	66.6	69.7	70.2	75.9	68.7
Sweden	88.3	87.2	82.0	92.5	98.6	101.3	115.1	109.8	117.5	117.8	117.0
United Kingdom	75.0	79.1	78.8	79.6	86.4	92.0	115.6	127	126.9	125.1	125.7
Italy	125.1	137.6	119.8	118.7	137.9	134.2	134.2	152.8	151.5	163.6	140.8

Source: [FAOSTAT 2014]

Exactly the opposite trends can be observed in the case of the third vegetal aggregated product category: pulses. The yearly consumption of these products, which include beans and peas in 2011 oscillated between 1kg/capita in Germany and 4.8 kg/capita in Italy. It shows growth trends only in the case of the Czech Republic and Sweden (Table 3).

Table 3. Consumption of pulses in selected EU countries (1991-2011) [kg/capita/year]

Country/year	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011
France	2.1	2.1	2.2	2.1	2.3	2.0	2.1	2.0	1.9	1.7	2.0
Germany	0.9	0.9	1.1	1.7	1.3	0.9	0.9	0.6	0.7	0.6	1.0
Poland	2.6	1.8	2.3	2.2	2.5	2.0	1.6	1.6	2.2	1.8	2.1
Czech Republic	n.a.	1.8	1.8	1.8	2.0	1.9	2.1	3.0	2.7	2.9	2.6
Sweden	0.8	1.1	1.3	2.3	1.6	1.5	1.7	1.8	1.9	1.8	1.9
United Kingdom	4.7	6.1	5.1	6.5	6.7	6.6	4.4	3.0	3.0	2.9	2.4
Italy	5.7	5.4	5.3	5.6	5.6	5.5	5.6	5.5	5.4	5.3	4.8

Source: [FAOSTAT 2014]

Consumption of animal products 1991-2011

The consumption of meat and its products at the beginning of the analyzed period was highest in France (100.9 kg/year) and lowest in Sweden (59.1 kg) (Table 4, Figure 1). In the next 20 years the consumption decreased only in two of the studied countries – France and Czech Republic. In the remaining countries meat consumption increased and in 2011 its level varied between 75.6 kg (Poland) and 88.7 kg (France).

Table 4. Consumption of meat and its products in selected EU countries (1991-2011) [kg/capita/year]

Country/year	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011
France	100.9	94.1	97.8	99.8	98.8	101.6	96.2	88.3	83.7	90.4	88.7
Germany	87.7	84.1	81.4	81.6	82.9	81.3	83.1	82.0	86.1	86.0	87.9
Poland	78.0	73.4	69.2	65.8	72.3	70.8	75.1	72.9	76.8	74.6	75.6
Czech Republic	n.a.	94.6	84.0	80.1	80.6	76.6	80.1	87.5	85.5	83.6	80.4
Sweden	59.1	61.9	64.8	67.6	72.5	70.2	76.5	77.5	78.9	78.8	81.9
United Kingdom	72.5	72.2	73.5	73.3	76.0	78.5	82.9	83.5	85.1	80.8	82.5
Italy	86.4	87.8	84.0	85.6	88.5	90.1	86.3	84.5	87.7	87.6	86.7

Source: [FAOSTAT 2014].

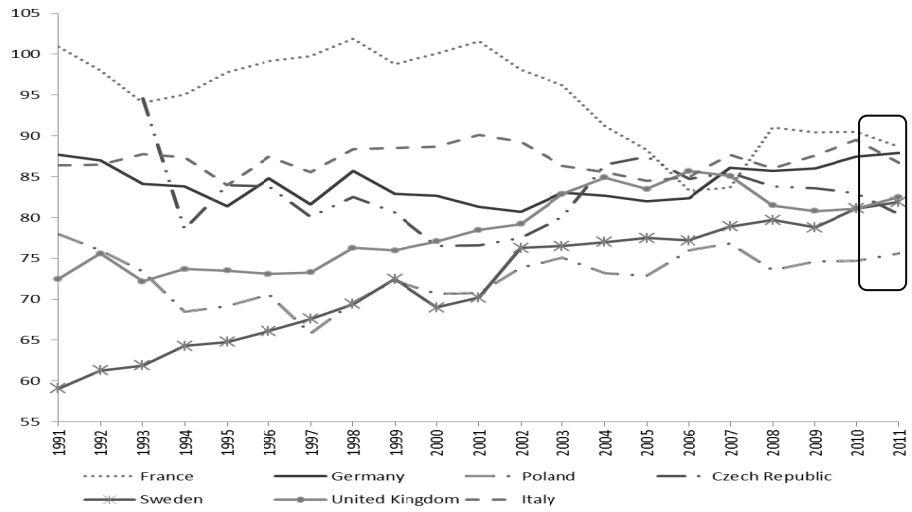


Figure 1. Changes in consumption of meat and its products in selected EU countries (1991-2011) [kg/capita/year]
Source: [FAOSTAT 2014].

Milk and dairy product consumption in the analyzed two decades showed both growth as well as falling trends (Table 5). In Sweden the level of milk consumption remained highest, surpassing 340 kg/capita/year. In the Czech Republic and France it decreased and in Italy, UK and Germany it increased slightly. In Poland consumption is relatively low but has increased in the last years, reaching almost 198 kg/capita in 2011.

Table 5. Consumption of milk and its products in selected EU countries (1991-2011) [kg/capita/year]

Country/year	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011
France	287.2	272.9	272.3	255.9	266.4	272.3	272.7	257.3	261.6	247.2	250.0
Germany	234.1	222.3	234.0	231.5	230.3	234.0	250.7	249.0	259.2	265.4	255.4
Poland	226.9	207.8	194.8	192.1	199.4	192.7	196.9	172.3	168.0	168.1	197.9
Czech Republic	n.a.	220.4	200.5	184.8	204.7	200.4	200.5	215.7	203.1	177.4	178.3
Sweden	345.3	369.3	346.8	340.8	346.6	362.2	380.3	369.9	355.7	357.5	342.3
United Kingdom	227.1	217.6	216.0	237.2	230.7	226.9	241.7	248.0	240.2	236.3	240.9
Italy	252.8	242.0	233.5	249.9	271.8	270.6	262.1	271.0	258.1	258.0	260.4

Source: [FAOSTAT 2014].

Table 6. Consumption of eggs in selected countries (1991-2011) [kg/capita/year]

Country/year	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011
France	14.7	14.6	15.8	15.7	16.0	15.8	15.3	14.3	14.4	14.1	12.5
Germany	14.4	11.8	12.1	12.7	12.2	12.4	11.9	11.6	11.9	12.2	12.8
Poland	9.8	8.8	8.6	10.6	10.4	11.1	11.7	11.8	11.5	11.4	9.5
Czech Republic	n.a.	12.7	13.1	14.3	17.4	16.7	14.6	14.0	15.0	15.2	13.0
Sweden	12.4	12.3	11.3	11.6	11.6	11.0	10.4	11.1	11.1	12.0	12.4
United Kingdom	10.4	10.0	9.9	9.8	9.3	10.0	9.9	10.2	10.3	10.3	10.5
Italy	12.7	12.2	12.0	12.8	12.3	12.0	11.6	11.6	11.6	12.7	11.7

Source: [FAOSTAT 2014].

Egg consumption in most of the studied countries was characterized by decreasing trends, with the exception of Poland and the UK. However in these countries the level is still lowest (Table 6). As in the case of total meat and meat products the consumption of eggs became less varied, ranging from 9.5 to 12.8 kg/year in 2011 compared to 8.8-14.6 kg in 1993.

Towards a sustainable and healthier diet

The volume of food consumption calculated per capita on the food balance level in the investigated European countries in 2011 varied from 860 kg in Czech Republic to over 1 ton in Italy (Table 7). Poland with the food consumption volume of 941 kg/capita occupies the sixth position, between France and the Czech Republic.

The highest consumption of cereals and starchy roots (incl. potatoes) and lowest of meat was noticed in Poland. The highest consumption of meat was found in France, Germany and Italy. Italy had also the highest consumption of fruits and vegetables, surpassing 280 kg/capita, which is about two times more than in the Czech Republic. In the case of milk & dairy product consumption, its level varied from 178 kg in the Czech Republic to 342 kg in Sweden. Germany and United Kingdom did not show extreme (maximum/minimum among countries) volumes in any of the analyzed product groups.

Table 7. Volume of food consumption in selected EU countries (2011) [kg/capita/year]

Country	Total consumptio	Cereals & starchy roots	Fruit & vegetables	Milk & dairy products	Meat (without offals)
France	965.4	180.0	213.7	250.0	88.7
Germany	966.4	182.2	174.7	255.4	87.9
Poland	941.0	265.7[1)]	183.6	197.9	75.6
Czech Republic	861.0[2)]	185.3	142.8	178.2	80.4
Sweden	1 015.6	156.6	210.9	342.3	81.9
United Kingdom	973.5	214.8	219.8	240.9	82.5
Italy	1 019.2	194.4	285.3	260.4	86.7

[1)] highest consumption level [2)] lowest consumption level

Source: [FAOSTAT 2014].

Consequently, significant differences were noticed in the total energy intake as well as in the level of energy originated from animal and vegetal products (Table 8). The highest energy value of an average diet was observed in Italy and Germany, whereas the lowest in Sweden. Italy, the Czech Republic and Poland (73-74%) had the highest share of vegetal energy in total energy intake, while France and Sweden had the lowest (66%).

Table 8. Total and vegetal dietary energy supply in European countries (2011) [kcal/capita/year]

Country	Total energy kcal/capita/year	Vegetal energy	
		intake, kcal	% of total
France	3524	2343	66.5
Germany	3539	2447	69.1
Poland	3485	2543	73.0
Czech Republic	3292	2435	74.0
Sweden	3160	2089	66.1
United Kingdom	3414	2425	71.0
Italy	3539	2624	74.1

Source: [FAOSTAT 2014]

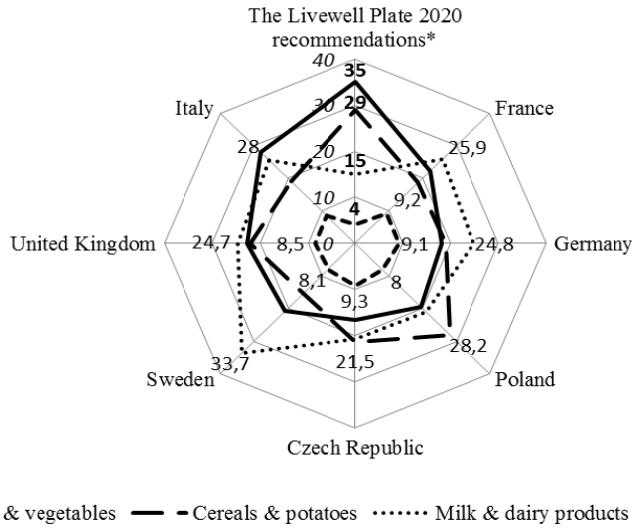
It is worth noticing that during the period 1991-2011, dietary energy supply increased in greatest extent in Sweden, United Kingdom, Germany, and Poland (by 6-7.4%). Only in Italy the energy value of an average diet fell by almost 3%. In the case of France the reduction was very small and reached 0.5%.

Having in mind that an average adult needs respectively 2500/2000 calories/day the data presented above prove that we tend to overeat food that has a highly detrimental impact on our health and on the environment [WWF-UK, 2011].

To help to change food habits in many countries, governmental (for example USDA in the US) and nongovernmental organizations prepare nutritional recommendations. In the United Kingdom the Food Standard Agency elaborated "The Eatwell Plate" which illustrates the proportion of major food groups that should be included in a healthy diet. Further - this concept was extended by the aspects of sustainable diet (UK's 2020 target for

reduction in greenhouse gas emission and recommendations for a healthy diet) and is popularized as *The Livewell Plate 2020*. The structure of the volume of different food groups which should be consumed to achieve a sustainable and healthy diet are as follows – in % of total daily food consumption: fruit and vegetables – 35%; bread, rice, potato, pasta and other starchy food – 29%; milk and dairy products – 15%; food and drinks high in fat and/or sugar – 9%; meat (without offal) – 4%; fish – 3%; eggs – 1%; beans and pulses – 4%; nuts and seeds – 0,3% [WWF-UK, 2011].

The existing food consumption patterns in the investigated European countries differ very much in comparison to these guidelines (Figure 2).



*WWF - UK Livewell: Heathy people, Healthy planet 2011

Figure 2. Share % of main groups of product in total food consumption in selected EU countries (2011) regarding the Livewell plate 2020 recommendations

Source: own calculations based on FAOSTAT Food Balance Sheet data 2014

Major changes are needed in the case of fruit and vegetable consumption. Special effort to increase the share of this group of products in total consumption should be made in the first priority in the Czech Republic, Germany and Poland. Increasing the share of cereals and starchy roots are needed firstly in Sweden, France and Germany.

The opposite tendency, that is, lowering its share in daily total energy consumption, should apply to meat as well as milk and dairy products. In the case of the first group of products this should take place especially in the Czech Republic, France, and Germany. In Sweden, Germany and France energy from dairy product consumption should be limited.

It is important to underline that the proportion of the main food groups in the model of a sustainable and healthy diet in Poland is closest to recommendations only in the group of cereals and starchy roots (potatoes). The presented data demonstrates that consumers do not need to eliminate any food groups to follow a health, sustainable diet.

Final remarks and conclusions

Based on the compared FAO data it can be concluded that in the last two decades in the selected countries a process of homogenization of food consumption patterns has slowly taking place, especially in the case of meat, eggs and vegetables. In each country the share of cereals & potatoes, fruit & vegetables, milk & dairy products, and meat did not meet sustainable diet recommendations. The consumption of the vegetal products is too low, while in the case of animal products – too high. In 2011 Italy, Czech Republic, Poland and UK had the highest share of vegetal energy in total energy intake, while Sweden, France and Germany had the lowest.

Further dissemination of the necessity for sustainable diet changes and research on the reasons of development is needed. It will have a positive impact on both environment and health. Moreover further cooperation between governments, civil society and the private sector (for example in the form of private-public partnerships) should be encouraged to promote sustainable diets in order to achieve sustainable food production, processing and consumption, and to minimize environmental degradation and loss of biodiversity.

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The impact of availability of means of transport on agricultural production in selected European countries

Abstract. The object of the paper is to determine the relationship between the number of tractors and production results. Seven European countries with diverse land, production and human resources and different natural and topographic conditions were selected by the application of the purposive sampling method and included in the study. The study period spans from 2004 to 2009. In the analysed population, production results were not in correlation with the number of tractors. When examining the relationship only in some selected countries, the author discovered the existence of differences in the correlation between the number of tractors and the value of agricultural production. The resulting correlation values for developed countries were positive, whereas in the case of developing countries, the values were negative. Thus, the number of tractors influences the value of agricultural production in harmonised economies. Nevertheless, we should also consider a number of additional factors, such as price volatility, weather conditions, etc.

Key words: means of transport , number of tractors, agricultural production.

Introduction

The Industrial Revolution in the second half of the 18th Century was the beginning of major changes in production. One of its consequences was the invention of the internal combustion engine in the 20th Century [Toynbee 2000]. According to many authors, technical progress is a key factor in economic growth [Blaug 2000]. For instance, Solow proves that in the first half of the 20th Century in the U.S. economy, labour productivity growth was due to technical advancement (87.5% influence), followed by the increase in the technical infrastructure of employment (12.5%) [*Gospodarka*… 2007]. In subsequent years, the increase in productivity resulting from technical progress and employment infrastructure steadily became smaller [Czarny 2000]. Determination of the influence of technical progress on productivity within the whole sector is difficult due to the existence of links with other branches of economy. Thus, the estimates may be flawed [Espositi 2000]. In narrow terms, technical progress in agriculture includes innovations of mechanical nature, whereas, in broader terms, it includes innovations of both mechanical and biological nature [Kierul & Majewski 1991]. Other authors additionally distinguished organisational, technological and socioeconomic progress [Strużek 1976; Klepacki 1990]. Once again, accurate assessment of the influence of the individual type of progress on agricultural productivity is not easy. However, the studies indicate that productivity growth is mainly due to technical progress [Rusielik & Świtłyk 2009]. Some authors attribute technical progress mainly to the growth of labour productivity [Malaga-Toboła 2008].

Progress in mechanisation is distinguished within technological progress, which in turn is part of the technical and scientific progress [Wójcicki 2001]. Progress in

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mechanisation affected the dynamic changes in the traction force and in the motorisation of agricultural farms [Wójcik 2004; Pawlak 2006]. It is achieved not only through the construction, manufacture and design of finer agricultural equipment, but also through better and more efficient use of existing and new technologies [Szeptycki 2006]. The low application of technical means of production, especially at small farms, is a factor limiting the efficiency of technical progress implementation [Pawlak 1997]. It should also be noted that progress occurs primarily at developmental farms, i.e. the ones which are open to investments [Wójcicki 2006]. Transport constitutes a significant element of agricultural activity. The studies indicate that agricultural transport consumes approx. 30% of the total labour expenditure, and 40-60% of working time expenditure of traction force [Bielejec 1989]. Thus, transport processes generate material costs. In order to reduce these costs, we need a proper selection of means of transport and an efficient organisation of transport processes [Kokoszka & Tabor 2006]. The studies indicate that the technical infrastructure of farms, i.e. agricultural equipment including tractors, varies significantly across individual farms. The differentiating factors are: size of the farm, its economic strength, natural and topographic factors [Muzalewski 2008].

In the description of the farm, many papers frequently use the term: means of transport, as part of machinery and equipment. A list of means of transport includes tractors, trailers, dump trailers and trucks. According to some authors, in addition to tractors and trucks, traction force shall also include combine harvesters and forage harvesters [Rokicki & Wicki 2010]. For the purpose of this article, means of transport have been limited to agricultural tractors. In 2007, according to estimates, there were 29.8 million tractors operating in the agricultural sector worldwide, of which more than 5% were located in Poland [Pawlak 2010].

Material and methods

In this article, the transport infrastructure of agriculture has been limited to tractors due to the fact that these machines are in common use in agricultural activity. The object of the paper is to determine the relationship between the number of tractors and production results. Seven European countries with diverse land, production and human resources and different natural and topographic conditions have been selected by the application of the purposive sampling method and included in the study, namely: Belarus, Iceland, Poland, Romania, Russia, Spain and Ukraine. Three of these countries are EU member states: Spain joined the EU in 1986, Poland in 2004, and Romania in 2007. Belarus, Ukraine and Russia are former Socialist [Eastern] Block countries. Iceland is not an EU member state and has very specific topographic conditions. The sources of materials for this paper are data provided by the World Bank. The study period spans from 2004 to 2009. When collecting necessary information, the author was not able to obtain complete data for the years 2010-2012, therefore the period between 2004 and 2009 was chosen for the study. The following methods have been applied in this paper: descriptive, tabular, graphic, indicator and correlation coefficient methods.

Research results

The number of tractors in various European countries is variable (Table 1). To a large extent, this number is influenced by the availability of land resources, human resources and the type of production, primarily crop production. Among the countries under the survey, the largest number of tractors was reported for Poland (approximately 1.5 million), and the smallest number – for Iceland. A clear upward trend, which should be considered in positive terms, can be observed in Poland and Spain in the years 2004-2009. Reverse trends can be observed in Russia, Belarus and Ukraine. In addition to the number of tractors, the following parameters are important: age, power and technical condition of tractors. However, these parameters are not taken into account in the present article.

Table 1. Number of agricultural tractors in selected European countries

Specification	Number of agricultural tractors in period 2004-2009					
	2004	2005	2006	2007	2008	2009
Belarus	55330	53581	52613	50436	49517	48100
Iceland	10750	10928	11144	11403	11525	11432
Poland	1365400	1437183	1495287	1553390	1566340	1577290
Romania	171811	173043	174563	174003	174790	176841
Russia	531973	480333	439600	405661	364356	329980
Spain	966598	980808	1000222	1016043	1030440	1038726
Ukraine	370404	352252	344263	336848	335473	333529

Source: results of own research based on „The World Bank Database'', http://data.worldbank.org.

Table 2. Number of tractors per 100 km^2 of agricultural land in selected European countries

Specification	Number of tractors per 100 km^2 of agricultural land in period 2004-2009					
	2004	2005	2006	2007	2008	2009
Belarus	62	60	59	57	56	54
Iceland	57	58	59	61	61	63
Poland	836	904	937	960	970	979
Romania	122	122	124	128	128	130
Russia	25	22	20	19	17	15
Spain	332	336	350	363	366	371
Ukraine	90	85	83	82	81	81

Source: as in Table 1.

The number of tractors per 100 km^2 of agricultural land constitutes a valid basis for comparing various countries (Table 2). This ratio is indicative of the equipment infrastructure of land. The higher the ratio, the better. Comparisons on an international scale present the ratio of the number of tractors per 100 km2 of arable land. However, this method of comparison may be flawed, as the share of arable land in agricultural land varies across countries. The ratio of the number of tractors to agricultural land is a better method for comparing individual countries. The best situation was reported for Poland, with almost

one thousand tractors per 100 km^2, and the worst results in this respect – in Russia (only 54 tractors in 2009). Overall, the highest rates were achieved in EU member states. The resulting correlation coefficient between the number of tractors and the area of agricultural land was negligible and amounted to - 0.07.

Individual countries also varied in terms of population living in rural areas. The indicator shown in Figure 1 presents the number of inhabitants of rural areas per 1 agricultural tractor. The smaller the value, the better. The best result was reported for Iceland (1.8 person per one tractor), and the worst result – for Russia (114 inhabitants per 1 tractor). Thus, the differences between individual countries are significantly large.

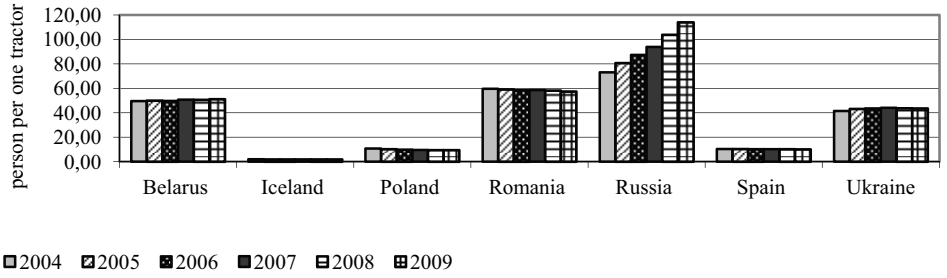

Fig. 1. Number of inhabitants of rural areas per 1 agricultural tractor in selected European countries

Source: as in Table 1.

In developed countries, the share of population working in the country is on the decrease. In 2009, in Iceland, only 4.8% of the population worked in the country, in Spain – 4.2%, but in Poland, as many as 13.3%, and the highest percentage – 29.1% was reported in Romania. In developing countries, for many residents, rural areas also perform social functions, masking the actual unemployment rates.

Table 3. Employment in agricultural sector in selected European countries (as per total employment values, in %)

Specification	Employment in agricultural sector in period 2004-2009 (as per total employment values, in %)					
	2004	2005	2006	2007	2008	2009
Belarus	10,5	10,5	10,5	10,5	10,5	10,5
Iceland	6,4	6,5	6,3	5,9	4,6	4,8
Poland	18,0	17,4	15,8	14,7	14,0	13,3
Romania	31,6	32,1	30,5	29,5	28,7	29,1
Russia	10,2	10,2	10,0	9,0	8,6	9,7
Spain	5,5	5,3	4,8	4,5	4,0	4,2
Ukraine	19,7	19,4	17,6	16,7	15,8	15,6

Source: as in Table 1.

In the agricultural sector, value added per worker varied quite significantly from one country to another (Figure 2). The highest indicators were reported in the most developed countries. The result reported for Poland proved to be quite poor, and the only country with poorer values was Ukraine. This stems from excessively high employment rates in the

agricultural sector in Poland and former socialist countries. The calculation of correlation coefficients indicates a minor relationship between the number of tractors and value added per 1 agricultural worker (0.31). A major positive relationship was observed in Spain (correlation coefficient of 0.91), and a major negative relationship - in Russia (-0.97). Thus, each country should be analysed individually.

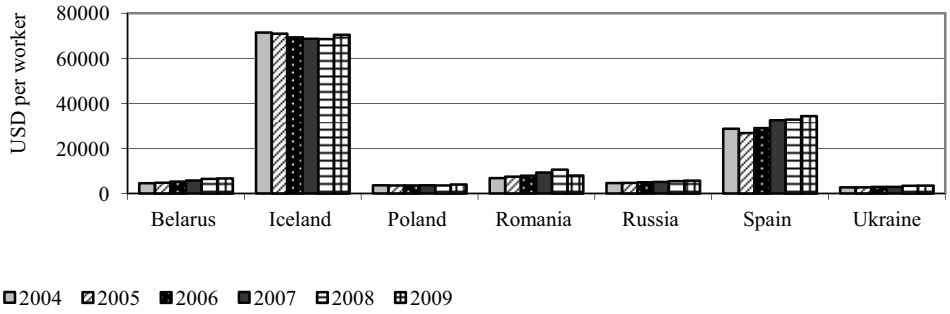

Fig. 2. Value added per agricultural worker in selected European countries (in USD, prices for 2005)

Source: as in Table 1.

In most countries under the analysis, food production was on the increase (Figure 3). Romania, where lower production values were reported, especially in 2008, was exceptional in this regard. Significant growth dynamics were observed in Ukraine whose agricultural land is of high quality. The correlation coefficient between the indices of changes in the number of tractors and the value of food production amounted to -0.41. This proved the existence of a minor negative correlation. This result was achieved mainly due to the decrease in the number of tractors in Russia and Ukraine. In developed countries, such as Iceland, a positive correlation between the number of tractors and the value of food production could be observed (0.94).

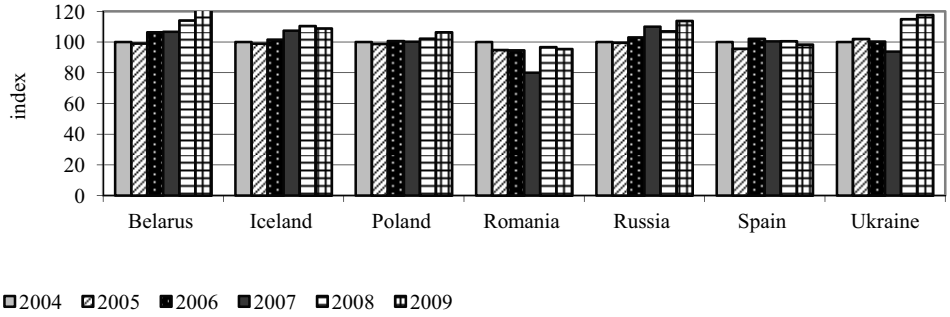

Fig. 3. Dynamics of changes in the value of food production in selected European countries (2004 =100.)

Source: as in Table 1.

In the case of crop production, the trends were similar to those in the production of all food (Figure 4). However, in Romania, where the decline in the value of crop production in 2008 accounted for 58% of production in 2004, the differences became more prominent.

Perhaps as a result of accession to the EU, there occurred some adverse changes in Ukrainian agriculture. Once again, Ukraine showed quite favourable results here. In addition, the correlation coefficient between the indices of the number of agricultural tractors and the value of crop production (correlation coefficient = -0.37) was calculated. The negative correlation was caused either by the decrease in the number of tractors at a similar value of crop production, or vice versa, by the drastic decline in the value of production at a similar number of agricultural tractors. Similarly, as in the case of food production, in the crop production in economically developed countries, there was a minor positive relationship between the number of tractors and the value of crop production (e.g. in Spain – 0.19, Iceland – 0.12, Poland – 0.43).

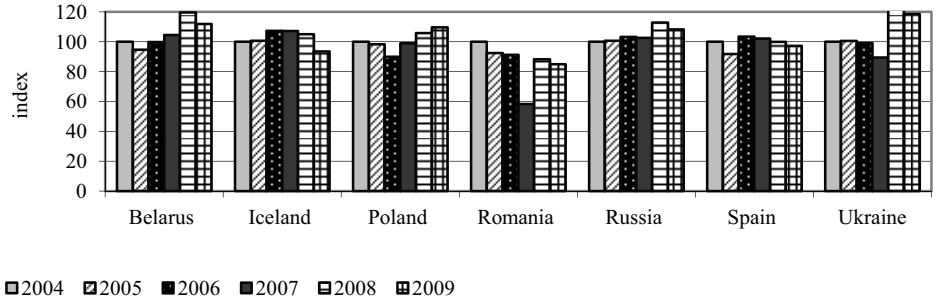

Figure 4. Dynamics of changes in the value of crop production in selected European countries (2004 r. = 100.)
Source: as in Table 1.

Changes in the value of livestock production were not significant (Figure 5). Stagnation can be observed in most countries. Even in Romania, similarly as in Ukraine, the situation was stable. The only exception was Belarus where the value of livestock production in 2009 increased by 29% as compared to 2004. The correlation coefficient between the indices of changes in the number of tractors and the value of livestock production showed a minor negative relationship (-0.37). This result can be explained in the similar manner as in the case of correlation of the value of total food production and the value of crop production. Similarly, in developed countries, the correlation between these values was positive: for Iceland – 0.93, Poland – 0.55, Spain – 0.04.

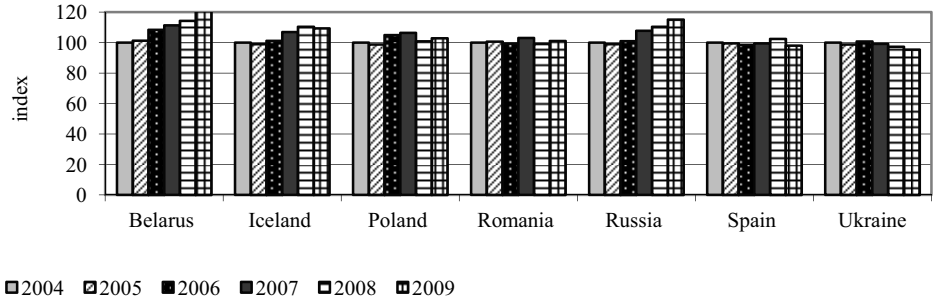

Fig. 5. Dynamics of changes in the value of livestock production in selected European countries (2004 r. = 100.)
Source: as in Table 1.

The results regarding the correlation between the number of tractors and the value of production enable us to conclude that there were differences across countries, and each case should be treated individually. The level of economic development of the country appears to be a crucial factor.

Summary

Technical advancement, including mechanisation, is one of many elements influencing progress in agriculture. Distinguishing the impact of one type of progress from another is difficult and requires application of complex mathematical models. This paper focuses on tractors, i.e. means of transport indispensable in modern agriculture. The author analyses the number of tractors, without regard to their age, power or technical condition. Disproportions occurred across countries under the study. The largest number of tractors per 100 km2 of agricultural land was observed in Poland (979 units in 2009), and the smallest – in Russia (15 units in 2009). The degree of importance of agriculture in the overall economy of individual countries was also variable, as evidenced by the share of employees of the agricultural sector in the total working population.

In the analysed population, production results were not in correlation with the number of tractors. When examining the relationship only in some selected countries, the author discovered the existence of differences in the correlation between the number of tractors and the value of agricultural production. The resulting correlation values for developed countries were positive, whereas in the case of developing countries, the values were negative. Thus, the number of tractors influences the value of agricultural production in harmonised economies. Nevertheless, we should also consider a number of additional factors, such as price volatility, weather conditions, etc.

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The growth and performance of the Belarusian agro-food industry in 2004-2012

Abstract. This paper provides an analysis of agro-food industry growth in Belarus, which is one of the key industries in the economy. Such an analysis allowed us to understand the main forces of relatively successful development. We pointed out that state owned companies in the Belarusian agro-food industry operate as *de facto* strongly integrated corporate groups which ensures reliable supply of raw materials. In addition, we looked at the government directed lending programs which, through allocation of credit, push funds toward priority subsectors.

Key words: Belarusian agro-food industry, food processing, competitiveness.

Introduction

The data analysis showed us that the development of the Belarusian national agro-industrial complex fully depends on exports. Almost all successful food-processing enterprises made a major profit in external markets due to the much higher consumer prices there compared to the lower costs of production in Belarus.

Belarus has a small domestic food market and a rather high agro-food output that is above consumption level in many sectors (milk, sugar, meat etc.). Therefore the growth prospects of the industry depend heavily on its export capabilities, but they are also limited by a greater vulnerability to external shocks, especially when they coincide with increased export concentration.

In 2012 food products accounted for over 10% of total Belarusian exports. Russia remains Belarus's largest trading partner, accounting for more than 80 percent of food exports, whilst another 11 percent is accounted for by members of the Commonwealth of Independent States (CIS)[3] [National Statistical Committee of the Republic of Belarus 2013].

Milk, meat and sugar industries are export-oriented and the most profitable, but there is little trade diversification. Russia purchases up to 95 % of certain food products. Other important markets are Kazakhstan and Ukraine, in which the Belarusian food industry has strong advantages. It is obvious that the dependence on the Russian market will increase in future years: particularly after the formation of the Eurasian Economic Union in 2015.

The government has a strong influence on the food industry, maintaining social stability. It limits consumer food prices and forces companies to supply the domestic market. This is feasible because the government owns the main share of the total capital.

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103, Kazintsa Str. 220108, Minsk, Belarus
3 The statistical data include: Armenia, Azerbaijan, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan.

Obviously export was the only possibility for generating enough profit, since internal prices during some periods remained much lower than production costs [Shpak, Pilipuk, Baranova 2012].

Recent years have shown that agro-food industrial performance in Belarus has remained strong since 2005. Industrial productivity growth was broad based and driven by improvements to the existing enterprises rather than by new entities.

The principal issue of this paper is to delve deeper into the competitive advantages of the Belarusian food industry. It attempts to analyze available data about the main growth and productivity drivers of the Belarusian agro-food industry and enterprise restructuring; as well as the state system of enterprise support, which is key to understanding the economical and social interplay between the state and the agro-food industry in Belarus. The other part of the article includes a general analysis of food trade performance, including changes in the trade patterns, issues of export diversification and factors regarding export growth. The period of analysis covers 2004-2012. The main section reviews the government's policies that have been largely responsible for a solid agro-food industrial performance. The analysis is based on data from national statistical sources.

Performance of the Belarusian food industry

The solid agro-food industrial performance reflects the peculiarities of its state-led economic policy, a favorable external environment and robust growth in neighboring Russia – a key trading partner.

After 2000, the Belarus food industry increased both investments and profitability. Industrial output more than doubled in the years between 2000 and 2012. This was accompanied by higher investment growth and improved profitability. The output grew on average at 8 percent p.a, and its structure was stable during the last decade. The largest sub-sectors (meat, dairy, animal feed and beverages) generated more than 74 percent of total output (Figure 1). Two of them (meat and dairy) represent 75% of total exports by the food industry (Figure 2).

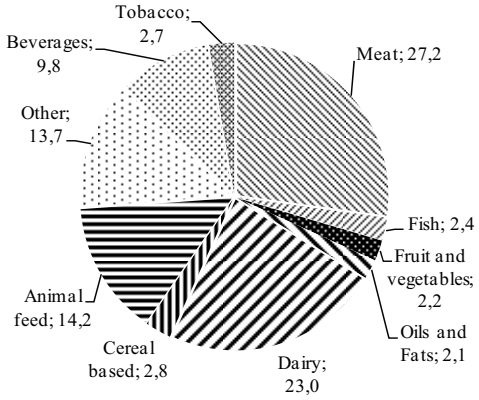


Fig. 1. Contribution to industrial output in 2012, by sub-sector

Source: own work based on National Statistical Committee data.

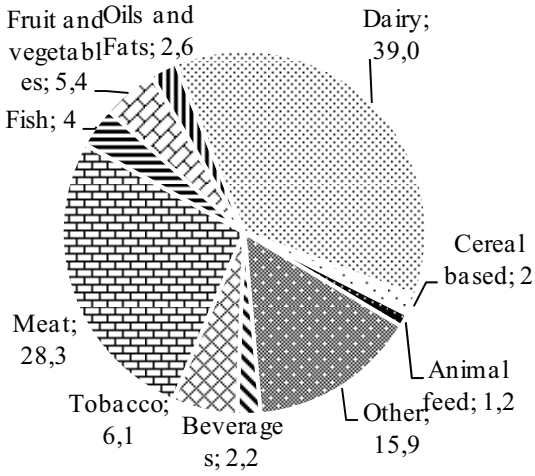
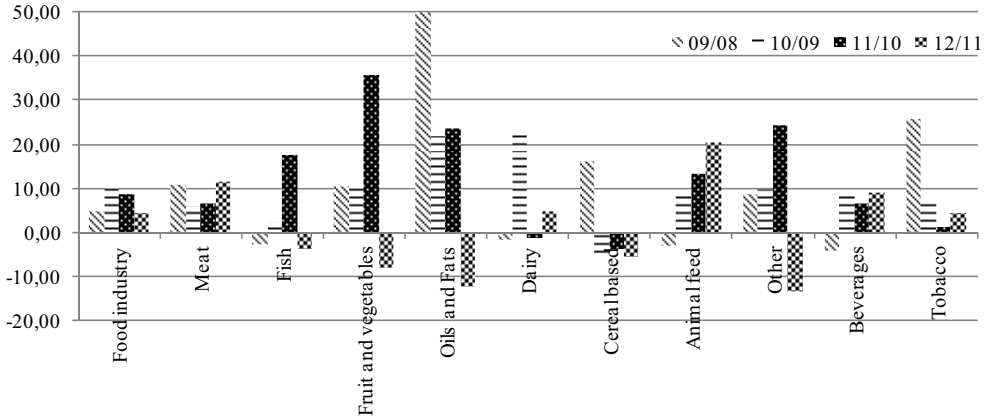


Fig. 2. Contribution to industrial export in 2012, by sub-sector

Source: own work based on National Statistical Committee data.

Detailed analysis of the growth dynamics detects extremely unstable trends in sub sectors (Figure 3). Significant variations in output occurred in almost all sectors. Two main factors impacted upon the industry: fluctuations in the external markets and the modernization of production facilities by means of various government schemes.

Fig. 3. Measures of industrial growth of total industry production.



Source: own work based on National Statistical Committee data.

The government built an efficient system of support and control, at the heart of which is an assurance of growth in quantitative output indicators (targets). But the real performance in the food industry showed that the main factor in meeting those targets was the growth of exports.

For example, the oilseed industry demonstrated a result of the support in 2008-2009 The production of rapeseed oil almost doubled in 2009 to 139.1 thousand tons. Exports increased sharply, three times, to 81.4 thousand tons to the value of $53 million [Pilipuk 2009; Pilipuk, Karpovich 2010].

Recent growth in global demand was accompanied by a surge in output and profitability in externally oriented sectors. Major winners were the sectors that gained from strong world market prices for dairy, meat, oils, sugar and others.

Belarus's food export growth rates were high during the last decade (Figure 4).

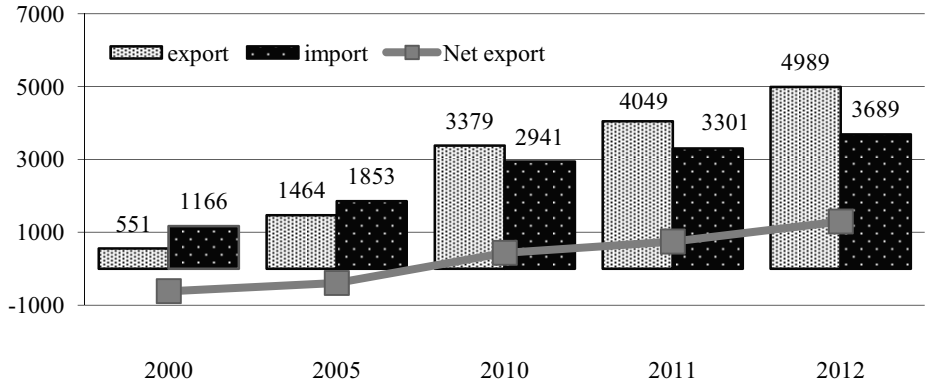


Fig. 4. The evolution of foreign trade of the Agro-food Industry of Belarus (million US dollar)

Source: own work based on National Statistical Committee data.

The exchange rate policy, which provided for a gradual real term depreciation of the Belarusian ruble against both the Euro and the Russian ruble, also supported export growth.

The commodity structure of exports has shifted further towards meat and dairy products. Total food exports have grown more than 10 times during the previous 15 years (Figure 5). Meat and dairy exports rose 17 times to $3.5 billion. These two groups were responsible for more than 50 percent of total Belarusian food exports in the last five years. But there is little trade diversification. Belarusian exporters generally managed to keep a significant (albeit declining) share of the Russian market. The main reasons are strong historical relations, similar preferences of consumers and lack of trade obstacles because of customs union. So Russia still purchases up to 80 percent of all food products.

The reason is a strong import demand in Russia, where Belarus has preserved privileged access, which was secured in the mid-1990s, while Belarus continues to operate a complex system of non-tariff import restrictions.

Other important markets are Kazakhstan and Ukraine. Exports to European markets remain low, on a level of about 5 percent. In 2012 they amounted to 283.5 million US dollars. The main shares being occupied by rapeseed oil, casein, bilberries and chanterelles (22, 18, 8 and 6 percent respectively).

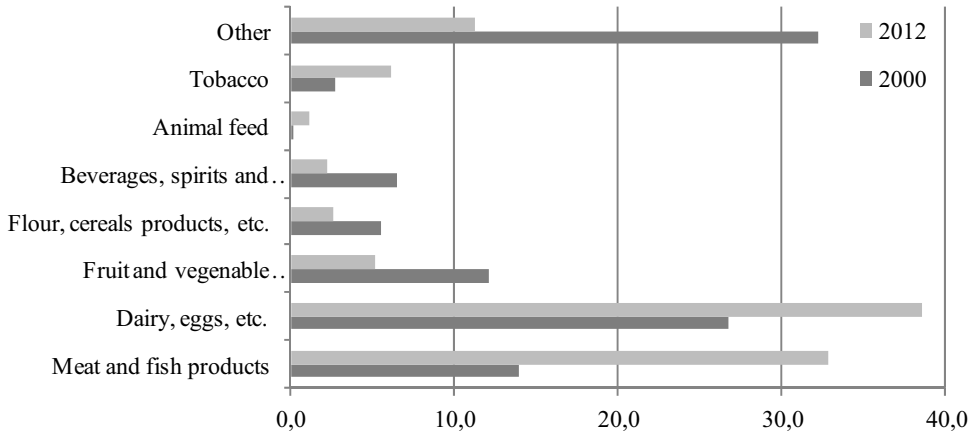


Fig. 5. Commodity structure of food export

Source: own work based on National Statistical Committee data.

However, the growth was increasingly driven by the expansion of the dairy-processing industry on the heels of domestically subsidized milk and high world milk prices. The dairy and meat processing sector's contribution to total industrial output accounts for 50 percent, reflecting an increase in the importance of the sector as regards tax revenues and export earnings (more than 70%). The problem is that the sector's expansion was based largely on purchasing meat and milk at subsidized prices for processing and exporting the processed goods at high world prices. This has been a highly profitable business in Belarus, but it has also made Belarus's food processing and industrial growth highly dependent and, therefore, vulnerable to (i) reductions in the levels of subsidy to agriculture (ii) drops in world milk prices (iii) increases in Russian agricultural production and, therefore, reduced demand for Belarusian food.

As we could see in almost all sub sectors the conditions of external markets were the main drivers to economic growth. The dairy industry is the most dependent on exports. Since 2008 more than a half of its production has been sold on external markets (68.4 % in 2012) [Pilipuk at al. 2011, Baranova 2010].

The analysis shows that the strong growth in the industry during the last decade was primarily driven by productivity. As we could see, almost all growth was generated by productivity gains, with employment levels practically unchanged (Figure 6).

The system of massive enterprise subsidies, some improvements in the business environment and significant improvements in the areas of consumer demand and tax policy are also responsible for the industry growth.

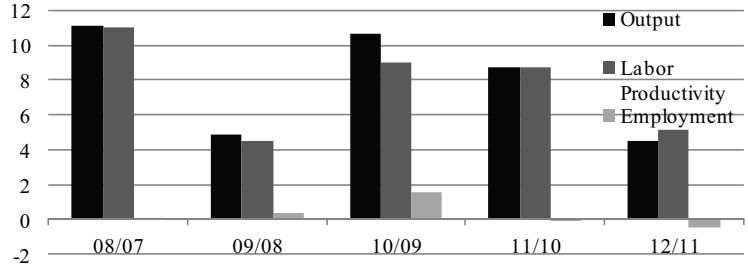


Fig. 6. Indices of output, labor productivity and employment increases in Food industry, increases over the period, percent

Source: own work based on National Statistical Committee data.

Increased capacity utilization complemented strong growth in labor productivity, but utilization is now closer to capacity and the existing capital stock needs renewal and replacement. In 2005-2012 capacity utilization in the industry increased by more than 25 percentage points to reach an average level of 70-75 percent (Figure 7). Thus, better capacity utilization could also directly explain a significant share of the observed overall industrial growth in that period.

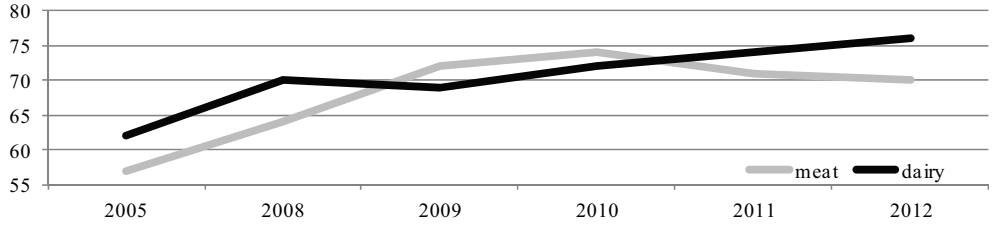


Fig. 7. Capacity utilization (percent) in main sub-sectors (dairy and meat industry)

Source: own work based on National Statistical Committee data.

Restructuring in food Industry

According to the practice of other transition countries, the first stage of enterprise restructuring (often called "defensive restructuring") is typically divestiture of non-core assets and activities, shedding excess labor, and closing down at least some of the chronically unprofitable firms [World Bank, 2008]. The Belarus government's preferred alternative policy of "enterprise consolidation" forces better performing enterprises to take over some loss-makers and does not allow downsizing of the acquired loss-making units. The losses are absorbed by larger enterprises and in many cases the management of combined assets is improved.

In the last few decades the government has been implementing a top-down approach towards food industry restructuring and consolidation. As a result, more than 100

unprofitable companies in sub sectors were assimilated by 2013 and now work as branches of effective enterprises. The last trend of restructuring is a merging of all state owned food enterprise companies which are located in each administrative region (Brest, Vitebsk, Gomel, Grodno, Minsk, Mogilev). In 2013, nine holdings were organized which include 69 organizations, generally in two main industries (dairy and meat), and there are some arrangements in hand towards merging them all into one Belarusian Meat-Dairy Company in 2015.

The other side of restructuring reflects improvements in the enterprise product mix. For example, the share of innovative products in the output of the Food Industry has tended to increase in the last decade (to 7.3 % in 2012). There are two factors which have influenced product innovation in the Industry: state enterprise support in the form of directed credits and the increase in the external demand for food in Russia. But research shows real risks associated with the practice of administratively set targets for food enterprises (targets for output, average wage growth etc.). One is the heavy reliance on the obligation of Government Owned Enterprises to purchase all raw materials from agriculture at fixed prices, even if the quality is low. A significant problem is also the loss-making enterprises which are a source of various forms of non-payments – undermining the ability of more efficient food processing companies to invest and grow.

Consequently, government policy of output targets leads to expanded outputs beyond the level justifiable by the existing demand. It results in over-production and excessive, expensive build-up of inventories which become an additional tax on the availability of an enterprise's working capital.

A strong system of food security was built by the government in the last two decades and the Food Industry is one of the most important parts of it. The goals are similar to the system in other developed countries, but the methods are different, because of the dominance of state property in agriculture and the food industry. As we could see the government has made significant institutional changes in the administration of state enterprise support in order to join WTO. However, if a state company uses any kind of government support, in most cases they have to increase the share of government ownership. The main channels for state enterprise support in Belarus are budget subsidies and tax incentives, budget interest rate subsidies and budget spending on repayment of guaranteed credits (called guarantees) [4].

In many cases the support was efficient, and brought high development trends in agro-food sub sectors, because of a strong designated system of monitoring and evaluation under the Ministry of Agriculture, which verifies recipients' performance with the agreed targets and produces regular monitoring reports. We still agree with the view of the World Bank [World Bank, 2010] about the potential risk of gaining unattractive features in the country's investment climate and it is bound to become a stumbling block for Belaruss' external trade negotiations, both globally (WTO) and regionally (Single Economic Space).

[4] Real high credit interests stimulate companies to use government support in return for share in capital. Particularly if the Government has 100% of the share, the support will cost nothing.

Competition

Favorable global demand and export prices increase competition in the Food Industry. In foreign markets it leads to a loss of food market share by the Belarusian Food Industry. One of the important reasons was the requirements of the supply chain, which Food Processing Companies couldn't follow – especially in relation to constant quality, regularity and predictability of supply.

The fundamental problem is that the system of management in agro-food companies does not focus on maximizing the value of enterprises as the main market-based incentive. This creates a system of incentives strongly biased towards production and some technical modernization.

According to the survey undertaken by the Institute for Privatization and Management (IPM) in 2007, the top three objectives were growth (55 percent), securing good wages for employees and technical modernization (45 percent each) [World Bank, 2010]. Therefore within industries competition remains limited. Liquidation and bankruptcy in agro-food industries isn't allowed by the Government in most cases, and loss-makers continue to rely on various sorts of government support[5]. Most enterprises are still fully controlled by the Government. All sorts of formal and informal controls limit their flexibility regarding adjustments in staffing, wage levels, and the redirection of sales to new regional markets within the country.

The other problem for the industry is price controls in the retail segment, including controls of retail margins which appeared stricter than controls over producer prices. In order to overcome the administrative monthly ceilings for price increases, companies make small changes in products, even just in their names, and increase the price of the "new" products.

For example, we could look at the performance of the dairy industry. Administrative controls are used by the Government with regard to pricing and milk procurement. Price regulation is biased towards households (by keeping low retail prices) and farmers (fixed procurement prices for milk), which puts milk processors at a disadvantage. This became particularly obvious after the devaluation of the Belarusian ruble in 2011 [Shpak, Pilipuk, Baranova 2012].

Summary and conclusions

The Belarusian Food Industry is an important sector which spans a wide range of economic activities. The important feature of the industry is the high state share in the total capital of the sectors' enterprises (70%). The country focuses on the development of major (large-scale) processing. Small and medium-sized enterprises' share in total output is less than 7%. Overall, agro-food industrial performance in Belarus during 2000-2012 remained strong. High rates of output expansion were driven primarily by strong external (mostly Russian) demand for Belarusian food and strong growth in labor productivity.

[5] For example, the flax processing industry (43 enterprises) wades through deep debts above U.S. $30 million of overdue liabilities. Total financial debt in October 2013 amounted to more than U.S. $150 million. Despite the fact that the state provides price support from $200 to $1800 per ton of fiber, they agreed with a large-scale restructuring program for 2014-2015 with funding of about U.S. $200 million [Kukresh, Kazakevich 2014].

There are some flourishing domains of which we can be proud. For instance, the dairy, meat and sugar Sub-sectors. Moreover, consumer preferences are evolving very quickly and are becoming more demanding and sophisticated. The industry needs to adjust and adapt to these circumstances.

The Government has made a significant effort to improve the competitiveness of sub-sectors of the agro-food industry through the system of direct state planning, financial support and control of performance targets of output, profit and productivity.

The production structure in nearly all sub sectors was consolidated in order to move the resources of the weakest enterprises to better management and by exploiting additional economies of scale. Such targets were strictly controlled and this system was efficient due to favorable conditions in the markets (domestic and foreign).

However, our research indicates that competitive pressures on Belarusian exporters will become stronger in the long term. The future prospects for the growth of Belarusian exports to Russia and Kazakhstan may be lowered because of their strategies of increasing food production up to a level of national food independence.

Consequently, competitiveness of the industry links to the ability to penetrate export markets. The other side is that state controls limit flexibility and the attractiveness of major Belarusian Food Companies to external business partners, and it also undermines incentives for restructuring and global integration.

Going forward, the main strategic question would be about the role of the government in boosting the competitiveness of the Agro-Food Industry and supporting the food security of Belarus. The important thing is to direct government support towards existing, and new, sub sectors of the food industry so as to strengthen their comparative advantages. The strategic goal is to generate enough profit to allow for adequate reinvestment to maintain, or even expand, the current market share in domestic and/or foreign markets.

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Visegrad countries - agrarian foreign trade development in relation to their total merchandise trade performance

Abstract. The paper analyzes merchandise and especially agrarian trade of Visegrad (V4) countries. It especially analyzes their mutual trade relations. The main aim is to identify changes in the agricultural sector which have happened during the last decade and to compare differences existing in the area of merchandise and agricultural trade development. Another very important objective is related to mutual trade realized among V4 countries. In this case the paper identifies basic trends in the area of each country's trade development. Mutual agrarian trade competitiveness is also analyzed. On the basis of the findings, it can be said that merchandise and agricultural trade for each V4 country changed significantly during the analysed time period. In relation to agricultural trade it can be mentioned that it represents only a marginal part of the total merchandise trade. Agrarian trade for individual V4 countries' commodity structures as well as the territorial structure are very significantly concentrated. The predominant majority of agricultural trade – export as well as import – is carried out with EU countries. In this case it is necessary to emphasize that V4 countries are also important trade partners for each other. On the basis of Visegrad countries' mutual trade analysis it is possible to say that the main traders active on the V4 market are the Czech Republic and Slovakia. The most competitive actors operating in the V4 market are Poland and Hungary. If we analyze each country's export performance we can see that the V4 market is dominated by Poland and the Czech Republic.

Key words: Visegrad, V4, agriculture, food, merchandise, trade, mutual, external, EU, competitiveness, Poland.

Introduction

Visegrad countries (Czech Republic, Hungary, Slovakia and Poland) represent a specific group of countries. They are located in the center of Europe and they have very intensive historical, economic and political relations. They have in recent years undergone dramatic development, which has significantly influenced the structure of their economy, including the agricultural sector and trade in agricultural products. Immediately after the collapse of the "Eastern bloc", all V4 countries faced a significant economic downturn that coincided with the collapse of the former socialist system and its market linkages. Their economies and especially their agrarian sectors suffered significant losses in the process of the transition from a centrally planned economy to a market economy – as has been highlighted, for example, by Pokrivcak, Ciaian [2004]; Ciaian, Swinnen [2006]; Ciaian, Pokrivcak [2007]; Bojnec, Ferto [2009]; Basek, Kraus [2009]; Bartosova et al. [2008].

The process of restructuring of each V4 economy significantly affected/influenced their merchandise and also agricultural trade performance. The changes pertained to both exports and imports [Pokrivcak Drabik 2008; Drabik, Bartova, 2008]. The share of agricultural exports in total exports in the case of the V4 countries fell below 10%. A very

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important factor characterizing V4 foreign trade activities development was the growth of their dependency in relation to the EU and the reduction of non-EU countries' share in their foreign trade performance [Bussiere, Fidrmuc and Schnatz 2005].

The EU share in total agrarian trade of the V4 countries increased mainly because of the integration process of the former Eastern European countries into the European structures [Pohlova, Tucek, Kraus 2007]. The EU accession brought about significant changes in merchandise and agrarian trade for individual countries. The Czech Republic, Slovakia, Hungary and Poland became part of the EU single market, and all the obstacles that had limited the movement of goods between them and the EU countries up to that time, ceased to exist [Svatos 2008].

The mutual links among Visegrad countries represent an important part of each countries' economy. Regardless their EU membership, individual Visegrad countries are important partners for each other in all areas of their economy.

The paper is concentrated on the agricultural trade of the Visegrad group. Agrarian trade performance is analyzed from two different perspectives (agrarian trade vs. total merchandise trade) and each perspective is analyzed in three different dimensions (V4 market, EU market and third countries). The main objectives of the paper are the identification of basic development trends related to individual V4 country's agrarian export; import and trade balance value and structure development (the analysis is conducted in respect to individual country's total merchandise trade performance). The paper also identifies the distribution of an individual country's comparative advantages distribution (in this case the paper is focused especially on the agrarian trade competitiveness analysis).

Methodology and objectives

The conducted paper analyzes the mutual trade relations existing among V4 countries. The main aim of the paper is to identify changes in their agricultural sector which happened during the monitored time period and to compare differences existing in the agricultural sector and in trade development. Another aim of the paper is related to mutual trade relations. In this case the paper identifies basic trends in trade development. Mutual agrarian trade competitiveness is also analyzed. The main idea of this part of the analysis is to identify the impact of past years' development on mutual agricultural trade development and relations.

The paper is divided into two basic parts. The first part analyzes individual Visegrad countries' agricultural trade development both in relation to the EU and to the rest of the World. The second part of the paper analyzes mutual trade development existing between Visegrad countries. Each Visegrad country's merchandise and especially agricultural trade performance is analyzed both in relation to the total Visegrad market and in relation to individual members of the Visegrad group. The paper also analyzes individual Visegrad foreign trade commodity structures. The commodity structure is analyzed according to the SITC, rev. 3 nomenclature. The basic division of agricultural trade according to SITC is the following: for the purpose of this paper the commodity structure is divided into 15 sub-groups.

The paper analyzes individual Visegrad countries' merchandise and agricultural trade performance and competitiveness during the last ten years or more. Individual time series are analyzed through the basic and chain indices (the average values of inter-annual growth

rate related to individual countries' characteristics are analyzed through the geomean). Individual countries are compared to identify changes existing among them. Except for each country's export and import performance, the paper also analyzes the Visegrad countries' mutual trade performance and their mutual trade relations. The paper analyzes especially the mutual agricultural trade competitiveness of Visegrad countries.

Table 1. SITC rev. 3

Commodity Code	Commodity Description
S3-00	LIVE ANIMALS
S3-01	MEAT, MEAT PREPARATIONS
S3-02	DAIRY PRODUCTS,BIRD EGGS
S3-03	FISH,CRUSTACEANS,MOLLUSC
S3-04	CEREALS,CEREAL PREPRTNS.
S3-05	VEGETABLES AND FRUIT
S3-06	SUGAR,SUGR.PREPTNS,HONEY
S3-07	COFFEE,TEA,COCOA,SPICES
S3-08	ANIMAL FEED STUFF
S3-09	MISC.EDIBLE PRODUCTS ETC
S3-11	BEVERAGES
S3-12	TOBACCO,TOBACCO MANUFACT
S3-41	ANIMAL OILS AND FATS
S3-42	FIXED VEG. FATS AND OILS
S3-43	ANIMAL,VEG.FATS,OILS,NES

Source: UN Comtrade, 2014.

The competitiveness analysis of individual Visegrad countries' foreign trade is realized through two indices - Balassa index and Lafay index of "revealed" comparative advantage. These indices are selected for this study for the following reasons: Firstly, they allow us to conduct the competitiveness analysis using available data. Secondly, these indices complement each other. Balassa index [Balassa 1965] estimates competitiveness of export flows of individual V4 countries in relation to the EU, the rest of the world and the Visegrad market. The Lafay [Lafay 1992] index can be used for bilateral trade relations competitiveness existing directly among individual V4 countries.

The Balassa index tries to identify whether a country has a "revealed" comparative advantage rather than to determine the underlying sources of comparative advantage [Qineti, Rajcaniova, Matejkova 2009]. The index is calculated as follows.

$$RCA = (X_{ij} / X_{it}) / (X_{nj} / X_{nt}) = (X_{ij} / X_{nj}) / (X_{it} / X_{nt}) \quad (1)$$

where x represents exports, i is a country, j is a commodity and n is a set of countries, t is a set of commodities. RCA is based on export performance and observed trade patterns. It measures a country's exports of a commodity relative to its total exports. If RCA>1, then a comparative advantage is revealed.

The next index is the Lafay index. Lafay index is a very useful instrument for the analyses of trade competitiveness between two countries. Using this index we consider the difference between each item's normalized trade balance and the overall normalized trade balance [Zaghini 2003]. For a given country, *i,* and for any given product *j*, the Lafay index is defined as:

$$LFI\ {}^{i}_{j} = 100 \left(\frac{x^{i}_{j} - m^{i}_{j}}{x^{i}_{j} + m^{i}_{j}} - \frac{\sum_{j=1}^{N} (x^{i}_{j} - m^{i}_{j})}{\sum_{j=1}^{N} x^{i}_{j} + m^{i}_{j}} \right) \frac{x^{i}_{j} + m^{i}_{j}}{\sum_{l=1}^{N} x^{i}_{j} + m^{i}_{j}} \tag{2}$$

where x^{i}_{j} and m^{i}_{j} are exports and imports of product *j* of country *i*, towards and from the particular region or the rest of the world, respectively, and *N* is the number of items. Positive values of the Lafay index indicate the existence of comparative advantages in a given item; the larger the value the higher the degree of specialization. On the other hand, negative values point to de-specialization [Zaghini 2005].

The paper is based on the long term research (cc 5 years) conducted at the faculty of economics and management. Both authors are summarizing their findings related to Visegrad countries' trade performance. The paper is closely related to several papers which have already been published [Smutka 2014; Smutka, Svatoš, Qineti, Selby 2013; Svatoš, Smutka, Elshibani, Mousbah 2013; Svatoš, Smutka 2012a; Svatoš, Smutka 2012b etc.].

Development and structure of merchandise trade of the Visegrad group countries with a focus on agricultural trade

The countries of the Visegrad group are representative of the new member countries of the EU. A general characteristic of such countries is their very significant orientation toward foreign trade, which is primarily significant in the case of the Czech Republic and Slovakia, as well as in the case of Hungary. Poland also likewise significantly engages in foreign trade activities, however, the share of foreign trade in the Polish GDP is significantly lower in comparison with the share of foreign trade in the GDP of the other three countries. If we analyse the commodity structure of merchandise trade of the V4 countries, we find that it is dominated by trade in processed industrial products, especially in relation to the EU. Another interesting finding that pertains to the development of goods trade of the Visegrad group countries is the fact that the average year-on-year rate of growth in merchandise trade of the V4 countries significantly exceeds both the average year-on-year rate of growth in the world merchandise trade, as well as the average year-on-year rate of growth in the goods trade of EU countries.

Thus, this also shows a significant increase in the value of effected trading operations in the years 2000 – 2010, when, in the case of exports, there was an increase in value from 100 billion USD to almost 500 billion USD (in the year 2008). In the case of imports, the value increased from 125 billion USD to approximately 530 billion USD (in the year 2008). It is also appropriate to mention that in terms of merchandise trade – the V4 group leaders are undoubtedly Poland and the Czech Republic.

Table 2. Development of value and structure of foreign trade (export and import) of Visegrad group countries in the years 2000 – 2010

Export		mld. USD	2000 Export	2004 Export	2008 Export	2010 Export	tempo růstu	2000 Import	2004 Import	2008 Import	2010 Import
CR	EU27	Agricultural products	0.86	1.89	5.08	4.51	1.180	1.12	2.59	5.98	5.64
		Fuels and raw materials	1.79	3.42	7.75	8.12	1.163	1.45	2.8	6.1	5.18
		Processed industrial products	22.31	51.84	108.3	95.11	1.156	21.31	42.87	81.67	65.45
SR	EU27	Agricultural products	0.32	0.89	2.24	2.39	1.223	0.59	1.07	3.03	2.82
		Fuels and raw materials	1.17	2.52	4.97	4.69	1.149	0.51	1.43	2.92	3.22
		Processed industrial products	9.17	20.75	52.59	46.82	1.177	7.81	17.75	37.1	28.11
Hungary	EU27	Agricultural products	1.32	2.52	5.68	5.25	1.148	0.55	2.02	4.29	3.82
		Fuels and raw materials	0.9	1.68	3.68	3.51	1.146	0.84	1.72	3.86	3.36
		Processed industrial products	20.94	41.87	68.11	59.38	1.110	19.72	40.35	59.17	44.57
Poland	EU27	Agricultural products	1.6	4.52	13.07	13.27	1.236	1.81	3.2	9.57	8.86
		Fuels and raw materials	2.2	5.29	9.31	8.61	1.146	1.66	2.83	8.88	6.18
		Processed industrial products	21.53	49.47	108.7	102.12	1.168	29.82	54.62	109.08	87.6
CR	World	Agricultural products	1.11	2.18	5.53	4.94	1.161	1.56	3.27	7.1	6.65
		Fuels and raw materials	1.91	3.63	8.13	8.69	1.164	4.13	6.47	18.45	15.19
		Processed industrial products	26.03	59.96	132.43	118.51	1.164	26.55	56.97	116.28	103.85
SR	World	Agricultural products	0.37	0.98	2.37	2.49	1.210	0.71	1.47	3.97	3.97
		Fuels and raw materials	1.22	2.59	5.19	4.84	1.148	2.73	4.78	11.36	10.55
		Processed industrial products	10.3	24.29	62.64	56.67	1.186	9.33	23.21	57.28	49.86
Hungary	World	Agricultural products	1.96	3.41	7.12	6.5	1.127	0.92	2.29	4.7	4.12
		Fuels and raw materials	1.02	2.08	5.33	4.5	1.160	2.13	5.34	10.69	10.74
		Processed industrial products	25.12	49.98	95.76	83.7	1.128	29.03	52.62	93.39	72.5
Poland	World	Agricultural products	2.43	6.11	16.13	16.79	1.213	2.86	4.95	13.6	13.08
		Fuels and raw materials	2.48	5.94	11.01	10.07	1.150	6.91	11.11	30.18	24.18
		Processed industrial products	26.05	61.73	144.72	130.21	1.175	38.36	72.1	166.7	136.87

Source: Comtrade, own processing, 2012.

In relation to the position of agricultural trade of the Visegrad group countries within the overall merchandise trade, it may be stated that likewise as in the case of the global and European market, agricultural trade represents only a supplement. In the case of total exports and imports, agricultural products have approximately a 7% respectively 6.2% share in the total value. In this regard, it is important to state that the value of both agricultural exports as well as imports of the V4 countries is dynamically increasing. Just in the years 2000-2010, the value of agricultural export of the V4 countries increased from USD 6 billion to more than USD 30 billion, and in the case of agricultural import, there

was an increase in the traded value from USD 6 billion to 28 billion. In terms of their own development of agricultural trade, the V4 countries achieve, other than certain exceptions, a positive balance of agricultural trade. Nevertheless, it is appropriate to state that currently, such positive balance is fully to the debit of the agricultural trade of Poland and Hungary, while the agricultural trade of the Czech Republic and Slovakia regularly finishes in negative values.

A specific characteristic of merchandise trade of the V4 countries is the competitiveness of realized trade transactions, both in relation to the market of the EU countries, and in relation to the market of third countries. In this regard, it is appropriate to emphasize that currently, in terms of the development of the value of effected trade flows, the important thing is primarily the ability to retain comparative advantages in relation to the EU market, which represents the main outlet for exports originating from V4 countries.

In the case of the Czech Republic, the most significant EU partners are: Germany, Slovakia, Austria, Hungary, Italy, Poland and Romania (these countries participate in the total agricultural export and import with a share from 75% to 55% respectively). In the case of Slovakia, the most significant partners are: Czech Republic, Austria, Germany, Hungary, Italy and Poland (these countries participate in the agricultural export and import with a share from 85% to 60% respectively). In the case of Hungary and Poland, the territorial concentration on a limited number of EU countries is not as prominent as is the case for the Czech Republic and Slovakia, but, nevertheless, a narrow orientation toward several key members of the EU territory is more than clear. In the case of Hungary, the most significant partners are: Germany, Italy, Romania, Slovakia, Austria, Poland and the Czech Republic (these countries participate in the agricultural export and import with a share from 60% to 65% respectively). And, finally, the most significant Polish trading partners from the territory of the EU countries are: Germany, Czech Republic, France, Italy, Hungary, Great Britain, Netherlands and Slovakia (these countries participate in the agricultural export and import with a share from 60% to 50% respectively).

The data further shows that the individual V4 countries are mutual significant business partners to each other. In the case of the Czech Republic, the countries of the V4 are currently participating with a share of approximately 40-45% in the total agricultural exports and 25-30% of imports. In the case of Slovakia, the share of V4 countries represents approximately 65% for export and approximately 40-45% for agricultural import. Further, the V4 countries also participate in agricultural exports and imports of Hungary with a share of approximately 20%, or 25% respectively. Only in the case of Poland is the share of V4 countries in the actual agricultural export (10-15%) and import (cc 10%) marginal, due to Poland's significantly higher production as compared to the other countries. Polish production significantly exceeds the absorbing capacities of the market of the V4 countries. The reason for the low share of V4 countries in Polish imports is the fact that, in relation to Poland, the V4 countries do not have such significant comparative advantages as it is the other way around.

Table 3 provides information on the development of values of the RCA index in the case of individual goods categories traded by the individual V4 countries. The data shows that comparative advantages are being maintained on a long-term basis by all of the monitored countries primarily in the case of trade in processed industrial products, both in relation to the EU market, as well as in relation to the market of third countries. Trade in fuels and mineral resources is, as a whole, uncompetitive on a long-term basis, both in relation to EU countries, as well as in relation to third countries. As regards agricultural

trade, there we can state that agricultural trade of the V4 countries is currently uncompetitive, both in relation to the EU market, as well as in relation to the market of third countries. Nevertheless, in the case of Poland, the situation is the opposite. Polish agricultural trade, unlike agricultural trade of the Czech Republic, Slovakia and Hungary, is capable of achieving comparative advantages, and, importantly – it is also capable of amplifying them.

Table 3. Competitiveness of commodity structure of goods trade of V4 countries in relation to the EU market and to the global market

Export		RCA	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
CR	EU27	Agriculture	0.41	0.37	0.35	0.35	0.38	0.44	0.43	0.45	0.45	0.44	0.42
		Fuels and Raw mat.	1.08	1.07	1.31	1.01	0.92	0.79	0.74	0.77	0.73	0.97	0.88
		Processed products	1.05	1.06	1.05	1.07	1.07	1.08	1.08	1.08	1.09	1.07	1.08
SR	EU27	Agriculture	0.36	0.37	0.37	0.33	0.42	0.53	0.52	0.47	0.41	0.45	0.44
		Fuels and Raw mat.	1.66	1.72	1.64	1.40	1.60	1.33	1.10	0.99	0.94	1.09	1.02
		Processed products	1.01	1.01	1.02	1.04	1.01	1.02	1.04	1.06	1.07	1.06	1.07
Hungary	EU27	Agriculture	0.68	0.72	0.62	0.63	0.63	0.63	0.61	0.79	0.79	0.75	0.77
		Fuels and Raw mat.	0.59	0.58	0.56	0.54	0.56	0.58	0.45	0.56	0.54	0.58	0.60
		Processed products	1.06	1.06	1.07	1.07	1.07	1.08	1.09	1.06	1.07	1.07	1.07
Poland	EU27	Agriculture	0.75	0.72	0.69	0.72	0.88	1.06	1.12	1.12	1.08	1.05	1.06
		Fuels and Raw mat.	1.31	1.47	1.37	1.24	1.37	1.13	0.95	0.91	0.81	0.74	0.81
		Processed products	1.00	0.99	1.01	1.01	0.98	0.98	0.99	1.00	1.01	1.02	1.01
CR	Others	Agriculture	1.04	0.79	0.50	0.70	0.57	0.65	0.46	0.38	0.31	0.30	0.28
		Fuels and Raw mat.	0.19	0.19	0.20	0.17	0.15	0.13	0.09	0.09	0.06	0.11	0.12
		Processed products	1.16	1.17	1.18	1.18	1.21	1.24	1.28	1.28	1.37	1.30	1.30
SR	Others	Agriculture	0.69	0.65	0.61	0.46	0.42	0.53	0.44	0.23	0.21	0.17	0.16
		Fuels and Raw mat.	0.26	0.28	0.23	0.17	0.12	0.11	0.13	0.09	0.09	0.09	0.07
		Processed products	1.18	1.16	1.16	1.21	1.23	1.26	1.27	1.29	1.37	1.32	1.32
Hungary	Others	Agriculture	2.20	2.08	2.08	1.83	1.62	1.26	1.28	0.72	0.80	0.69	0.76
		Fuels and Raw mat.	0.16	0.15	0.21	0.22	0.26	0.24	0.25	0.25	0.23	0.22	0.19
		Processed products	1.08	1.08	1.06	1.09	1.11	1.17	1.18	1.21	1.27	1.24	1.24
Poland	Others	Agriculture	2.49	2.24	2.10	2.26	1.87	1.74	1.68	1.44	1.29	1.46	1.72
		Fuels and Raw mat.	0.32	0.34	0.32	0.26	0.28	0.20	0.18	0.16	0.18	0.18	0.22
		Processed products	1.02	1.02	1.04	1.04	1.08	1.14	1.17	1.18	1.25	1.18	1.15

Source: Comtrade, own processing, 2012.

It must be emphasized that despite of the fact that Czech, Hungarian and Slovak total agrarian exports are not competitive, the total realized export value of all countries is constantly growing. The reason for this development is the fact that individual items (individual aggregations) representing total agrarian trade are able to get competitive advantage both in relation to global markets and the EU market. The details related to comparative advantage distribution of export items of individual V4 members' agrarian trade are available in the following table (Table 4).

Table 4. Comparative advantage of individual V4 members agrarian exports items (aggregations) in relation to EU members and the rest of the World (the market of so called "third countries")

RCA	EU27				World			
	CR	Hungary	Poland	Slovakia	CR	Hungary	Poland	Slovakia
S3-00	**1.99**	**1.52**	0.73	**1.96**	**3.82**	**5.37**	**2.34**	**9.48**
S3-01	0.49	**1.17**	**1.41**	0.54	0.20	**1.81**	**1.58**	0.33
S3-02	**1.29**	0.45	**1.12**	**1.67**	**4.86**	0.91	**2.27**	**2.43**
S3-03	0.31	0.01	**1.49**	0.08	0.04	0.00	0.30	0.01
S3-04	**1.54**	**2.76**	0.71	**1.93**	0.55	**1.49**	0.44	**1.30**
S3-05	0.41	0.80	**1.11**	0.55	0.60	**1.11**	**1.28**	0.59
S3-06	**2.28**	**2.09**	**1.18**	**3.14**	**1.91**	**1.10**	**1.62**	0.85
S3-07	**1.14**	0.70	0.96	**1.92**	**1.04**	0.28	**1.35**	**2.42**
S3-08	**1.08**	**1.67**	0.51	0.71	0.58	**1.71**	0.57	0.45
S3-09	**1.72**	0.54	**1.13**	**1.20**	**1.74**	**1.22**	**1.78**	**2.60**
S3-11	0.95	0.45	0.29	0.48	**2.60**	0.41	0.67	0.68
S3-12	**2.14**	0.27	**1.76**	0.00	0.74	0.13	**2.16**	0.00
S3-41	0.16	0.63	0.45	**1.05**	0.12	0.37	**2.77**	**1.12**
S3-42	0.63	**1.03**	0.51	0.26	0.28	0.51	0.01	0.02
S3-43	0.74	0.06	0.16	**1.08**	0.31	0.01	0.02	0.08

Source: Comtrade, own processing, 2012.

Mutual merchandise trade of the V4 countries

The following Table 5 provides a detailed overview of realized trade flows between the individual monitored countries and territory of the V4. The mentioned data shows that in terms of the market of the V4 countries, the dominant aggregation being traded is processed industrial products. The share of agricultural trade to the total trade flows realized within the market of the V4 countries only ranges around ten per cent.

In terms of the distribution of comparative advantages within the market of the V4 countries, the Czech Republic achieves long-term comparative advantages in the case of industrial products, and Slovakia achieves comparative advantages in fuels and mineral resources. Hungary has comparative advantages in processed industrial products and agricultural products, and Poland has a comparative advantage primarily in the case of agricultural production. However, the results of the analysis of the distribution of RCA index values within the territory of the V4 countries generally show that all of the countries have a tendency to specialize in trade of processed industrial production, where the value of the RCA index is higher than one or very close to one. In relation to trade in agricultural and food production, the finding is that the Czech Republic and Slovakia do not achieve comparative advantages in terms of agro-trade within the monitored territory. On the other hand, Poland has a continuously growing comparative advantage. In the case of Hungary, we can see strong fluctuations in the RCA index value, which shows that the comparative advantages of Hungarian agricultural trade are gradually fading away. More detailed data pertaining to the development of RCA index values can be found in Table 6.

Table 5. Merchandise trade structure of foreign trade of the V4 countries in relation to the market of the V4 countries

Export		mld. USD	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
CR	V4	Agriculture	0.45	0.49	0.60	0.65	0.90	1.25	1.38	1.94	2.45	1.99	2.13
		Fuels and Raw mat.	0.39	0.49	0.73	0.64	1.02	1.28	1.55	2.06	2.82	2.09	2.78
		Processed products	3.50	4.07	5.20	6.04	8.82	10.56	12.99	17.46	20.74	14.71	16.76
SR	V4	Agriculture	0.23	0.27	0.32	0.41	0.58	0.83	1.04	1.36	1.47	1.51	1.63
		Fuels and Raw mat.	0.72	0.75	0.77	0.96	1.40	1.57	1.96	2.28	3.03	2.11	2.58
		Processed products	2.39	2.49	2.67	3.54	4.74	6.01	8.02	11.11	13.63	11.49	13.49
Hungary	V4	Agriculture	0.21	0.21	0.23	0.27	0.37	0.40	0.52	0.77	1.10	0.88	1.15
		Fuels and Raw mat.	0.10	0.10	0.10	0.13	0.24	0.34	0.29	0.57	0.56	0.39	0.50
		Processed products	1.01	1.24	1.51	2.26	3.36	4.62	7.61	9.26	10.94	7.94	9.30
Poland	V4	Agriculture	0.23	0.26	0.30	0.39	0.66	1.03	1.38	1.68	2.22	2.05	2.20
		Fuels and Raw mat.	0.31	0.40	0.45	0.69	1.17	1.12	1.68	1.76	2.08	1.55	1.93
		Processed products	1.67	1.96	2.31	3.17	4.56	5.94	8.41	11.06	14.04	10.84	13.70
Import		mld. USD	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
CR	V4	Agriculture	0.35	0.37	0.50	0.59	0.76	0.99	1.32	1.62	1.86	1.83	1.77
		Fuels and Raw mat.	0.63	0.71	1.61	1.02	1.59	1.63	1.93	2.25	2.84	1.86	2.22
		Processed products	2.63	2.88	3.62	4.22	5.84	7.01	9.10	12.39	15.07	10.73	12.53
SR	V4	Agriculture	0.32	0.39	0.42	0.49	0.61	0.96	1.04	1.38	1.83	1.60	1.74
		Fuels and Raw mat.	0.27	0.34	0.42	0.59	0.96	0.90	1.14	1.29	1.81	1.22	1.85
		Processed products	1.95	2.35	2.79	3.87	4.58	5.13	6.77	9.18	11.01	8.04	8.80
Hungary	V4	Agriculture	0.11	0.14	0.17	0.24	0.49	0.66	0.76	0.95	1.10	1.03	1.11
		Fuels and Raw mat.	0.29	0.29	0.32	0.42	0.57	0.76	0.95	1.00	1.23	0.85	0.76
		Processed products	1.40	1.60	1.96	2.72	3.79	4.16	6.13	7.21	8.85	6.13	6.93
Poland	V4	Agriculture	0.30	0.26	0.28	0.32	0.39	0.46	0.60	0.89	1.10	0.87	0.94
		Fuels and Raw mat.	0.28	0.33	0.29	0.35	0.61	0.72	0.87	1.15	1.95	1.10	1.49
		Processed products	2.41	2.63	2.89	3.85	5.30	5.95	7.66	9.91	11.89	9.07	10.67

Source: Comtrade, own processing, 2012.

Table 6. Distribution of comparative advantages of individual goods segments carried out by the V4 countries amongst themselves mutually

Export		RCA	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
CR	V4	Agriculture	1.03	1.01	0.96	0.98	0.93	0.95	0.94	0.96	0.98	0.95	0.94
		Fuels and Raw mat.	0.66	0.71	0.83	0.69	0.69	0.79	0.83	0.88	0.96	1.04	1.12
		Processed products	1.05	1.05	1.03	1.05	1.06	1.04	1.03	1.02	1.01	1.00	1,01
SR	V4	Agriculture	0.68	0.79	0.88	0.92	0.96	0.98	1.02	0.98	0.84	0.89	0.88
		Fuels and Raw mat.	1.58	1.56	1.52	1.54	1.51	1.51	1.52	1.42	1.48	1.31	1.27
		Processed products	0.94	0.92	0.92	0.92	0.91	0.92	0.92	0.94	0.95	0.97	0.98
Hungary	V4	Agriculture	1.58	1.40	1.31	1.12	1.03	0.74	0.67	0.77	0.91	0.86	1.01
		Fuels and Raw mat.	0.56	0.47	0.40	0.39	0.44	0.51	0.29	0.49	0.39	0.40	0.40
		Processed products	1.00	1.04	1.07	1.09	1.10	1.11	1.14	1.10	1.10	1.10	1.09
Poland	V4	Agriculture	1.03	1.03	1.02	1.02	1.14	1.27	1.30	1.23	1.26	1.27	1.18
		Fuels and Raw mat.	1.03	1.12	1.09	1.28	1.32	1.12	1.25	1.12	1.00	1.01	0.95
		Processed products	0.99	0.98	0.98	0.95	0.92	0.95	0.93	0.96	0.97	0.96	0.98

Source: Comtrade, own processing, 2012.

Mutual agricultural trade of the countries of the Visegrad group

The following text focuses on a detailed analysis of the commodity structure and territorial structure of V4 mutual agricultural trade. The leader of the agricultural market of the V4 countries is undoubtedly the Czech Republic, which realized a share of over 30%. of total agricultural trade within the V4 countries. Second place is held by Slovakia – which, by way of intensive trade between it and the Czech Republic, had a share of approximately 28%. Poland attained a share of approximately 24% and Hungary had approximately 16%.

The data set out in Table 7 shows that the value of mutual trade among the V4 countries is growing dynamically. In the years 2000–2012, the value of mutual agricultural trade rose from approximately 1.1 billion USD to almost 10 billion USD. If we look at the commodity structure of mutual agricultural trade of the V4 countries in detail, we find that this structure is dominated primarily by trade in the following aggregations: grains, vegetables and fruit, milk and dairy products, meat and meat products, stimulants and beverages. Further, in terms of the dynamics of growth in value, the most distinctly growing aggregations include: meat and meat products, sugar and candy products, live animals, milk and dairy products and vegetable and animal fats and oils.

Table 7. Commodity structure of agricultural trade of V4 countries

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Exports	V4	V4	V4	V4	V4	V4	V4	V4	V4	V4	V4	V4	V4
mil. USD	V4	V4	V4	V4	V4	V4	V4	V4	V4	V4	V4	V4	V4
S3-00	18.7	20.7	26.4	27.50	64	89	143.3	165.6	162.2	149.7	216.5	317.5	361.2
S3-01	51.3	52.3	76.7	87.20	166	376.1	441.4	589.4	821.4	855.6	1050.1	1277.7	1332.9
S3-02	94.2	108.9	120.9	155.80	268.9	416.9	542.5	695.1	887.5	718.2	830.9	991.2	852.3
S3-03	22.3	25.9	28.6	33.50	48.9	60.2	71.3	88	107.5	110.1	114.8	147.1	123.1
S3-04	224.6	212.4	211.3	280.20	354.2	418.2	583.8	877.8	1189.9	873.5	931.2	1431.0	1318.6
S3-05	155.4	188.6	203.4	256.30	373.1	493.3	558.6	735.2	856.5	706.9	765.9	798.2	755.2
S3-06	47.6	57.2	73	79.90	172.7	211.8	315.5	411.3	412.5	435.4	624.4	864.8	1202.6
S3-07	150.2	172.8	195.6	266.80	336.7	409.5	491.4	581.4	683.1	666.3	659.3	857.2	874.6
S3-08	50.8	58.4	64.6	78.30	104.2	141.1	175.1	258.5	372.9	276.8	321.8	437.7	459.4
S3-09	138.6	135.6	165.7	178.60	242.7	341.6	377.7	485.5	638.6	522.9	512.2	630.2	582.9
S3-11	68.4	79.2	101.9	120.50	187.4	267	312.9	438	532.7	487.8	477.7	599.8	565.3
S3-12	61.2	68.2	150	106.40	110.1	188.6	201.7	312.4	282	293.1	271.9	326.1	349.3
S3-41	4	5.4	7.1	11.30	15.6	12.7	14.9	16.3	19.9	23.8	28.9	41.7	39.3
S3-42	31.4	36.1	25.2	34.80	52.9	60	64.7	80.1	225.9	219.6	258.9	553.0	907.3
S3-43	8.5	6.1	6.1	8.70	16.4	19.8	20.1	25.6	40.3	86.7	38.3	57.5	55.7
Total	1127.2	1227.8	1456.6	1726.0	2513.9	3506	4315	5760.3	7233	6426.3	7102.7	9330.8	9779.8

Source: Comtrade, own processing, 2012.

Below, Tables 8 and 10 provide an overview of the development of export, import and the balance of agricultural trade carried out on the market of the V4 countries in the case of each individual country. The tables show the especially bad situation of Slovakia, which has a long-term negative balance in agricultural trade in relation to the V4 countries. In the Czech Republic and Poland, on the other hand, a positive balance predominates. In the case of Poland, this is caused by substantial comparative advantages primarily in relation to the Czech Republic and Slovakia. For the Czech Republic, its positive balance within the territory of the V4 countries is caused by a distinctly positive balance in relation to Slovakia.

Table 8. Position of individual member countries within agricultural trade carried out among the V4 member countries themselves

Mil. USD		2000	2 002	2004	2005	2006	2007	2008	2009	2010	2011	2012	2000-12	Geomean - inter annual growth rate
V4	trade	1127.2	1456.6	2513.9	3506	4315	5760.3	7233	6426.3	7102.7	9330.8	9779.8	61505.4	1.197
CR	export	454.9	603.2	900.8	1249.8	1379.3	1938.1	2446.5	1986.5	2128.2	2850.5	3075.4	20148.6	1.173
CR	import	355.2	465.9	830.5	1065.2	1384.3	1747.5	2127.8	1992.7	2013.2	2505.4	2664.2	18144.7	1.183
CR	balance	99.7	137.3	70.3	184.6	-5	190.6	318.7	-6.2	115.1	345.1	411.2	2004	
Hungary	export	212.7	231.2	369.1	402.4	517.5	774.8	1097.1	876	1148.1	1651.4	1462.4	9218	1.174
Hungary	import	316.3	306.2	443.5	537.1	703.2	947.6	1217.4	945.7	1018.6	2024.9	2143.4	11260.1	1.173
Hungary	balance	-103.6	-75.1	-74.4	-134.7	-185.7	-172.8	-120.4	-69.8	129.5	-373.5	-681	-2042.4	
Poland	export	230.2	300.6	662.3	1026.5	1382.9	1685	2220	2052.2	2197	2600.5	2615.9	17630.5	1.225
Poland	import	120.9	182.5	496.6	763.2	909.7	1221.5	1418.6	1325.5	1499.2	1424.5	1595.3	11349.6	1.240
Poland	balance	109.3	118.1	165.7	263.3	473.2	463.5	801.4	726.7	697.8	1176	1020.6	6280.9	
SR	export	229.4	321.7	581.7	827.2	1035.4	1362.5	1469.3	1511.7	1629.3	2228.4	2626.1	14508.4	1.225
SR	import	334.8	502.0	743.2	1140.4	1317.9	1843.8	2469.1	2162.4	2571.8	3375.9	3376.8	20750.7	1.212
SR	balance	-105.4	-180.3	-161.5	-313.2	-282.5	-481.3	-999.8	-650.7	-942.4	-1147.5	-750.7	-6242.2	

Source: Comtrade, own processing, 2012.

The last part of this paper provides an overview of the distribution of agrarian trade comparative advantages on a bilateral level among individual countries of the Visegrad group. As was stated above, agricultural trade as a whole holds comparative advantages in relation to global markets only in the case of Poland and Hungary. In relation to the market of the V4 countries, only the agricultural trade of Poland has comparative advantages as a whole, and in some years, also Hungarian agricultural trade. Agricultural trade of the Czech Republic and Slovakia as a whole does not have comparative advantages even in within the market of the V4 countries. Nevertheless, it is appropriate to state that agricultural trade as a whole is growing in the case of all of the V4 countries, and not only for imports, but also for exports. The above thus clearly proves the existence of comparative advantage - if not on the level of total agricultural trade, then at least on the level of individual aggregations. Table 9 provides an overview of the distribution of comparative advantages for individual aggregations traded between the monitored countries mutually. In the case of each of the monitored countries, there are 45 flows monitored within 15 aggregations realized between the given economy and its three partners.

The results show (for the year 2012) that the Czech Republic has comparative advantages for 7 monitored aggregations in relation to Hungary, for 6 in relation to Poland, and for 10 in relation to Slovakia. Slovakia has comparative advantages for 8 aggregations in relation to Hungary, 7 aggregations in regard to Poland, and 5 aggregations in relation to the Czech Republic. Hungary achieves comparative advantages in relation to the Czech Republic for 8 aggregations, for 7 aggregations in relation to Slovakia, and for 7 aggregations in relation to Poland. Polish agricultural trade in relation to the V4 countries achieves comparative advantages in the case of the Czech Republic for 9 aggregations, for 8 aggregations in the case of Slovakia, and for approximately 9 aggregations with Hungary.

Table 9. LFI Index – Comparative advantages of agricultural trade among individual V4 countries at the level of individual aggregations representing agricultural trade

2012	LFI	S3-00	S3-01	S3-02	S3-03	S3-04	S3-05	S3-06	S3-07
Slovakia	Czech R.	-0.45	-2.48	0.32	-0.68	0.80	-1.59	6.37	-0.54
Slovakia	Hungary	3.12	1.42	3.12	-0.12	0.13	1.70	7.57	1.95
Slovakia	Poland	4.09	-11.02	-4.82	-0.67	13.90	-1.68	2.35	1.58
Czech R.	Hungary	4.64	-3.06	4.09	1.37	0.78	-0.33	1.92	-0.41
Czech R.	Poland	1.45	-7.76	-4.04	-0.29	8.20	-1.18	-0.27	-1.76
Czech R.	Slovakia	0.45	2.48	-0.32	0.68	-0.80	1.59	-6.37	0.54
Hungary	Czech R.	-4.64	3.06	-4.09	-1.37	-0.78	0.33	-1.92	0.41
Hungary	Poland	-0.65	-5.14	-4.57	-0.83	5.95	4.41	4.16	-2.40
Hungary	Slovakia	-3.12	-1.42	-3.12	0.12	-0.13	-1.70	-7.57	-1.95
Poland	Czech R.	-1.45	7.76	4.04	0.29	-8.20	1.18	0.27	1.76
Poland	Hungary	0.65	5.14	4.57	0.83	-5.95	-4.41	-4.16	2.40
Poland	Slovakia	-4.09	11.02	4.82	0.67	-13.90	1.68	-2.35	-1.58
2012	LFI	S3-08	S3-09	S3-11	S3-12	S3-41	S3-42	S3-43	Total agr. trade
Slovakia	Czech R.	-0.91	-1.05	-0.11	-1.61	-0.01	1.78	0.17	-2.35
Slovakia	Hungary	-0.94	0.90	-5.71	-2.06	-8.74	-1.24	-1.09	3.96
Slovakia	Poland	1.47	-1.88	0.12	-2.91	0.11	-0.52	-0.12	-4.37
Czech R.	Hungary	-4.10	1.14	-1.31	-1.46	-0.03	-3.73	0.49	0.15
Czech R.	Poland	1.71	-1.80	1.60	-2.34	-0.15	6.37	0.26	-1.76
Czech R.	Slovakia	0.91	1.05	0.11	1.61	0.01	-1.78	-0.17	2.35
Hungary	Czech R.	4.10	-1.14	1.31	1.46	0.03	3.73	-0.49	-0.15
Hungary	Poland	6.34	-3.01	0.13	-6.73	-0.54	2.90	-0.04	-1.69
Hungary	Slovakia	0.94	-0.90	5.71	2.06	8.74	1.24	1.09	-3.96
Poland	Czech R.	-1.71	1.80	-1.60	2.34	0.15	-6.37	-0.26	1.76
Poland	Hungary	-6.34	3.01	-0.13	6.73	0.54	-2.90	0.04	1.69
Poland	Slovakia	-1.47	1.88	-0.12	2.91	-0.11	0.52	0.12	4.37

Source: Comtrade, own processing, 2012

Table 10. Mutual agricultural trade flows – territorial structure - in 2012 (Mil. USD)

2012	Export	S3-00	S3-01	S3-02	S3-03	S3-04	S3-05	S3-06	S3-07	S3-08	S3-09	S3-11	S3-12	S3-41	S3-42	S3-43
Slovakia	Czech R.	18.7	126.7	92.6	5.5	117.7	88.8	213.1	57.8	20.4	41.2	83.1	0.1	1.7	124.8	9.4
Slovakia	Hungary	107.2	110.4	82.6	2.9	130.0	45.1	273.1	177.1	35.3	24.8	44.1	0.0	11.8	167.9	18.9
Slovakia	Poland	36.1	7.9	12.7	0.5	144.3	10.6	64.4	38.0	32.8	14.4	15.6	0.1	2.7	12.7	0.6
Czech R.	Hungary	37.1	26.6	35.3	8.9	39.0	24.6	57.0	23.4	5.3	31.3	16.7	5.9	0.2	6.5	3.6
Czech R.	Poland	28.1	20.8	45.4	12.0	224.3	37.1	43.9	45.0	61.1	42.9	54.9	18.2	0.1	169.3	5.7
Czech R.	Slovakia	55.9	353.6	165.7	40.1	194.1	241.4	137.8	135.8	78.9	125.2	166.1	70.1	3.9	165.2	11.1
Hungary	Czech R.	7.3	46.4	9.0	0.2	34.2	26.8	44.8	26.1	31.8	24.0	25.2	15.3	0.4	30.6	0.4
Hungary	Poland	4.0	27.2	13.0	1.3	82.8	65.4	46.3	20.9	62.2	20.7	18.6	6.5	0.2	24.3	0.0
Hungary	Slovakia	15.4	44.3	0.5	3.7	76.7	0.4	45.4	76.5	36.3	0.8	117.5	32.8	146.0	121.6	28.7
Poland	Czech R.	5.1	256.1	190.6	28.2	137.6	95.3	80.4	124.9	52.4	122.4	45.2	96.9	4.5	98.5	2.0
Poland	Hungary	14.0	104.0	75.7	12.1	51.1	43.9	18.3	60.9	15.3	68.0	26.3	92.5	6.9	0.9	0.5
Poland	Slovakia	2.3	176.8	93.4	10.7	45.9	43.4	77.4	42.9	35.3	52.7	25.3	43.2	3.1	29.8	2.9

2012 Export	Slovakia Czech R.	Slovakia Hungary	Slovakia Poland	Czech R. Hungary	Czech R. Poland	Czech R. Slovakia	Hungary Czech R.	Hungary Poland	Hungary Slovakia	Poland Czech R.	Poland Hungary	Poland Slovakia
S3-00	18.7	107.2	36.1	37.1	28.1	55.9	7.3	4.0	15.4	5.1	14.0	2.3
S3-01	126.7	110.4	7.9	26.6	20.8	353.6	46.4	27.2	44.3	256.1	104.0	176.8
S3-02	92.6	82.6	12.7	35.3	45.4	165.7	9.0	13.0	0.5	190.6	75.7	93.4
S3-03	5.5	2.9	0.5	8.9	12.0	40.1	0.2	1.3	3.7	28.2	12.1	10.7
S3-04	117.7	130.0	144.3	39.0	224.3	194.1	34.2	82.8	76.7	137.6	51.1	45.9
S3-05	88.8	45.1	10.6	24.6	37.1	241.4	26.8	65.4	0.4	95.3	43.9	43.4
S3-06	213.1	273.1	64.4	57.0	43.9	137.8	44.8	46.3	45.4	80.4	18.3	77.4
S3-07	57.8	177.1	38.0	23.4	45.0	135.8	26.1	20.9	76.5	124.9	60.9	42.9
S3-08	20.4	35.3	32.8	5.3	61.1	78.9	31.8	62.2	36.3	52.4	15.3	35.3
S3-09	41.2	24.8	14.4	31.3	42.9	125.2	24.0	20.7	0.8	122.4	68.0	52.7
S3-11	83.1	44.1	15.6	16.7	54.9	166.1	25.2	18.6	117.5	45.2	26.3	25.3
S3-12	0.1	0.0	0.1	5.9	18.2	70.1	15.3	6.5	32.8	96.9	92.5	43.2
S3-41	1.7	11.8	2.7	0.2	0.1	3.9	0.4	0.2	146.0	4.5	6.9	3.1
S3-42	124.8	167.9	12.7	6.5	169.3	165.2	30.6	24.3	121.6	98.5	0.9	29.8
S3-43	9.4	18.9	0.6	3.6	5.7	11.1	0.4	0.0	28.7	2.0	0.5	2.9

Source: Comtrade. own processing. 2012.

Conclusions

On the basis of the above findings, it is shown that agricultural trade in the case of all of the countries of the Visegrad group represents only a marginal part of the total merchandise trade. Further, in regard to the agricultural trade of the individual analysed countries, it may be stated that the commodity structure as well as the territorial structure is very significantly concentrated. The predominant majority of agricultural trade – export as well as import – is carried out with EU countries. Third countries represent only a marginal market in regard to the sale of merchandise and agricultural products from the V4 countries.

In relation to the development of the commodity structure of merchandise and especially agricultural trade, it may be stated that the value of trade realized within the majority of traded aggregations is growing on a long-term basis in the case of all of the V4 group countries. In terms of agricultural trade, it is appropriate to state that the most dynamic growth was seen in the case of Poland. However, Czech and Slovak agricultural trade also showed considerable growth in terms of realized trade.

The objective of the article was to identify the comparative advantages of agricultural trade of the V4 countries in the area of commodity structure and territorial structure in relation to the global market, to EU countries, and to the "internal market" of the V4 group countries – all for the purpose of ascertaining the most significant changes that occurred in the field of agricultural trade within the analysed time period. As such, the following must be stated: Agricultural trade of the Czech Republic, Slovakia and Hungary as a whole does not have comparative advantages either on the global market or on the internal market of the EU countries. Poland, however, does have it. It is the only representative of the V4 countries that has comparative advantages in the field of agricultural trade, both in relation to the internal market of the EU countries, as well as in relation to the global market. If we focus further on the distribution of comparative advantages within the mutual trade of the V4 countries – we can state that Poland clearly dominates. Hungarian export is capable of gaining comparative advantages in some years in relation to the market of the V4 countries. Czech and Slovak agricultural trade as a whole is profiled as uncompetitive within the whole of the space of the V4 countries, However, it should be mentioned that both countries have several aggregations existing within their agricultural trade which could be able to get comparative advantages if not at general level, then at least on a bilateral level.

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Status quo and willingness to pay for reduction of risk of erosive runoff

Abstract. In this paper the problem of Status Quo and willingness to pay by inhabitants of Haute-Normandy region in France for reduction of risk of erosive runoff was researched. The paper is dedicated to the definition of the factors which influence people's willingness and unwillingness to pay for protection from erosive runoff. Analysis of data requires statistical methods that can properly account for the correlation of respondents with the risk of missing values due to drop-out of study respondents.

Key words: erosive runoff, risk reduction, willingness to pay, Status Quo, Choice Experimental Design.

Introduction

This paper estimates the willingness to pay for protection from erosive runoff and the problem of Status Quo among the people in the area of Haute-Normandy region in France, which is presented on a map in Figure 1.

This area was chosen because it is highly impacted by erosive runoff, which has strong economic issues at a local and regional level. Protection against this phenomenon exists but is expensive and requires people's agreement to be implemented. It is thus important to understand the decision-making process in order to provide decision tools to decide whether such protection should be implemented.

Nowadays the problems of climate change have become more and more important. The speed of these changes is increasing from year to year. According to the results of a research paper [Nearign et. al 2005], soil erosion and runoff are significantly affected by changes in rainfall and cover. Among the reasons which can cause soil erosion, the most direct one is the erosive power of rainfall.

Many scientists have written papers about increasing global temperatures and that the earth is warming. That is why this problem should be taken into account by many countries.

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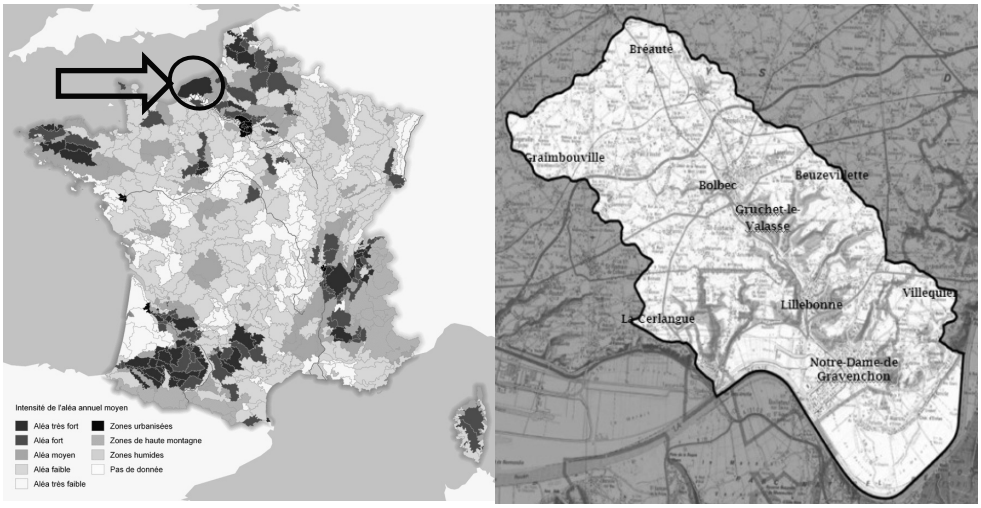
Research method and subject of research

The study is based on a two-round survey. The first survey was made in 2012, with a sample of 773 respondents. The second survey was made in 2013 with a one year time difference, with a sample of around 350 respondents. Because it was not possible for interviewers to survey the same people, the two samples are not equal. Therefore in this research only the same respondents from both surveys were taken into account – which represent a group of 151 respondents.



a) b)

Fig. 1. Map of researched region

Source : a) Gis Sol – Inra – SOeS, 2010; b) Made by authors using Google Maps.

The methodology "Choice Experimental Design" was used to create the part of questionnaires concerning the amount which people would like to pay to protect themselves from erosive runoffs. The Choice Experimental Design method allows us to see the difference between the same questions answered by the same people but in different sequences.

The two questionnaires included questions about gender, age, profession of respondent and respondent's role in family. The questionnaire also allows us to know if the respondents plan to live in this region during the next 20 years.

Another focus in the questionnaires is for people's awareness of erosive runoff. The questions address respondents' knowledge of the occurance and whether they have ever been affected by this phenomena during the past 10 years.

The main problem of this study is the choice of Status Quo or in other words the research question is: "Why don't people want to pay for erosive runoff protection and why don't they want to change the current situation?" There are many reasons . Using Choice Experimental Design methodology and after analyzing the results with STATISTICA 10 software, the main factors which can explain the decision-making process for respondents'

choices are obtained (Status Quo choice, agreement to pay, and reasons why opinion changed between the two surveys).

Choice Experiment is used by many scientists to value the environment. For example, Hanley, Wright and Adamowicz made a study on forest landscape changes in the UK and their economic consequences [Hanley et. al 1998, Hoyos 2010].

In the surveys, respondents were asked to choose between different combinations of environmental protection such as: improvement of communication, agriculture and infrastructure which are described in terms of their characteristics or attributes. One of these characteristics is the price which respondents are willing to pay for erosive runoff protection. Different combinations of actions with different prices were presented. People were asked to choose one of the most preferable choices among six different practices.

Erosive runoff protection includes the following actions connected with:

- Communication development about erosive runoff related risks.
- Modification of agriculture practices (responsible water management, restoration of the wooded area, land policy connected with water retention).
- Reinforcement of protective infrastructures against erosive runoff related risks.

According to scientific works, it was observed that respondents choose the Status Quo quite disproportionally. However, questions about the reasons which make people choose the Status Quo were not answered. Jurgen Meyerhoff discussed in his paper three potential determinants of status quo such as protest beliefs, attitudes towards environmental change and perceived task complexity. Choice Experiments has been used to investigate this problem quite often. In this case people are asked to choose several times between alternatives (which change the current situation) and the Status Quo (current situation). According to rational theory, people usually choose the alternatives, which increase their utility. But there are other factors which influence people's choices and which depend on the attributes presented in other alternatives. In order to evaluate this influence the alternative specific constant (ASC) and status-quo bias are used [Mayerhoff 2006, Hoyos 2010, Samuelson 1988].

Research results

The first step was starting with data from 2012. The following variables were chosen: Status Quo of year 2012 as dependent variable; as the independent – Age (interval scale); Gender (male or female); Continue residence for next 10 years (yes or no); knowledge about erosive runoff (open text); touched by erosive runoff (yes or no); City (city – 1; village -0); and politics(from 1 to 10, where 1 – more left and 10 more right preferences).

Table 1. Mixed Model Analysis (significant variables, 2012)

Characteristics (indicators)	Values
Age	0,256
Gender	-0,230
Politics	0,236
P-value(F test)	0,038

Source: made by author using STATISTICA 10software.

Based on the results of Linear mixed model with incomplete data, three variables were found, which significantly influence SQ choice. These variables are the following: age; gender and politics (Table 1).

The explanation of the significance of the politics variable is quite straightforward and could be explained within the context of the election in 2012.

The second step was choosing the combination of variables which can describe the Status Quo in year 2013. The Status quo from 2013 was chosen as a dependent variable, and as independent variables the following were chosen: Age; Gender; Continue residence for next 10 years; knowledge about erosive runoff; touched by erosive runoff; City (city – 1; village – 0); and politics; and the last variable is "increasing of the revenue in comparison with previous year" (code: revenue increased – 1, revenue not increased – 0).

Table 2. Mixed Model (significant variables, 2013)

Characteristics (indicators)	Values
Age	0,274
knowledge about erosive runoff	0,234
P-value(F test)	0,095

Source: made by author using STATISTICA 10software.

Results show that increase of revenue does not have significant influence for choosing the Status Quo. It means that money does not really influence the people's willingness to pay for erosive runoff protection.

An interesting characteristic about the variable "knowledge about erosive runoff" was noticed. Here it is possible to see that during the second survey people already knew and started to understand the problem of erosive runoff (during the first survey respondents got information about problem of erosive runoff). Maybe during the first survey respondents didn't understand yet the importance of the problem of erosive runoff and that is why they didn't want to pay for something they had no idea about (So they chose SQ).

In order to see the impact of full understanding of the problem, it is important to estimate the influence of factors which change people's willingness to pay for the erosive runoff protection during two surveys in 2012 and 2013. This variable was chosen as dependent and coded as following: 1 – changed their opinion, 0 – didn't change).

Results show that the significant influence for people's changes of SQ choices in 2012 and 2013 had such factors as age, gender and continuation of residence (P-value = 0,001, F test). This means that it depends on independent variables chosen: age, gender and people plans to continue to live in this area, respondents changed their mind about SQ during second surveys.

To show the influence of variation of revenue within the decision-making process, a dependent variable - not paying in 2012 but paying in 2013 – was chosen, but the variable "increasing of revenue" was replaced by the variable "decreasing of revenue". Results then show that variables connected with revenue don't have any significant influence for the people's willingness to pay. This means that changes of revenue are not important for respondents during their decision-making about willingness to pay for erosive runoff protection.

After calculations it was seen that these types of actions don't have significant influence on the people's Status Quo choice.

Conclusions

In this paper the main factors which significantly influence people's Status Quo choice were defined.

Based on statistical results obtained using a mixed model, the following conclusions were made:

- The "Age" variable is a significant factor. It means that respondents' age has important influence on their willingness to pay for erosive runoff.
- The political situation in France in 2012 had significant influence on respondents' willingness to pay for erosive runoff protection.
- Continuation of residence significantly influenced respondents' SQ choice during the first survey.
- Knowledge and awareness about the problem of erosive runoff significantly influenced the respondents during the second survey.

This research has to be continued and data collected from similar surveys in the future. In fact the analysis in longitudinal data requires statistical methods that can properly account for the internal correlation of respondents [Vebeke and Molenleberghs, 2000]. There is also the risk of missing values due to drop-out of study respondents.

Acknowledgements

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Poland's competitiveness in foreign trade in apples

Abstract. Poland is one of the largest global producers and particularly exporters of apples. The export is of great importance to domestic producers of these fruits. The objective of the article was to assess Poland's competitiveness in world trade in apples in the years 2003–2013. In connection with that, in an innovative way ten mutually complementary indices of ex-post competitiveness have been calculated for Poland and analysed. The study presents ranges in which the values of particular indices of competitiveness may be comprised. It also explains the impact which re-export may have on the levels of some of these indices, making it difficult for their correct interpretation. The studies have demonstrated that in the analysed period, Poland was characterised by high and growing competitiveness in foreign trade in apples, particularly in the years 2012–2013.

Key words: competitiveness, foreign trade, export, import, apples, Poland

Introduction

Economic competition, i.e. rivalry aimed at achieving the benefits from business activity on the domestic and international market [Bossak, Bieńkowski 2004] is one of the basic economic mechanisms [Pawlak, Poczta 2008]. The concept of competitiveness is derived from competition and is an element thereof [Skawińska 2002], although there is no universally accepted definition of competitiveness [Bossak 1984; Bieńkowski 1995; Kuciński 2000; Misala 2007][4]. However, we may assume that competitiveness shows the position of an operator in relation to other market participants [cf. Adamkiewicz 1999]. Therefore, competitiveness is a concept assessing operators from the point of view of their performance, as well as their ability to achieve benefits in the future. A comparison of economic performance achieved by competitors in the global economy, thus an ex-post comparison, is used to assess past and current international competitiveness [cf. Bossak, Bieńkowski 2004]. This is a relative concept as the assessment of competitiveness requires the adoption of an appropriate reference point, e.g. the past status or economic achievements of competitors. It is necessary to select assessment criteria (measures) in an appropriate manner [Bieńkowski 1995], taking into account the disadvantages of various indices adopted to measure competitiveness [by Misala 2003]. However, many indices of competitiveness complement each other. Thus, while drawing conclusions on the basis of results obtained using a limited number of indices may be encumbered with errors, the application of the larger number of them and taking into account their interdependencies,

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[4] The above-mentioned authors have recorded several hundreds of definitions of competitiveness.

particularly in a longer term, allows the proper assessment of competitiveness.[Nosecka et al. 2011].

The importance of the international competitiveness of Polish producers has grown as a consequence of globalisation, which has changed their business environment from the national market to the global arena. [Woś 2003]. Nevertheless, conditions of competition may be distorted due to bad political relations between the country and the states that are the major international outlets for goods of a given sector [Porter 1996].

The production of apples in Poland has significantly increased since the country's accession to the EU [Statistical Yearbook of Agriculture… 2007–2013; Wyniki… 2014]. Exports allowed the management of surpluses of those fruits and was an important source of income. In the longer term, sending surpluses of the domestic production of apples abroad is, however, possible only when this production is competitive on the international market. High competitiveness of Poland in foreign trade in apples is therefore a prerequisite for producing a significant part of these fruits domestically for export. This justifies the purpose of this study, i.e. determination of Poland's competitiveness in world trade in apples in the period immediately before and after the country's accession to the EU, i.e. in the years 2003–2013.

Material and methodology of the study

The assumed study objective was implemented using secondary materials, i.e. statistical data on the market output of apples in Poland [IERiGŻ-PIB 2014], Polish foreign trade in apples and agri-food products in general [CAAC 2003–2013] and world foreign trade in apples and agri-food products in general [UN Comtrade 2014.] The data used regarding foreign trade in apples refer to the products falling within CN code 0808 10 [Regulation 1987, 2002, 2003]. In the study, Polish foreign trade is understood as an exchange of goods with the EU Member States and third countries. The material used regarding the Polish export and import includes, therefore, the total turnover with all countries of the world.

In order to implement the study objective, the following mutually complementary indices of ex-post competitiveness in foreign trade in apples have been calculated for Poland and analysed:

1. *Quantitative/value balance of foreign trade (TB)*

$$\mathbf{TB = E_{Pa} - I_{Pa}} \qquad (TB<0 \text{ or } TB\geq 0)$$

where: E_{Pa} – export of apples from Poland (thousand tonnes/million USD), I_{Pa} – import of apples to Poland (thousand tonnes/million USD).

In terms of the open economy, the positive balance of foreign trade in a given product, continuing for a longer time, may attest to international competitiveness of the country with regard to this product [Nosecka 2013].

2. *Trade coverage index (TC*)

$$\mathbf{TC} = \frac{\mathbf{E_{Pa}}}{\mathbf{I_{Pa}}} \qquad (TC\geq 0)$$

where: E_{Pa} – export of apples from Poland (million USD), I_{Pa} – import of apples to Poland (million USD).

The value of the TC index greater than 1 means that the country has a relative internal advantage over competitors [Szczepaniak 2013], but also reflects competitiveness revealed in the export dynamics [Nosecka 2013].

3. *Share in global export (SGE*)

$$\mathbf{SGE} = \frac{\mathbf{E_{Pa}}}{\mathbf{E_{Wa}}} \times \mathbf{100\%} \qquad (0\% \leq SGE \leq 100\%)$$

where: E_{Pa} – export of apples from Poland (million USD), E_{Wa} – world export of apples (million USD).

It is believed that the increasing share in the world export of a given product means improving of international competitiveness of the country with regard to this product [Zawiślińska 2003], as far as the increase in the value of this index does not result from the increasing re-export only.

4. *Export orientation index (EO)*

$$\mathbf{EO} = \frac{\mathbf{E_{Pa}}}{\mathbf{P_{Pa}}} \times \mathbf{100\%} \qquad (EO \geq 0\%)$$

where: E_{Pa} – export of apples from Poland (million USD), P_{Pa} – market output of apples in Poland (million USD).

The increasing level of the EO index may attest to growing international competitiveness only when the share of the country in the world export of a given product (SGE) also increases [Nosecka 2013], and provided that the increase in the value of the EO index (and thus the SGE index) is not caused by the increasing re-export only.

5. *Specialisation index (SI*)

$$\mathbf{SI} = \frac{\mathbf{E_{Pa}}}{\mathbf{E_P}} \div \frac{\mathbf{E_{Wa}}}{\mathbf{E_W}} \qquad (SI \geq 0)$$

where: E_{Pa} – export of apples from Poland (million USD), E_P – export of agri-food products from Poland (million USD), E_{Wa} – world export of apples (million USD), E_W – world export of agri-food products (million USD).

The SI index compares the share of a given product in the agri-food export of the country with the share of this product in the world agri-food export. The SI index values greater than 1 may be indicative of high competitiveness [Pawlak 2013], as long as they are not the result of the large re-export only.

6. *Share in global import (SGI*)

$$\mathbf{SGI} = \frac{\mathbf{I_{Pa}}}{\mathbf{Wa}} \times \mathbf{100\%} \qquad (0\% \leq SGI \leq 100\%)$$

where: I_{Pa} – import of apples to Poland (million USD), I_{Wa} – world import of apples (million USD).

The decreasing share in the world import of a given product may mean improving of competitiveness of the country with regard to this product [Pawlak, Poczta 2011].

7. *Import penetration index (IP*)

$$\mathbf{IP} = \frac{\mathbf{I_{Pa}}}{\mathbf{P_{Pa} - E_{Pa} + I_{Pa}}} \times \mathbf{100\%} \qquad (IP \geq 0\%^{5} \text{ or } IP < 0\%^{6})$$

where: I_{Pa} – import of apples to Poland (million USD), P_{Pa} – market output of apples in Poland (million USD), E_{Pa} – export of apples from Poland (million USD).

[5] The IP index assumes values greater than 100% e.g. when the country which does not produce a given product re-exports this product.

[6] The negative value of the IP index is theoretically possible e.g. in a situation when the country which does not produce a given product would re-export the product imported in the previous year and this re-export would be greater than the import of this product in the given year.

The IP index shows the share of the import in the supply of a given product on the domestic market. The low and decreasing value of the IP index, particularly along with the low and decreasing share in the world import may attest to high and increasing international competitiveness of the country with regard to a given product [Nosecka 2013].

8. *Relative revealed comparative export advantage index (XRCA)*

$$\mathbf{XRCA} = \frac{\mathbf{E_{Pa}}}{\mathbf{E_{Wa}}} \div \frac{\mathbf{E_{P \neq a}}}{\mathbf{E_{W \neq a}}} \qquad (XRCA \geq 0)$$

where: E_{Pa} – export of apples from Poland (million USD), E_{Wa} – world export of apples (million USD), $E_{P\neq a}$ – export of agri-food products from Poland exclusive of apples (million USD), $E_{W\neq a}$ – world export of agri-food products exclusive of apples (million USD).

9. *Relative import penetration index (MRCA)*

$$\mathbf{MRCA} = \frac{\mathbf{I_{Pa}}}{\mathbf{I_{Wa}}} \div \frac{\mathbf{I_{P \neq a}}}{\mathbf{I_{W \neq a}}} \qquad (MRCA \geq 0)$$

where: I_{Pa} – import of apples to Poland (million USD), I_{Wa} – world import of apples (million USD), $I_{P\neq a}$ – import of agri-food products to Poland exclusive of apples (million USD), $I_{W\neq a}$ – world import of agri-food products exclusive of apples (million USD).

10. *Relative trade advantage index (RTA)*

$$\mathbf{RTA} = \mathbf{XRCA} - \mathbf{MRCA} \qquad (RTA < 0 \text{ or } RTA \geq 0)$$

If the RTA index is positive and the XRCA index is also greater than 1, it attests to high competitiveness of the country with regard to a given product when compared to other countries of the world in total. On the other hand, the negative value of the RTA index and also the value of the MRCA index greater than 1 means that the country shows the absence of competitiveness. In other cases, the results of the analysis are not unambiguous [Frohberg 2000].

Production of apples in Poland on the background of the world market

Apples are fruits enjoying increasing recognition of consumers in the world. It is evidenced particularly by the increase in their global production. In the years 2003–2012, the global production of apples increased from 58.2 million tonnes to 76.4 million tonnes, i.e. by 31%. The increase in the global production of apples was largely due to the dynamically increasing production in China, the world's main producer of these fruits. In the years 2003–2012, the production of apples in that country increased from 21.1 million tonnes to 37 million tonnes and the share of the Chinese production in the global production increased from 36% to 48% [FAOSTAT 2014]. The increase in the production in China resulted from the increasing demand for apples in that country. In the years 2003–2012, the consumption of apples in China increased from 16.6 million tonnes to 32.2 million tonnes, thus by 94% [Indexmundi 2014]. After China, large but much smaller producers of apples were the United States and Turkey, whose share in the global production of these fruits in 2012 amounted to 5% and 4%, respectively [FAOSTAT 2014].

In 2012, Poland was the world's fourth producer of apples and the EU's largest producer (with the share of 4% in the world harvest and the share of 26% in the EU harvest) [FAOSTAT 2014]. In the years 2003–2013, the production of apples in Poland was subject to significant fluctuations (the particularly large decrease in the production took place in 2007, due to frost [*Rynek*...2007]), however, it was characterised by an upward

trend, especially in the last three years of that period. In 2013, 3.1 million tonnes of apples were picked when compared to 2.4 million tonnes in 2003. In the analysed period, apples had, on average, a share of about 70% for harvest of all fruit in the country [Statistical Yearbook of Agriculture… 2007–2013; Wyniki… 2014]. The growing production of apples in Poland was a resultant of market factors and structural transformations. The large-scale introduction of dwarf orchards, the increase in the area of cultivation of apple trees and the creation of adequate logistic facilities in the form of storage and sorting and packaging equipment made it possible to increase production and improve the commercial offer.

Significant investment projects were possible, *inter alia*, thanks to the fact that producers of apples, to a much larger extent than producers of other fruit and vegetables in Poland, made use of EU and national support funds with regard to the creating and functioning of producer groups and organisations. In particular, this refers to the funds allocated for the implementation of eligible investment projects included in the plans of achieving recognition of producer groups created within the framework of the common organisation of the fruit and vegetable market in the EU. It is estimated that the share of producer groups and organisations in supplies of apples to the domestic market and foreign markets at the end of the analysed period amounted to about 30%, and in the supply of other types of fruit and vegetables it did not exceed 10% [Nosecka 2013].

The development of producer groups contributed to a reduction in production costs, which enabled price competition mainly on the Commonwealth of Independent States (CIS) and also the EU market. In addition, the quality of dessert apples has improved, which also enabled an increase in the apple export. Also, the well-developed processing industry in Poland allowed better management of industrial apples. The large export demand for concentrated apple juice, for the production of which most harvests of industrial apples were used, was also an important factor stimulating the development of the production of apples in the country.

Characteristics of Polish foreign trade in apples

In the last years of the analysed period, the annual average export of apples in the world oscillated within the limits of 10% of their production, which gave apples, in terms of volume, third place among the most important export items of global horticulture [Światowy…2013]. In the years 2003–2013, the world export of apples amounted to, on average, about 7.5 million tonnes. By 2012, the world's first exporter of apples was China, which exported 0.6–1.2 million tonnes of apples a year. In 2013, Poland became the world's largest exporter of apples and the further places were occupied by: China, USA, Chile and Italy [UN Comtrade 2014]. In recent years, the world's largest importer was Russia, which imported 1.0–1.2 million tonnes of apples a year. Further places were occupied by: United Kingdom, Germany, the Netherlands and Mexico [Światowy… 2013].

The lack of a clear increasing tendency of production and export in the leading countries exporting apples in the world, and particularly the decreasing supply in the last years on the international market from China, constituted the profitable external market conditions for the growth of apple export from Poland [Nosecka 2014]. Finally, in the analysed period, Polish foreign trade in apples recorded a dynamic growth in volume, and particularly, in the value. The export of apples from Poland increased from 353 thousand

tonnes in 2003 to 1,230 thousand tonnes in 2013, i.e. by almost 3.5 times. The value of the Polish export of apples increased from USD 68 million to USD 591 million, i.e. by more than 7 times. The scale of the import of apples to Poland was incomparably lower. Admittedly, in the years 2003–2013 the import of apples to Poland increased from 14 thousand tonnes to 42 thousand tonnes, but in the last two years of that period a decline was recorded [CAAC 2003–2013]. That import was only a supplement to the domestic offer [Nosecka 2013].

The main foreign outlets for Polish apples were the CIS countries, mainly Russia. In 2013, the export of apples to that country amounted to 676 thousand tonnes (almost 55% of the total export volume of these fruits). Among the other CIS states, significant quantities of apples were exported to Belarus (145 thousand tonnes), Ukraine (53 thousand tonnes) and Kazakhstan (47 thousand tonnes.) In most recent years of the analysed period, the export of apples to Russia, Belarus and Kazakhstan has been characterised by a significant growth dynamic. Only the export to Ukraine declined. In 2013, a large recipient of Polish apples was also the EU countries, to which 289 thousand tonnes of apples were sent (23% of the total export of these fruits), mainly to Germany (78 thousand tonnes), Romania (34 thousand tonnes), France (27 thousand tonnes) and Belgium (19 thousand tonnes) [CAAC 2003–2013].

Analysis of Poland's competitiveness in foreign trade in apples

In the analysed period, i.e. in the years 2003–2013, the Polish foreign trade balance (TB) in apples was positive and characterised by an upward trend, while the dynamics of its growth in terms of value was greater than in terms of quantity (Table 1, Fig. 1). The value balance increased from USD 62 million in 2003 to USD 569 million in 2013 (i.e. by 9 times), and quantitative balance – from 339 thousand tonnes to 1,188 thousand tonnes (i.e. by 3.5 times.) The largest increase in the surplus of trade in apples was recorded by Poland in the years 2012–2013. The trade balance, positive and improving in the years 2004–2013, to a very large extent attests to the high and increasing competitiveness of Poland in world trade in apples.

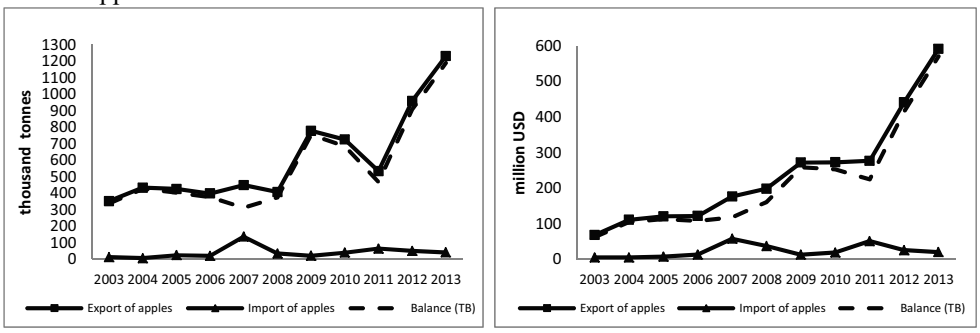

Fig. 1. Polish foreign trade in apples

Source: own elaboration pursuant to the CAAC data and IERiGŻ-PIB calculations.

In the years 2004–2013, the value of the trade coverage index (TC) was characterised by an upward trend – it increased by 2.5 times, although it was subject to very large fluctuations (Table 1, Fig. 2). The TC index had the highest value (27) in 2013 and the lowest (3) in 2007. In 2007, the level of the TC index was the lowest, which resulted from the above-mentioned decline in domestic production. Throughout the analysed period, the TC index was significantly greater than 1, which shows that Poland has a relative internal advantage over foreign competitors. The large and increasing value of the TC index reflects high and improving competitiveness of Poland in foreign trade in apples, manifesting itself in the dynamics of export. Such a level of the TC index also means a small and decreasing share of re-export in the entire export. Special attention should be paid to the significant increase in the value of the TC index in the years 2012–2013.

Table 1. Indices of Poland's competitiveness in world trade in apples

Index	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
TB (thousand tonnes)	338,6	426,2	403,8	377,2	311,7	375,0	754,9	684,0	468,3	906,9	1 188,1
TB (million USD)	61,8	105,5	112,8	108,0	117,5	159,8	258,3	252,4	224,0	412,9	568,9
TC	10,3	19,3	14,2	8,5	3,0	5,1	19,3	13,2	5,2	15,5	26,6
SGE (%)	2,0	2,9	3,1	2,7	3,2	3,1	5,0	4,3	3,9	6,3	8,1
EO (%)	16,2	25,4	26,5	19,5	49,2	17,2	58,7	55,9	26,5	67,4	55,5
SI	2,3	2,7	2,4	1,9	2,1	2,0	3,1	2,7	2,5	3,8	4,2
SGI (%)	0,2	0,1	0,2	0,3	1,0	0,6	0,3	0,4	0,8	0,4	0,3
IP (%)	1,8	1,7	2,5	2,8	24,5	3,9	6,9	8,8	6,4	11,7	4,5
XRCA	2,4	2,8	2,4	1,9	2,1	2,0	3,1	2,7	2,6	3,9	4,3
MRCA	0,3	0,2	0,2	0,3	0,9	0,5	0,2	0,3	0,6	0,3	0,2
RTA	2,1	2,6	2,2	1,6	1,2	1,5	2,9	2,4	2,0	3,6	4,1

Source: own elaboration pursuant to the data from UN, GUS, CAAC and IERiGŻ-PIB calculations.

In the years 2004–2013, the share of Poland in the global export of apples (SGE) showed an upward trend – in 2013 it was 4 times higher than in 2003 and amounted to 8%. This index increased most in the last two years of that period (Table 1, Fig. 2). The increase in the level of the SGE index not resulting from the growing importance of re-export (which was established in case of the TC index) also means improvement of Poland's competitiveness in trade in apples.

In the analysed period, the upward trend was also characteristic of the value of the export orientation index (EO) – it increased by almost 3.5 times. However, it was subject to significant fluctuations (Table 1, Fig. 2). The increasing value of the EO index, with the above-mentioned increase in the share in the world export (SGE), additionally confirms improved competitiveness of Poland in foreign trade in apples.

In the analysed period, the level of the specialisation index (SI) exceeded 1 (Table 1, Fig. 2). That index showed an upward trend and in 2013 was nearly 2 times higher than a decade earlier, with the largest increase occurring in the years 2012–2013. Such value of the SI index confirms high and improving competitiveness of Poland in world trade in apples.

In the analysed period, the share of Poland in the global import of apples (SGI) was at the similar level and did not exceed 1% (Table 1, Fig. 2). That share significantly decreased in the years 2012–2013.

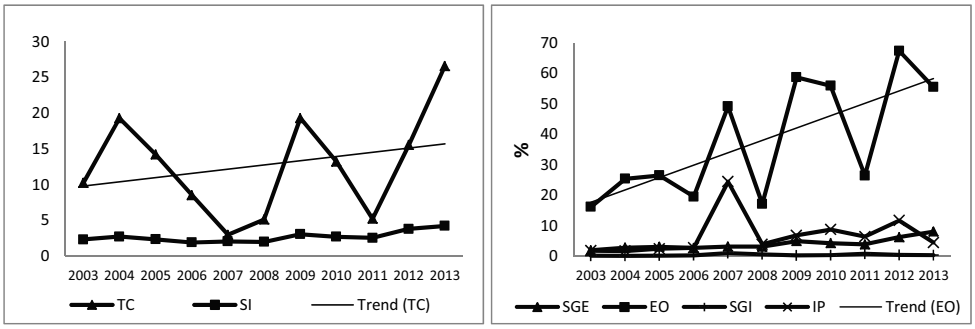

Fig. 2. Trade coverage index (TC), specialisation index (SI), export orientation index (EO), import penetration index (IP), Poland's share in the global export (SGE) and import of apples (SGI)

Source: own elaboration pursuant to the data from UN, GUS, CAAC and IERiGŻ-PIB calculations.

In the years 2004–2013, the value of the import penetration index (IP) increased, but in the analysed period, apart from 2007, it did not exceed 12% (Table 1, Fig. 2). The relatively low level of the IP index with the decrease in the share in the world import (SGI) over the period 2012–2013 confirms the increase in competitiveness of Poland in foreign trade in apples at that time.

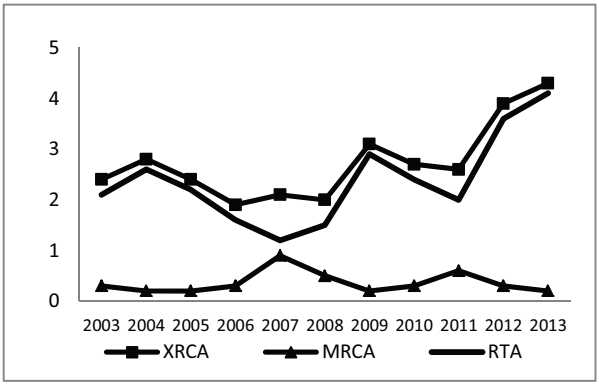

Fig. 3. The relative revealed comparative export advantage index (XRCA), relative import penetration index (MRCA) and relative trade advantage index (RTA) of Poland in world foreign trade in apples

Source: own elaboration pursuant to the data from UN, GUS, CAAC and IERiGŻ-PIB calculations.

In the entire analysed period, the relative revealed comparative export advantage index (XRCA) assumed values greater than 1 and also, the relative trade advantage index (RTA) was positive (Table 1, Fig. 3). Both indices were characterised by an upward trend and increased almost twice at that time. The largest increase in the level of the XRCA and RTA indices was recorded in the years 2012–2013. Such values of the XRCA and RTA indices evidence high and improving competitiveness of Poland in foreign trade in apples.

Conclusions

In the years 2003–2013, the foreign trade balance (TB), trade coverage index (TC), specialisation index (SI), relative revealed comparative export advantage index (XRCA) and relative trade advantage index (RTA) assumed values attesting to high competitiveness of Poland in foreign trade in apples. The above indices as well as the share in the global export (SGE) and export orientation index (EO) in the years 2004–2013 were characterised by an upward trend which indicates the improvement in competitiveness. However, in that period the import penetration index (IP) also increased, although it was still relatively low. Also, the Polish share in the global import of apples (SGI) was low. The most significant increase in the level of TB, TC, SI, XRCA, RTA, SGE and EO indices, with the simultaneous decrease in the value of the SGI index, was recorded in the years 2012–2013.

The presented results of the analysis clearly indicate the high and improving competitiveness of Poland in world trade in apples in the years 2003–2013, in particular, in the last two years of that period. However, the Russian embargo on the import of EU apples, applicable from August 2014, may significantly distort the conditions of competition by affecting adversely the competitiveness of Poland in foreign trade in apples. Therefore, it seems justified to continue the research on international competitiveness of Poland in terms of apple production in the situation of market restrictions.

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The accounting features of agricultural enterprises

Abstract. Agricultural production has a number of special features which essentially distinguish it from other sectors of national economy (industry, building industry, trade, etc.) The general regularities often prevail very specifically. The agricultural production is performed in open areas, exposed to the force of nature, closely connected to the land.
The land has a primary role in farming, and a major part of expenditures are utilised through arable land. The natural and economic attributes of arable land and the inseparably related climate conditions substantially determine the method and success of farming.
Farming specialties often require special accounting solutions which can also be found in the case of agricultural enterprises. The objective of the present paper is to examine the assessment procedures in regard to agricultural enterprises which can be applied in the case of fixed assets.

Key words: accounting policy, assessment procedure, fixed assets, breeding stock.

Introduction

The ecological conditions of Hungary are rather favorable for agricultural production. The competitiveness of agricultural production and the integration into the member states of the European Union depends on many factors. Out of these factors, the available resources – including agro-ecological conditions – play an outstanding role. Some resources and factors of production affect farming activities independently of agricultural enterprises, while other factors can be influenced by the enterprises. Factors of production which are regarded as independent from enterprises include climate, topography and soil conditions, determining the possibilities of agricultural production within a given area. Factors of production which can be affected by enterprises are, for example, the capital, asset portfolio, size and composition of human resources.

The specialties of accounting treatment of agricultural production are determined by the features of agricultural production itself, which affect accounting treatment and recording, as well. [Miklósyné et al. 2006] Among the most typical, the following can be highlighted:

- The basic input of production in agriculture is the soil, the specific feature of which is that it cannot be relocated, it does not run out, it cannot be expanded without limits and its fertility can be improved by rational cultivation;
- The agricultural production processes are affected by natural conditions (climate, typography, soil quality). These are endowments which cannot be changed or radically transformed by man, at most these can be modified at some expense (for example: irrigation);

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- Agricultural production is a biological process, and production continues until this process is interrupted because production can be characterized by periodicity due to climate conditions and the periodic alternation of seasons. This requires special organizational work, first of all in plant production;
- A majority of produced goods are rapidly perishable which requires substantial transportation and processing capacities. [Internet-1]

One of the main tasks of accounting is to follow business activities precisely, because market actors need accessible, reliable and true information about the financial and revenue situation as well as changes in respect to enterprises. [Helgertné et al. 2003]

Specialties of accounting policy in agriculture in respect to tangible assets

Accounting policy is the totality of methods and processes required for the practical implementation of accounting law. Accounting policy should provide the basis for the development of an accounting system which is the most appropriate regarding the features and conditions of the enterprise.

The accounting policy fulfils its function and meets the expectations raised if it is based on the basic principles and assessment standards laid down in accounting law, considering also the specialties of the given enterprise.

The elaboration of accounting policy is enabled and prescribed by the legal regulations concerning accounting. The law provides the possibility of decision-making to the enterpreneur (for example: in the field of sales, storage, definition of direct and indirect costs. implementation of value adjustment, etc.) and allows broad scope for the development and operation of management accounting.

By applying the basic framework of rules of accounting upon the elaboration of report, the business entity should form and write down the rules of methods and procedures which are the most suitable for its conditions and business processes and which are required for the practical implementation of accounting legislation. This should be fixed in the accounting policy. [Korom et. al. 2005] In Hungary, the § 14 of Law No. C of year 2000 lays down provisions about this. The accounting system formed and operated this way ensures the true economic content of information and supports decision-making based on real (actual) data.

The regulations which must be prepared in the frames of accounting policy are as follows:

- regulation of making inventory of assets and liabilities,
- assessment regulation of assets and liability,
- internal regulation concerning the order of direct cost calculation,
- money management regulation. [Helgertné et al. 2003]

Agricultural enterprises (also) need means of production. Part of these means serve the activities of the enterprise permanently, for at least more than one year. According to Article 23 of accounting law, these are registered among the fixed assets. The other part of assets, which support the business activities for less than one year (not permanently), are called current assets.

Among fixed assets the tangible assets are those which can be characterised by specialties resulting from agricultural production, therefore, hereinafter the rules of accounting of these types of assets are introduced.

Definition of tangible assets

Tangible assets in general mean those material assets installed and accepted for intended use (land, property, developed land, forest, plantation, buildings, other structures, technical equipment, machines, vehicles, tools and equipment, other equipment, right to assets and licenses), breeding stock which serve permanently – directly or indirectly – the activities of the entrepreneur, and the advance payment for the purchase of these assets (investments) and the investment as well as the value adjustment of fixed assets. [Internet-1]

The following types of assets can be highlighted within the fixed assets of agricultural enterprises:

- properties and related rights to assets and licenses (land, developed land, plantation, etc.)
- breeding stock.

The land accepted for intended use and all the material assets established in permanent relation with land should be recorded among properties. The properties should include: agricultural land, building plot, developed land, buildings, parts of buildings, other structures, properties outside the sphere of operation or ownership share, as well as rights of a property value connected with land and building, apart from whether they were purchased or produced by the entrepreneur, or implemented in owned or rented property. Investment or reconstruction undertaken and activated in rented properties should also be recorded among properties.

Land is considered arable land when it is recorded in the land registry as plough land, vineyard, orchard, garden, meadow, pasture, reeds, forest, or fishpond.

The building plot is the outcome of an investment activity made in order to improve soil utilisation. As the result of this, the quality, surface and fertility of soil is modified. Building plots include the costs of landscaping, land filling and land protection but cannot include the value of land where the investment is made. [Miklósyné et al. 2006]

The crop culture planted for several years of regular production, in close connection with arable land is regarded as plantation. Vineyard, fruits, hop and asparagus culture, as well as poplar and willow plants can be listed here. The perennial crops do not belong to plantations (e.g. alfalfa, grassland). The plantations can be recorded among tangible assets only after they bear fruit. [Helgertné et al. 2003]

The permanent rights connected with properties should be recorded among land and buildings and rights to immovable, regardless of whether the property is owned by the enterprise or not. These are, for example: land use, life tenancy and use, rental right, easement.

According to Article 26 (6) of the accounting law, those animals which produce separable product (offspring or other separable animal product) in the course of breeding or farming should be recorded among breeding stock and the rearing costs are returned from the sales of these products. The agricultural enterprises usually keep breeding stock

with the purpose of procreation. The major breeding stocks are cows, bulls, rams, etc. Cows are also kept for milk while sheep provide wool.

Breeding stock also include those, the other utilization of which (draft performance, watching tasks, riding) ensures the return of husbandry costs regardless of how long they serve the enterprising activity. Such are, for example: draft horses, mules, oxen, the task of which is providing a draft force. Breeding stock should be recorded here even if the useful life (in case of livestock it is called breeding time) is shorter than one year.

Those enterprises which also deal with livestock should address in their accounting policy those animal species for which the utilisation line of rearing is different from the legal regulations. For example, sports horses used for racing or riding should be recorded among breeding stock, while sports horses kept for sale should be included among current assets (e.g. the breeding stock put to fattening is included among fattening livestock, the animals purchased for sale are listed among products).

Assessment of tangible assets (historical cost, amortisation, accelerated depreciation, value adjusted)

Cost of tangible assets is determined by the way they were procured by the enterprise, thus, accordingly, it can be:

- cost of production, or
- purchase price.

The cost of tangible assets is realised in the interest of purchasing, producing, installing the asset until implementing or delivering it to the warehouse, in other words it is the total sum of items which can be connected individually to the asset. [Miklósyné et al. 2006]

The cost is composed of the following elements connected directly with the purchase of the given asset:

- duty (on gifts, inheritance, purchase or exchange transaction),
- interest rate for the credit or loan used for the period until the tangible asset is installed or delivered to the warehouse,
- exchange rate difference of foreign currency liabilities calculated for the period until the installation.

The following elements are not part of cost on the basis of §47 (3):

- deductible value added tax calculated preliminary,
- according to the law on value-added tax, the proportion non-deductible from the preliminary calculated value added tax shared in ratio of payment.
- the amount of support received definitively in connection with the investment does not reduce the cost of asset.

According to §47 (5), when the building plot (land) and the building or structure on the plot is purchased at the same time and the building or the structure is not taken into use as intended (the building or structure cannot be utilised as intended), then the purchasing and demolition costs of the building or structure and the costs of works made in order to develop the purchased plot for construction should be accounted as purchase costs which increase the value of the plot (land) up to the amount corresponding to the market value of

the plot (land) after the demolition (empty plot). The costs or expenditures above this amount should be considered as the cost of investment (building or structure) realised.

In the case of tangible assets, the fees of work connected with the expansion, function change, makeover, increasing life span of already existing tangible asset, as well as the fees of renovation work serving the reconstruction of the original state (capacity, precision) of the tangible asset worn out should be accounted as cost which increases value.

On the basis of accounting law, Article 48 (2), the price of maintenance or repair work made in order to ensure permanent, uninterrupted or safe operation as well as the price of forest growing, forest maintenance and forest renewal work cannot be considered as cost of tangible assets.

One specific investment activity of agriculture is plantation growing, which needs several years. The treatment and planting costs of vineyard and orchard culture as well as hop plantations belong to this category. The performance value accounted until the plantation gives yield should be recorded among investments. The records are activated when the plantation bears fruit. The value of yield until the plantation bears fruit should be accounted as a cost reducing item – that is, it reduces the cost of plantation.

In the case of breeding stock, the given fixed asset is moved from the investment account into the breeding stock at cost. The cost of breeding stock is the same as the actual purchase price.

Amortization can be accounted in the case of tangible assets for those years when the asset will probably be used that are during the useful lifespan. The value realized at the end of the useful lifespan is the remaining balance which is the future market price of the given, worn out tangible asset. The market value, of course, is only an estimated value, which can be determined by a method laid down in law on corporate income tax and dividend tax.

In the case of breeding stock, the useful lifespan means the duration of breeding period corresponding to the breeding technology, therefore the useful lifespan in case of livestock can be very different according to the species.

The amount of cost reduced by the remaining balance can be accounted as amortization on the basis of different methods (linear, degressive, performance-proportional and progressive description).

Due to the nature of breeding stock, the linear and performance-related description can be used in practice. There is a performance-related description in the case of cows on the basis of the quantity of milk produced.

According to the law No. C of year 2000, Article 50 (5), planned amortization cannot be accounted in the case of cost of land, plot or forest (…) as well as in the case of investments which are not installed.

Planned amortization can be accounted in the case of tangible assets which are taken into use or installed as intended as long as they are used as intended.

As regards tangible assets, extraordinary depreciation should be accounted in the following two cases:

- if the accounted value is permanently and significantly higher than the market value of a tangible asset (except for investments),
- if the value of a tangible asset permanently declines, because it becomes unnecessary, goes wrong, is destroyed or cannot be used properly, or is unusable.

If due to the extraordinary depreciation records, the recorded value of tangible assets is lower than the original cost of these assets, and the reasons of extraordinary depreciation do

not but partly exist, the extraordinary depreciation records should be eliminated by reducing the already settled extraordinary depreciation. [Szakács 2009]

Accelerated depreciation can be accounted in the case of breeding stock, if emergency slaughter is made or animal death occurs. Since in these cases the livestock usually cannot be utilized, the remaining balance should be accounted as cost together with the accelerated depreciation.

Value adjustment can be accounted for tangible assets in the balance sheet if the balance sheet value of the given asset, after reversing the extraordinary depreciation, is significantly lower than the market value.

Results, conclusions

Due to the composition of assets in the agricultural sector, one of the main factors is the appropriate application of accounting connected with fixed assets. Agricultural enterprises have substantial tangible asset stock and their accounting includes some special cases. The precisely kept accounting books have great significance because the business entity must keep permanent records about the business events affecting its financial or income situation during its activities. In Hungary, the accounting law gives priority to the reporting requirements, that is to the reliable, real and true picture about the activities of the given enterprise, therefore the principles and assessment rules as laid down in legal regulations must be observed in preparing reports and book-keeping. If the accounting work is made while considering this, the principles are applied and the requirements imposed on the accounting information system, then is the reliability and authenticity of information better guaranteed.

The application of evaluation processes considerably determines the output of the company, thus the degree of growth. The actual content of data that is recorded and the information from the data contribute to the evaluation of economic processes, and thus to the development of business activities. Economic events are recorded according to the principles and evaluation methods laid down by the accounting law, thus these events are included in the data set of the accounting system (both financial and management accounting) and the data of decision-making information is a reflection totally corresponding to the processes which take place in reality.

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Ecological development of rural areas in the European Union member states in 2000-2012

Abstract. The purpose of research was to analyze ecological development in EU countries during 2000-2012. Six primary variables have been applied, namely: the share of forest area in total land area, emissions of sulphur oxides (SO_x) in agriculture, emissions of nitrogen oxides (NO_x) in agriculture, electric power consumption per capita, the share of alternative and nuclear energy in total energy use and the share of area under organic farming in total agricultural land area. The authors have developed a synthetic index, which enabled the statement that Latvia, Finland, Austria, Sweden and Estonia are leading EU countries in terms of ecological development; the worst situation is in France, Poland, Malta, Spain and in the United Kingdom.

Key words: ecological development, European Union, rural area.

Introduction

Poverty, development and environment are closely linked. The world's poorest countries are those most directly dependent on natural resources for their daily survival and therefore most vulnerable to environmental hazards. This statement is true not only for the less developed countries; a few decades ago the interdependence between poverty and environment and the functional links between agriculture and ecological issues became an area of particular concern among the wealthiest nations. The European Union is not an exception to this global tendency. Since the ratification of the Maastricht Treaty [Treaty on… 1992], there has been a legal obligation for the European Union to take account of environmental protection requirements when drawing up and implementing EU policies. The European Commission has defined the protection and sustainable management of natural resources as a top priority in its poverty reduction policies. Integrating environmental concerns into development policy is also a key to ensuring that natural resources are protected. The EU through the various development instruments has been paying particular attention to this. Thus, the support for biodiversity, water and climate change is among the key areas for development support identified in the European Consensus on Development [2006], besides the fact that environmental sustainability is also one of the Millennium Development Goals [Millennium… 2000].

The EU budgetary spending on agri-environmental measures has increased rapidly since 1993 and it reached EUR 3026 million in 2010. At EU-27 level, the average agri-

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environment expenditure (period 2007-2009) was EUR 84 per hectare of UAA under agri-environmental schemes. The amount of expenditure per hectare is higher in the 12 Member States which joined the EU in 2004 and 2007 (EUR 123.4 per ha) than in the EU-15 (EUR 77.8 per ha) [European Commission…2012]. The application of these differences in spending was meant to level general disparity in agriculture between "old" and "new" EU Member States.

As is known, a secure environment is the foundation of sustainable agricultural development. Ecological security displays the situation when the internal structure of the system is stable and the health service function of the system tends to be positive [Liao et al. 2004].

In order to control regional ecological evolvement more conveniently, factors that affect it the most should be determined. The principal ones are:

- population: human is the most important and active factor in an ecological region, being the consumers of ecological systems, and also the producers of an economic system. Both quantity and population education and awareness affect ecological status of a region, the style and extent of economic development, and thus – ecological carrying capacity;
- technology: it is the medium that joins the ecological and the economic system. Ecological system is the basis of system evolvement and economic system is its driving force;
- policy: policy affects not only the process of evolvement of ecological region, but also the direction of regional evolvement. When the market is out of order and cannot allocate environmental resources effectively, policy will be the key factor that affects regional ecological evolvement [Ran and Jin 2004].

The ecological development itself is a complicated, multi-factorial process that may be characterized by multiple uncertainties and mutual inconsistencies; it should be developed based on the features and evolvement trends of the particular study area.

Sustainability indicators have received increasing attention since the Rio Earth Summit [Agenda 21 1992], reflecting growing concern by the public and policy makers over environmental trends [Sherbinin 2003].

Choosing the representative indicators and building the conceptual system plays a key role in the entire assessment of the development outcomes (Table 1).

Different ecological development models have been elaborated for different purposes. Some of them can be unacceptable to policymakers [Ran and Jin 2004], because of great dependence on GDP per capita and the modernization level of agricultural and industrial infrastructure, which were chosen as development variables. As a result, man-made effort must be exerted on the vulnerable ecological region to change this evolvement trend.

On the other hand, the Environmental Sustainability Index (ESI) permits cross-national comparisons of environmental sustainability in a systematic and quantitative way. It assists the move toward a more analytically rigorous and data driven approach to environmental decision-making [Sherbinin 2003]. Some are aimed at regionalization of ecological security and sustainable agricultural development in order to provide the reference for the regional agricultural resources protection, environmental construction and formulating the ways to be lifted out of poverty [Liao et al. 2004].

Table 1.Selected definitions of ecological development models and approaches

Author(s) and year	Concept (model) description
Krutilla and Fisher [1975]	The Krutilla-Fisher approach ensures that the benefits of nature protection are correctly included in the basic cost-benefit equation. Environmental benefits are likely to increase relative to other benefits in the economy. This increase in relative value means that environmental benefits are discounted at less than other value or maybe not at all. If the relative importance of environmental benefits grew sufficiently strong, they could even count more than their nominal value so that, they would be "discounted" at a negative rate.
Environment al… [2001]	Traditional economic instruments for wealth estimates such as the GDP need to be supported with new environmental quality indicators. Therefore, on one hand economic reasoning is being combined with an environmental sustainable development analysis, while on the other hand the statistical information needed as a support to the decision making process is being worked out, while suitable accounting and statistical tools are being provided to encourage integration. However it does not only apply to public decision makers or authorities but also to private sectors, such as initiatives for the certification and modernization of processes.
OECD [2002]	Many indicators and indicator sets are based on – or on some variation of – the OECD Pressure-State-Response framework. In terms of this framework index groups are classified into 4 groups: 1 – indices solely based on natural equivalent; 2 – policy performance indices; 3 – indices based on an accounting framework; 4 – synoptic indices. The aggregation of two or more indicators into one index typically involves several steps, to wit: selection of variables, transformation, weighting and valuation.
Sherbinin [2003]	The Environmental Sustainability Index (ESI) measures overall progress toward environmental sustainability through "indicators", each of which combines some number of variables. The ESI tracks relative success for each country in five core components: environmental systems, reducing stresses, reducing human vulnerability, social and institutional capacity and global stewardship.
Liao et al. [2004]	In view of the conception of system service of environment, according to Analytic Hierarchy Process (AHP), the general level structure system of ecological security evaluation can be formed. According to that, the index system of ecological security evaluation in particular area is formed from the pressure of resources and environment, the quality of resources and environment, as well as the ability of environmental protection and ecological improvement. Each index has distinct contribution to ecological environment. Using the degree of ecological security to indicate the ecological condition, the model of synthetic evaluation is as follows. $$P_0 = \sum W_i \times P_i$$ where P_0 is security index, W_i is the weight of the ith index, P_i is valuation of the i index. The larger security index, the higher ecological security degree is in the region.
Ran and Jin [2004]	Based on the theories of ecological carrying capacity and ecological resilience, a vulnerable ecological region's evolvement model can be established. Those synthetic variables are ecological carrying capacity, ecological resilience, economic development intensity and economic development velocity.
Lavlinskii [2010]	The functional part of the approach is the model of sustainable development of the natural resource territory. It generates predictions of the consequences of realization of the expertly stated regional development program based on the hypothetical assumption that the administration acts in such a way as to increase the living standard of the population over the long term and to conserve the natural environment. The dynamics of the indicators of the environmental condition of the region is defined by the distribution of the annual amounts of emissions of residents and by the environmental projects in the framework of the compensatory measures which have been realized. Synthesis of the initial model or some modification of equation makes it possible to close the general system of equations and at the same time solve the environmental problems and the problem of transformation of the natural resource potential into renewable growth factors.

Stanners et al. [2007], Environment al… [2013].	European Environmental Agency's (EEA) indicators are developed and categorized according to a causal framework that organizes interactions between society and the environment into five stages: driving force, pressure, state, impact, and response. In simple terms, this DPSIR assessment framework works as follows: social and economic developments drive changes that exert pressure on the environment. As a consequence, changes occur in the state of the environment, which lead to impacts on society. Finally, societal and political responses affect earlier parts of the system directly or indirectly. This framework helps to structure thinking about the interplay between the environment and socio-economic activities.

Source: own elaboration.

The Krutilla-Fisher algorithm leads to rather conservation-oriented rule, which is arrived at entirely on the ground of economic efficiency [Krutilla and Fisher 1975]. Most of nature policy programs, however, also deal with other goals, such as equity and sustainability, and the trade-offs between them [Heide 2005]. For instance, having constructed the dynamics of the pollution level in the framework of the general system, it is possible to check the ecological conditions of the initial setting of the task in the long-term prospect and reject the socioeconomic development trajectories violating the principles of sustainable development [Lavlinskii 2010].

Research purpose, materials and methods

The research was aimed at evaluating the level of the ecological development in rural areas and its changes over time in each EU Member State during 2000–2012.

The following ecological variables of rural sustainability were estimated: (1) forest area (% of land area), (2) emissions of sulphur oxides (SO_x) in agriculture (tons), (3) emissions of nitrogen oxides (NO_x) in agriculture (tons), (4) electric power consumption (kWh per capita), (5) alternative and nuclear energy (% of total energy use), (6) area under organic farming (%) (tab. 3).

The data needed for developing indicators and variables on which they are created, was chosen through selection of available data, its weighting and valuation. The data sets selection was related to certain indicators, in terms of its harmonization, quality, geographical coverage and availability. It was mainly obtained from the World Bank, OECD and European Commission statistics databases.

Through the specified calculating model, the synthetic index (SI) was applied to characterize the overall situation of ecological development in each particular country. We input the initial data (variables) into the factor analysis model to analyze and quantify the impacts of the indicators on overall sustainable development of rural areas dynamically. Each variable has distinct contribution to this SI and, as a result, to environmental development (security) of respective country.

A main hypothesis of the research states that it is possible for countries to have similar scores in terms of ecological development indicators, but very different economic development levels. It means that changes in ecological development of the EU counties don't reflect the level of economic development.

After defining the evaluation variables, it is still difficult to evaluate the level of ecological sustainability with them directly, because they are not unified and not suitable for the comparison. Therefore the authors have implemented factor analysis in order to replace the original secondary variables array, describing the development of rural areas, by

a new variables set, converted for more convenient practical application. Factor analysis was based on the study of interrelationships between variables in a multidimensional extend and to clarify the reasons for the general variability [Harman 1967; Bolch and Huang 1974; Morrison 1990; Jajuga 1993; Tadeusiewicz 1993; Dobosz 2001].

The analysis fulfilled a linear transformation of the original *n*-variables X_i (i = 1, ... n) to the new secondary *t*-variables U_k (k = 1, ... t), which were uncorrelated, and their variance sum equals total variance of the original variables X_i. Variables U_k have been defined as main factors. The variance of each new factor explains certain variation value of the primary (original) variables and is represented by eigenvalue. Subsequently isolated main factors indicated less variability each next time. The decision concerning definition the stage of termination isolating factors depended mainly on state of random variation, which remained undefined by the new factors. All the factors were applied to determine the SI with no exclusions, having defined100% of the total variation.

The value of the main factors and the synthetic index has been calculated by the following equations:

$$U_k = a_{1k}x_1 + a_{2k}x_2 + a_{3k}x_3 + \ldots a_{nk}x_n \quad (1)$$

where:
U_k – value of the main *k*-factor, k = 1,2,…t,
a_{1k} – estimated significance of primary *i*-variable by the primary *k*-factor,
x_1 – value of primary *i*-variable, i = 1,2,…n.

$$W_s = b_1U_1 + b_2U_2 + b_3U_3 + \ldots b_tU_t \quad (2)$$

where:
W_s – synthetic index of ecological development of rural areas in the EU countries,
b_k – estimated significance of main *k*-factor, which reflects a certain percentage of variation, k = 1,2,…t,
U_k – value of main *k*-factor, k = 1,2,…t.

Ranking results of ecological development of EU Member States are presented in respective tables.

Results

Within the framework of factor analysis of six primary variables, the same number of main factors was distinguished. First, second and third factors reflected about 83% of the total variation (44%, 26% and 13% respectively) (table 2). The first factor was influenced mostly by the following primary variables: forest area, alternative and nuclear energy and area under organic farming; second factor – by emissions of sulphur oxides (SO_x) and emissions of nitrogen oxides (NO_x) in agriculture; and the third one – by electric power consumption (table 3).

Table 2. Factor analysis of ecological development of rural areas in EU countries, 2000-2012

Factor	Eigenvalue	Percentage of variation	Cumulative percent
1	2.64	43.93	43.93
2	1.54	25.70	69.63
3	0.81	13.48	83.10
4	0.54	8.99	92.09
5	0.32	5.28	97.37
6	0.16	2.63	100.00

Source: calculated by the authors.

Table 3.Factors which determine ecological sustainable development of rural areas in EU countries, 2000-2012

Primary variables	Cumulative percent = 83.1%		
	Factor 1	Factor 2	Factor 3
Forest area (% of land area) – [x_1]	0.8192	0.0584	-0.3019
Emissions of sulphur oxides (SO_x) in agriculture (tones) – [x_2]	0.1158	0.9210	-0.1438
Emissions of nitrogen oxides (NO_x) in agriculture (tones) – [x_3]	0.0812	0.9403	0.0634
Electric power consumption (kWh per capita) – [x_4]	-0.2183	-0.0523	0.9669
Alternative and nuclear energy (% of total energy use) – [x_5]	0.8592	0.2351	-0.0103
Area under organic farming (%) – [x_6]	0.8055	-0.0022	-0.1247

x_i – value of primary *i*-variable, i = 1,2, … 6; U_k – value of main *k*-factor, k = 1, 2,…6

Source: calculated by the authors.

In general Latvia, Finland, Austria, Sweden and Estonia are the leading EU countries in terms of ecological development by the applied indicators; the worst situation is in France, Poland, Malta, Spain and the United Kingdom (tab. 4, fig. 1).

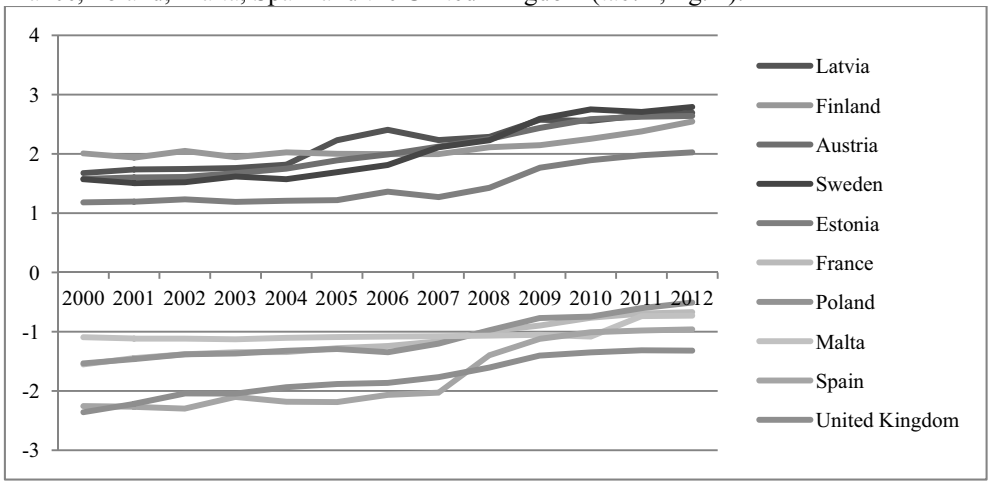

Fig. 1. Ranking of EU Member States by the value of the SI of ecological development of rural areas, 2000-2012

Source: calculated by the authors.

Comparing the average positions of the countries in the ranking for 2000-2012 with positions in 2012, it should be noted that the largest improvement in ranking has recently occurred in Greece, Italy, and the slight worsening – in Finland.

Ranking of 10 selected EU Member States (with the highest and lowest score by SI) based on GDP per capita shows that the countries distribution within these two groups has been changed. Latvia and Estonia, which have been holding 1st and 5th rank respectively, decreased to 9th and 8th rank (fig. 2) with 13,947 and 16,844 US$ per capita in 2012, whereas France (26th) and United Kingdom (28th) shifted to 4th and 5th place respectively.

These distinctions, however, weren't unexpected and can't be simply explained as belonging of one or another country to the "old" or "new" EU Member State. Higher level of economic development doesn't explain better outcomes in environmental situation in above mentioned states.

This means that some countries succeeded in economy growth while increasing emissions, pollution or electric power consumption etc. In some EU Member States, the total SI of rural areas' ecological development exceeded the rate of the GDP per capita increase inversely.

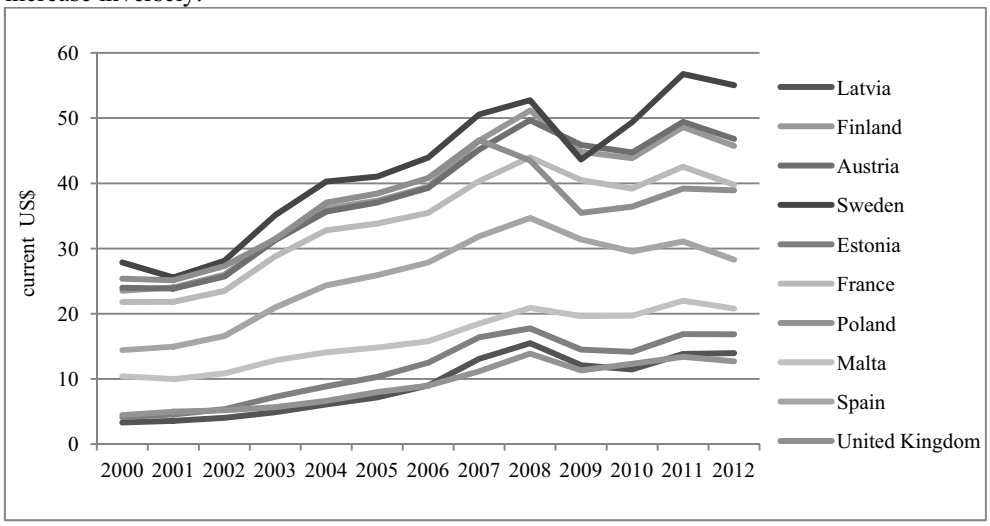

Fig. 2. Ranking of EU Member States by the value of GDP per capita (current US$), 2000-2012

Source: grouped by the authors based on http://data.worldbank.org/indicator/NY.GDP.PCAP.CD.

Table 4. Ranking of EU Member States based on the value of the main factors of ecological development of rural areas, 2000-2012

Country	2000		2001		2002		2003		2004		2005		2006	
	SI	Rank	SI	Rank	SI	Rank	SI	Rank	SI	Rank	SI	Rank	SI	Rank
Austria	1.5776	3	1.6030	3	1.6121	3	1.6750	3	1.7504	3	1.8929	3	1.9923	3
Belgium	-0.7313	16	-0.7007	17	-0.6375	15	-0.6509	17	-0.6423	17	-0.6159	17	-0.5279	17
Bulgaria	-0.8993	18	-0.8832	18	-0.7872	18	-0.8078	19	-0.7559	19	-0.7479	19	-0.7309	20
Croatia	0.0157	10	-0.0572	11	-0.0685	11	-0.0143	11	-0.0150	11	-0.0401	12	-0.0233	12
Cyprus	-0.6887	15	-0.6868	16	-0.6817	17	-0.6820	18	-0.6708	18	-0.6354	18	-0.6215	18
Czech Republic	0.0146	11	0.0693	10	0.0910	10	0.0772	10	0.1121	10	0.1500	10	0.1735	11
Denmark	0.0367	9	0.1321	9	0.2117	8	0.2462	8	0.3087	8	0.3206	9	0.2797	10
Estonia	1.1826	5	1.1937	5	1.2334	5	1.1895	5	1.2097	5	1.2207	5	1.3626	5
Finland	2.0087	1	1.9381	1	2.0516	1	1.9446	1	2.0268	1	2.0027	2	1.9955	2
France	-1.5526	25	-1.4450	24	-1.3812	24	-1.3467	25	-1.3419	26	-1.2772	25	-1.2394	25
Germany	-1.6022	26	-1.4904	26	-1.3813	25	-1.2960	24	-1.2058	24	-1.1179	24	-1.0611	23
Greece	-1.0059	21	-1.0209	22	-0.8880	20	-0.5692	14	-0.5578	16	-0.4283	15	-0.4364	15
Hungary	-0.7436	17	-0.6760	15	-0.6480	16	-0.6122	15	-0.4941	15	-0.3910	14	-0.3623	14
Ireland	-0.9708	20	-0.9505	20	-0.9286	21	-0.9133	21	-0.8910	21	-0.8566	22	-0.8402	22
Italy	-1.1707	23	-1.0165	21	-0.9713	22	-0.9468	22	-0.9168	22	-0.7539	20	-0.6443	19
Latvia	1.6774	2	1.7366	2	1.7465	2	1.7628	2	1.8194	2	2.2303	1	2.4058	1
Lithuania	0.1921	8	0.1807	8	0.1675	9	0.1641	9	0.1964	9	0.3392	8	0.4859	8
Luxembourg	-0.3662	13	-0.2856	13	-0.2356	13	-0.2300	13	-0.2171	13	-0.1976	13	-0.1934	13
Malta	-1.0932	22	-1.1164	23	-1.1170	23	-1.1273	23	-1.1022	23	-1.0895	23	-1.0821	24
Netherlands	-0.9373	19	-0.9101	19	-0.8615	19	-0.8606	20	-0.8117	20	-0.7673	21	-0.7600	21
Poland	-1.5339	24	-1.4619	25	-1.3821	26	-1.3668	26	-1.3208	25	-1.2915	26	-1.3452	26
Portugal	0.2492	7	0.3232	7	0.3247	7	0.4482	7	0.6333	7	0.7012	7	0.8768	7
Romania	-0.4484	14	-0.5587	14	-0.5527	14	-0.6227	16	-0.4757	14	-0.5016	16	-0.4930	16
Slovakia	-0.1157	12	-0.1302	12	-0.1287	12	-0.1135	12	-0.0611	12	0.1290	11	0.2810	9
Slovenia	0.8679	6	0.8607	6	0.8336	6	0.8628	6	0.8708	6	0.8795	6	0.9579	6
Spain	-2.2564	27	-2.2669	28	-2.2983	28	-2.1014	28	-2.1822	28	-2.1869	28	-2.0648	28
Sweden	1.5724	4	1.5063	4	1.5223	4	1.6194	4	1.5748	4	1.6913	4	1.8127	4
United Kingdom	-2.3575	28	-2.2178	27	-2.0423	27	-2.0449	27	-1.9360	27	-1.8814	27	-1.8646	27

SI – the value of the synthetic index of rural areas' ecological development in the EU Member States.

Source: calculated by the authors.

Continuation of table 4. Ranking of EU Member States based on the value of the main factors of ecological development of rural areas, 2000-2012

Country	2007		2008		2009		2010		2011		2012		2000-2012	
	SI	Rank	SI	Rank	SI	Rank	SI	Rank	SI	Rank	SI	Rank	SI	Rank
Austria	2.1244	2	2.2522	2	2.4396	3	2.5879	2	2.6277	3	2.6417	3	2.0598	3
Belgium	-0.4691	17	-0.3939	17	-0.2703	17	-0.1993	18	0.1082	12	0.1537	12	-0.4290	16
Bulgaria	-0.7504	21	-0.5598	20	-0.4343	20	-0.3109	19	-0.4023	20	-0.3767	20	-0.6498	20
Croatia	-0.0770	12	-0.0550	12	-0.0178	12	0.0231	13	0.0946	13	0.0946	13	-0.0108	12
Cyprus	-0.5625	18	-0.5104	18	-0.4086	19	-0.3867	20	-0.3748	19	-0.3748	19	-0.5604	18
Czech Republic	0.2858	11	0.4109	11	0.6031	10	0.7920	9	0.8922	8	0.9253	9	0.3536	10
Denmark	0.3949	9	0.5226	9	0.6557	9	0.7784	10	0.8642	10	1.0726	7	0.4480	9
Estonia	1.2706	5	1.4290	5	1.7678	5	1.8934	5	1.9778	5	2.0262	5	1.4582	5
Finland	1.9955	4	2.1123	4	2.1470	4	2.2547	4	2.3784	4	2.5470	4	2.1079	2
France	-1.1634	25	-0.9897	25	-0.8947	25	-0.7637	25	-0.6923	25	-0.6686	25	-1.1351	26
Germany	-0.8807	23	-0.8192	23	-0.6268	22	-0.5676	21	-0.5534	21	-0.5525	22	-1.0119	23
Greece	-0.4651	16	-0.3517	16	-0.2301	16	-0.0724	15	-0.2490	18	-0.2159	18	-0.4993	17
Hungary	-0.3227	14	-0.2391	14	-0.1109	15	-0.0682	14	-0.0602	15	-0.0318	16	-0.3662	15
Ireland	-0.8113	22	-0.7810	22	-0.7224	23	-0.6941	23	-0.6604	24	-0.6405	24	-0.8201	22
Italy	-0.6078	19	-0.5546	19	-0.3184	18	-0.1851	17	-0.1116	17	-0.0292	15	-0.6328	19
Latvia	2.2346	1	2.2873	1	2.5776	2	2.5562	3	2.6521	2	2.6948	2	2.1832	1
Lithuania	0.5354	8	0.5944	8	0.6974	8	0.9076	7	0.8704	9	0.8789	10	0.4777	8
Luxembourg	-0.0936	13	-0.0684	13	-0.0631	13	-0.0764	16	-0.0694	16	-0.0713	17	-0.1668	13
Malta	-1.0750	24	-1.0659	26	-1.0533	26	-1.0812	27	-0.7370	26	-0.7285	26	-1.0360	24
Netherlands	-0.7425	20	-0.6782	21	-0.6267	21	-0.6422	22	-0.6025	23	-0.5873	23	-0.7529	21
Poland	-1.2011	26	-0.9747	24	-0.7677	24	-0.7441	24	-0.6023	22	-0.5066	21	-1.1153	25
Portugal	0.8164	7	0.8043	7	0.7571	7	0.8756	8	0.9329	7	0.9859	8	0.6714	7
Romania	-0.3517	15	-0.2617	15	-0.0767	14	0.0340	12	-0.0276	14	0.0151	14	-0.3324	14
Slovakia	0.3363	10	0.4403	10	0.5534	11	0.7029	11	0.6946	11	0.6813	11	0.2515	11
Slovenia	0.9873	6	1.0257	6	1.1751	6	1.2175	6	1.2347	6	1.2801	6	1.0041	6
Spain	-2.0287	28	-1.3966	27	-1.1192	27	-1.0077	26	-0.9791	27	-0.9593	27	-1.7575	27
Sweden	2.1122	3	2.2325	3	2.5933	1	2.7512	1	2.7092	1	2.7906	1	2.0376	4
United Kingdom	-1.7670	27	-1.6058	28	-1.4024	28	-1.3489	28	-1.3123	28	-1.3180	28	-1.7768	28

SI – the value of the synthetic index of rural areas' ecological development in the EU Member States.

Source: calculated by the authors.

Conclusions

The synthetic indicator of ecological development and its score can be interpreted as a measure of the relative probability that a country/region will be able to achieve favorable environmental conditions, but it doesn't mean that it will be able to sustain those for a longer period in the future. The assumption that the countries at the top of ranking are more likely than those at the bottom to experience lasting environmental quality, can be either fallacious. As was expected, the outcomes of the present research indicated that the relatively wealthy countries (by the value of GDP per capita) are at the bottom of the ranking in terms of their ecological development and vice versa. It means that changes in ecological development of the EU counties don't reflect the level of economic development.

Unfortunately, it is hardly possible in terms of dynamically changing environment to draw conclusions about ecological sustainability of a particular country/region in the long run. These kind of conclusions would require a whole complex of information associated with two other dimensions of sustainable development: economic and social.

Given the multiple factors that affect both the rural areas and agriculture, it is complicated to draw direct relationships between variables of environmental domain. Some additional descriptors which could aid in explaining the fluctuation of these are the characteristics of the economic structure of the sector (farm and household structure, economic accounts for agriculture, agriculture value added per worker, cereal yield, livestock production etc.), the social characteristics of the area (employment/unemployment level, rural population, total social expenditures etc.). However, the specific context of each country has to be taken into account, since it could cause differences in factor combinations and their aggregate effects.

Besides, the environmental component of rural areas' sustainable development has to be integrated into decision-making at all levels, by promoting coordination between all the policies of each EU Member State, taking into account economic, social and environmental dimensions.

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Food production in Poland, compared to selected European Union Member States

Abstract. The purpose of this paper is to characterize the food sector in Poland during 2008-2012, compared to selected European Union Member States, and to define the factors affecting growth of the sector under consideration. The structure of sold production of the Polish food industry and the levels of food production in Europe are presented in the paper. Discussion covers quantitative fluctuations in the number of businesses and production value of food products, as well as employment and salaries in the food sector. Finally, growth perspectives are determined for the studied sector.

Key words: production, food, food sector, European Union.

Overview

The food sector in Poland is among those which underwent major changes and recovered quickly after the political transformation in Poland. Thus, the sector became an essential branch of the economy, affecting economic growth. Generally, the food industry is considered resistant to crises, while business cycle fluctuations do no strongly affect demand [3].

Through technological and organizational growth, Poland has become a modern and innovative food manufacturer in Europe. This is proven by increasing exports of food products (the volume of export tripled during the last 10 years).

Another important factor that contributed to the development of this industry was Poland's accession to the European Union and the consequent opportunities for better exploration of foreign markets. With the EU membership, Polish food manufacturers were able to receive various types of grants and subsidies. Polish food products are competitive and recognized on many foreign markets.

According to the Polish Classification of Economic Activities, manufacture of food products is classified in section C - processing activities. It includes processing of products of agriculture, forestry, hunting and fishing into food and beverages[4] for human and animal consumption, as well as manufacture of semi-finished products which are not used for direct consumption.

Manufacture of food products covers a very extensive range of operations. Business undertakings engage in processing of products of animal origin (e.g. poultry processing

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[3] Food sector in Poland - Sectoral Profile, Business Information Department, Polish Information and Foreign Investment Agency (PAAIZ) 2013.

[4] Manufacture of beverages is a separate sub-section. Here it only covers manufacture of fruit and vegetable juices, non-alcoholic beverages based on milk, coffee, tea and mate.

industry), of plant origin (e.g. fruit and vegetable processing), or secondary processing (e.g. food concentrates industry). Furthermore, the food sector supplies various raw materials for the pharmaceutical industry (blood, glands), tanning industry (leather), or cosmetics industry (fat)[5].

This sector does not include preparation of meals for direct food service, e.g. in restaurants, or food distributors.

The food sector does not include producers of agricultural produce, animal breeders, fishing enterprises and fisheries.

The main characteristics of the food sector include:

1. Enormous effect on human health;
2. Stringent legal regulations defining food quality standards;
3. Requirement to comply with the sanitary and environmental standards applicable in the EU;
4. Significant barriers to entry on the food processing market (high investment outlays);
5. Competitive advantage depending mainly on the ability to adapt to the standards and requirements under the European Union legislation.

The purpose of this paper is to characterize the food processing sector in Poland during 2008-2012, compared to selected countries[6], and to define the factors affecting growth of the sector under consideration.

Structure of sold production of the Polish food industry

The food sector is essential for the food safety of the country. Due to its effects on human health, this sector is affected by extensive formal and legal requirements.

The food production requirements in Poland are mainly determined by European Union legislation. Compliance with EU laws and regulations is particularly important for food exporters, as ca. 80% of the Polish food exports reach the EU markets.

Sales structure of the Polish food sector during the studied period underwent certain minor fluctuations. The following products had the highest shares in 2012 sales: meat 28%, dairy products 15%, beverages 11%, fruit and vegetables 8% (Fig. 1).

After 2 quarters of 2014, the value of sold production of food products in Poland exceeded 94 bn PLN, corresponding to 2.6% increase as compared to the same period of the preceding year. 358.6 thousand persons were employed in this production.. Net profit of the food industry exceeded 3.2 billion PLN, corresponding to more than 10% of the net profit of industry in Poland.

In 2012, the following EU Member States were the largest buyers of Polish food: Germany, United Kingdom, Czech Republic, France, Netherlands, Italy and Slovakia (Fig. 2). Recent years have seen a prominent rise in food exports to such countries as Vietnam, Japan, Saudi Arabia, United Arab Emirates.

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[5] Clarifications to the Polish Classification of Economic Activities – 2007. [Available at:] www.stat.gov.pl [Access: November 2014].

[6] The subjects of analysis were selected as countries that were accessing the European Union along with Poland in 2004: Cyprus, Czech Republic, Estonia, Lithuania, Latvia, Slovakia, Slovenia, Hungary. Malta is excluded due to partial lack of available data.

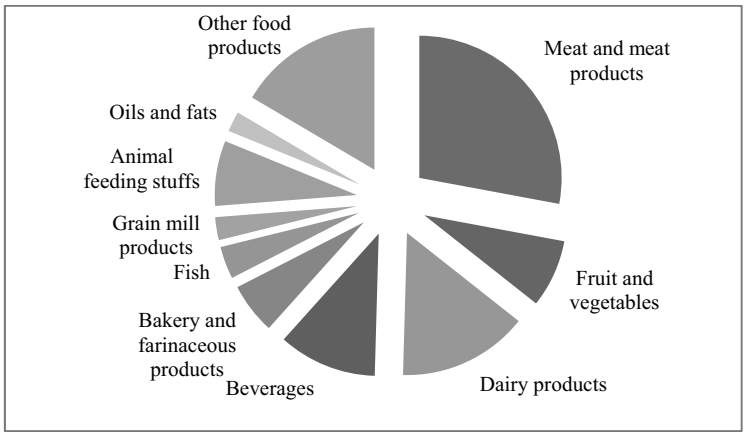

Figure 1. Polish food sector 2012 sales structure

Source: Polish Information and Foreign Investment Agency (PAAIZ) The food sector in Poland, Economic Information Department, 2013.

In terms of food production value, Poland ranks good in the perspective of the entire Community. In 2012, Poland ranked 6th across the EU.

Manufacture of food products in Europe

There are numerous publications available concerning manufacture of food products in Europe, from general reports on the condition of the entire food sector to papers relating to specific products (such as meat, dairy, fruit or vegetables). European countries specialize in manufacturing specific food products and achieve various market positions.

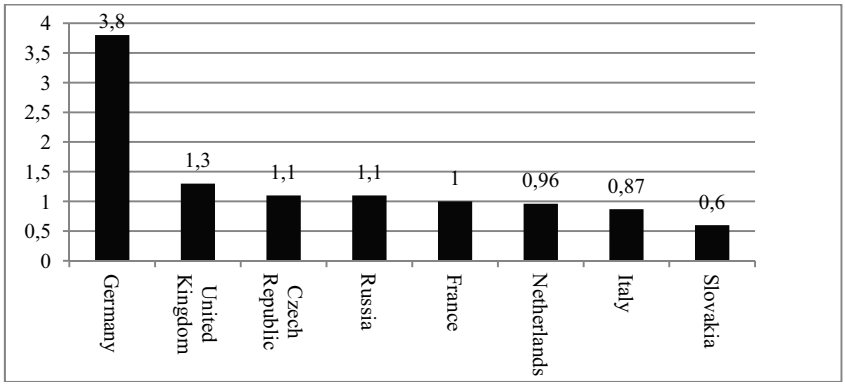

Figure 2. Main buyers of Polish agricultural and food products (value of export sales, bn EURO, 2012)

Source: own research, based on: Drewnowska B., Padł rekord eksportu polskiej żywności. [Available at:] www.ekonomia.rp.pl [Access: November 2014].

According to Datamonitor [2011], the following were the largest producers of milk in Europe in 2010: the United Kingdom, Italy, Germany and France. Their combined share in

the value of milk production in Europe exceeds 47%. They are closely followed by Poland, with production volume comparable to that of the Netherlands.

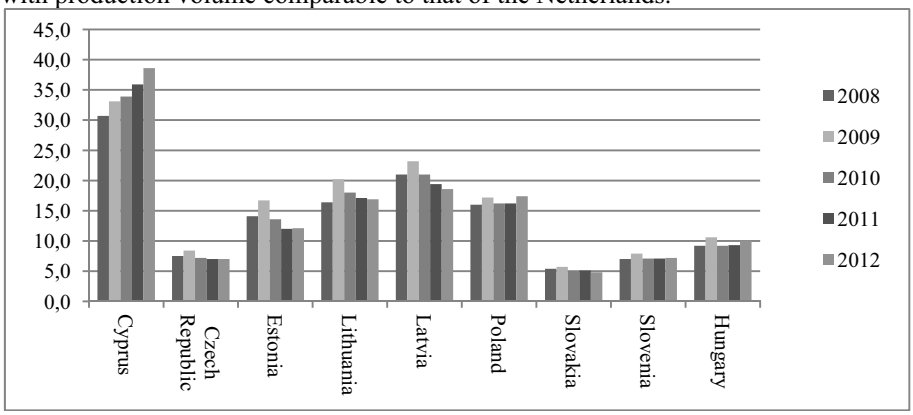

Figure 3. Percentage of food production in overall industry value (%)

Source: based on data from Eurostat database.

Krzecht and Środoń [2013] were studying production of pork in the European Union. Their research shows that the following countries were the main producers of pork during 2008-2011: Germany, Spain, France and Poland. They manufactured approx. 10-11 million tonnes of pork each year in aggregate, i.e. around 50% of the whole EU production. 2012 leaders in poultry meat production were: France, the United Kingdom, Germany and Poland, with France and the Netherlands being the largest exporters [Kozioł, Krzywoń 2014]. Poland is the most competitive poultry manufacturer in Europe in terms of prices. During 2007-2010, Germany produced the most beef, amounting to almost 1/4 of the entire EU production [Małkowski et al. 2011]. In terms of cereals production, Poland is a significant manufacturer. During 2008-2012, Poland ranked second across the European Union (following France) in terms of cereal crop areas, and third (following France and Germany) in terms of grain harvest. During 2004-2007, Italy and Spain produced over 40% of all vegetables across the European Union [Puškarić et al. 2009], but they are also the largest fruit producers in the Community. Poland is the leader in apple production. Its yield in 2009 was the highest across the EU, and in 2010 it was outstripped by Italy. Industrial animal feeding stuffs are also recognized as food products. France, Germany and Spain have been their dominant producers for years [Bodył et al. 2013]. According to Marketline report [2013], Italy, Germany and France were the leading manufacturers of baby food in 2012. M. Zuba pointed out in her research that Germany was the largest manufacturer of eco-foods in Europe in 2008, with Italy being the largest exporter of these products. They are continuously among the leaders in this field today.

Quantitative fluctuations in the number of businesses and production value of food products

Cyprus is characterized by the highest proportion of food in the value of overall industry volume among all the studied countries, at 31-39%. Another distinguished country in this perspective is Latvia, showing a decreasing tendency (from 21 to 18.6%). Poland

ranks third on this list. During the studied period, the percentage of food production ranged from 16% to 18% of the full value of the industry (Fig. 3).

During the years of study, Poland manufactured food products with the highest value (Table 1). In 2009, production value decreased in all the studied countries, followed by increases during the next two years. Increase was most prominent in 2011 in Lithuania (over 20%), and decrease was strongest in Latvia in 2009 (over 20%). In 2012, Lithuania and Poland reported the highest growth of production value as against the value of 2008 (by over 16%), and the same value decreased in the Czech Republic and Slovenia at the same time.

Table 1. Value of food production in million EUR

Country	2008	2009	2010	2011	2012
CY- Cyprus	1,125.0	1,100.3	1,155.8	1,169.5	1,139.6
CZ - Czech Republic	10,353.8	9,020.8	9,133.2	9,876.0	9,827.6
EE- Estonia	1,105.1	953.0	1,005.6	1,138.7	1,180.2
HU- Hungary	8,023.9	6,954.5	7,045.1	7,892.6	8,311.4
LT- Lithuania	2,721.1	2,311.4	2,539.0	3,074.0	3,163.6
LV- Latvia	1,411.0	1,109.2	1,200.7	1,313.0	1,433.2
PL- Poland	36,596.2	30,678.0	34,499.1	38,689.0	42,516.0
SK - Slovakia	2,728.1	2,281.0	2,537.7	2,905.9	2,911.3
SI- Slovenia	1,637.2	1,461.6	1,485.0	1,569.8	1,548.3

Source: own research, based on data from Eurostat database.

In the countries under review, over 80% production value would be generated by business establishments employing over 50 persons. During 2008-2012, the highest value proportion of food against total processing was recorded in Cyprus (34% on average) and the lowest in Slovakia (5% on average). This ratio is around 16% in Poland.

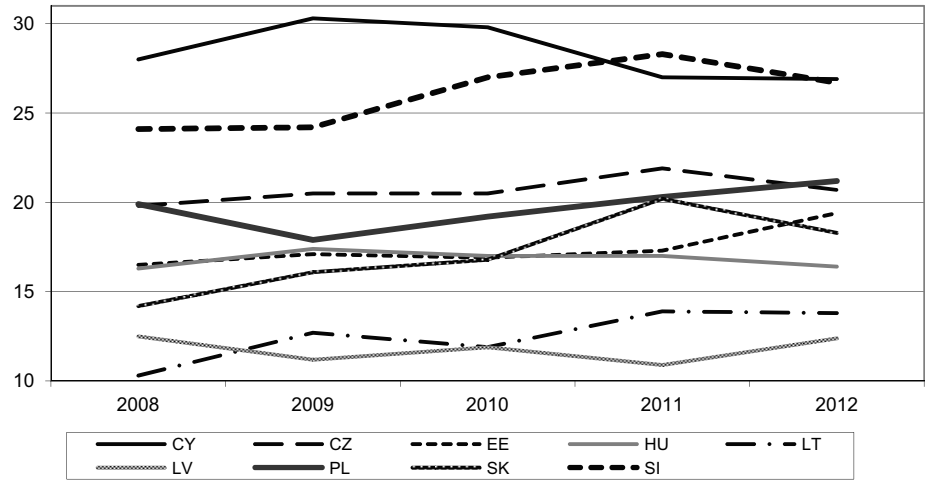

Figure 4. Gross Value Added per 1 employee, in thousand EUR
Source: own research, based on data from Eurostat database.

The most commonly applied labour productivity measure is the Gross Value Added (GVA) and its modification - Gross Value Added per employee. Employees were most productive in Cyprus and Slovenia (Fig. 4). The worst situation in this perspective was

observed in Lithuania. Productivity of Polish employees ranged above average for the studied counties, and the percentage of added value of food products in total added value of the processing sector is nearly 15%.

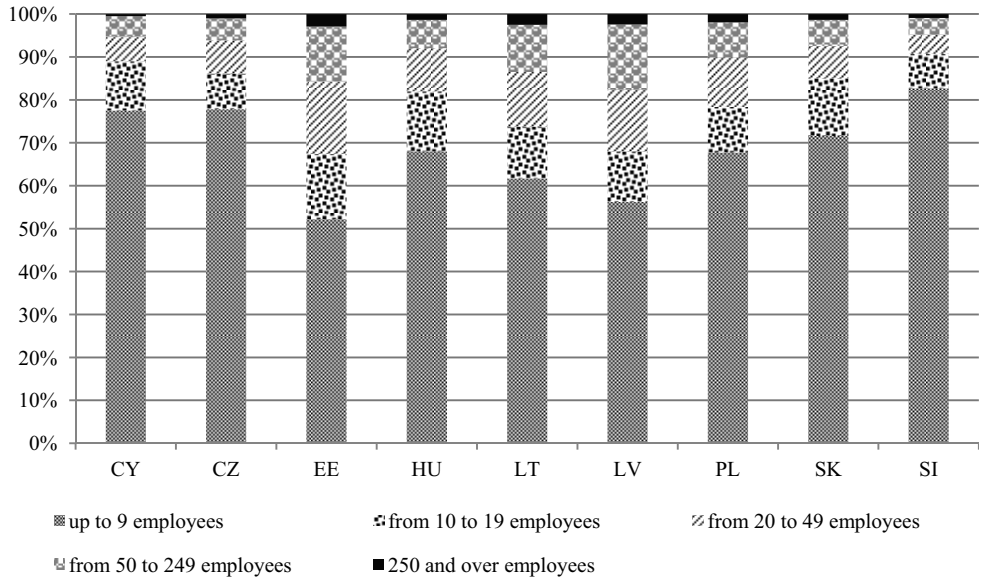

Figure 5. Average yearly number of enterprises during 2008-2012,
Source: own research, based on data from Eurostat database.

Micro-enterprises strongly prevailed within the overall group of food product manufacturers in each of the studied countries, while the number of large enterprises was negligible (Fig. 5). Micro-enterprises represented almost 80% of all businesses in Cyprus, while their production value represented less than 15% of the value of the entire processing sector. In addition, this percentage slightly exceeded 5% in Poland and in Slovenia and remained even lower in the remaining countries. Large number of enterprises did not correspond to higher productivity. The highest growth (including 80% of micro-enterprises) was observed in Slovakia where the overall number of business operators quadrupled during the period of study. Only in Poland and in Cyprus would the number of enterprises decrease in 2012 as against the value of 2008.

Employment and salaries in the food sector

Most people were employed in Poland in manufacture of food products during 2008-2012 (Table 2). Least employees worked in this field of manufacture in Cyprus; however, their proportion in overall employment in the processing industry was highest, exceeding 30% during each of the years of study, which is due to poor development of other branches of industry in this country. In Slovakia, the average number of employees per 1 enterprise was highest (for 2008 and 2009). A very significant increase in the number of micro-enterprises was recorded there in 2010 (by 1816 businesses), resulting in a strong

narrowing of this category. 29 persons were employed per enterprise in Poland during 2008-2012 on average. During the years of study, the number of employees dropped in all countries except Cyprus. This is an alarming phenomenon. People lose their jobs as a consequence of increasing automation of production. Regular annual drops of the average numbers of employees per enterprise were observed in: the Czech Republic, Estonia, Lithuania and Slovenia.

Table 2. Average employment in manufacture of food products

Country	Average number of employees per 1 enterprise				
	2008	2009	2010	2011	2012
CY	12.3	12.5	14.2	14.5	14.0
CZ	19.3	17.4	15.8	14.1	13.8
EE	37.8	34.6	34.5	33.0	31.4
HU	22.3	21.4	20.7	20.0	20.2
LT	38.3	37.2	34.9	32.0	28.2
LV	40.8	35.6	31.5	31.6	28.3
PL	26.7	29.4	29.1	29.3	28.4
SK	51.2	46.4	14.3	13.9	14.5
SI	16.4	14.9	13.6	12.2	11.4

Source: own research, based on data from Eurostat database.

According to the research, during the study period Cyprus and Slovenia were the countries in which employees could count on earning the highest wages and salaries. They were almost three times higher than in Lithuania where earnings were lowest. Lithuania is also the only country in which salaries and wages in 2012 lowered as against the value of 2008; wages and salaries increased elsewhere. Average nominal salary in the food sector in the European Union was above 3,000 Euro during the years of study (Fig. 6).

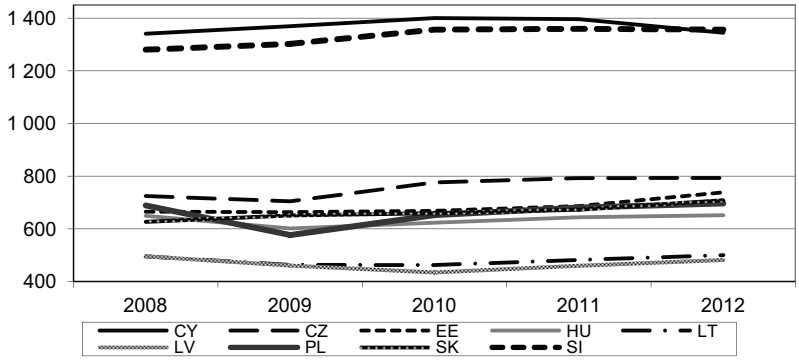

Figure 6. Average monthly salary during 2008-2012, Euro
Source: own research, based on data from Eurostat database.

Employers from Latvia, Poland, Lithuania and Hungary were paying the lowest social security premiums, which were highest in the Czech Republic and Estonia. In four of the countries, average cost of employing a single worker did not exceed 10,000 Euro, and these are the most competitive countries in terms of costs. Cyprus and Slovenia are the countries

where these costs are highest, despite the lowest percentage of social security paid by employers (Fig. 7).

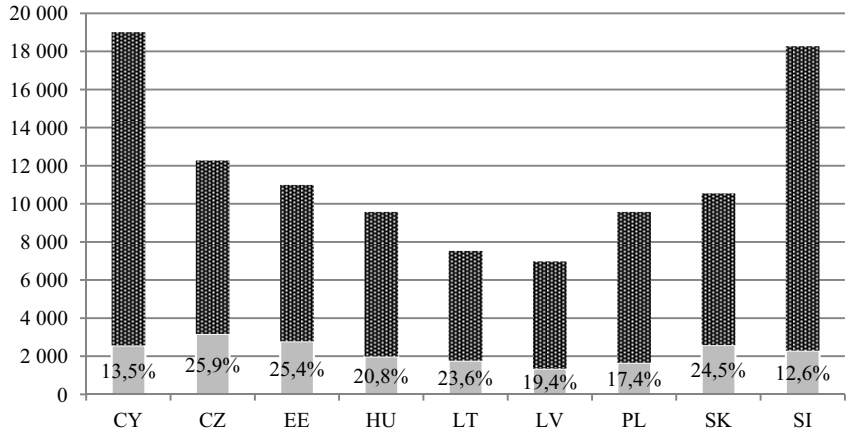

Figure 7. Average annual cost of employment per 1 employee during 2008-2012, Euro, and social insurance contributions (paid by the employer), %

Source: own research, based on data from Eurostat database.

Food industry growth perspectives

Poland is among the largest beneficiaries of EU funds. Accession to the EU involved the need for enterprises to adapt to the standards applicable in the EU. With these funds, many food producers were able to survive and expand. The Polish food industry is competitive against other EU Member States due to the prices of agricultural produce and relative low processing costs [Szwacka-Mokrzycka, Kociszewski 2011]. Low labour costs further encourage investments in the food sector. Investments in new technologies to enhance productivity are necessary to maintain the competitive advantage. Retaining and acquiring new sales markets is possible through such activities as: strengthening the brands of Polish foods and creating its positive image as healthy, high quality products manufactured in compliance with stringent sanitary standards. Consumers' interest in food manufactured with the use of industrial methods has been decreasing for years. Chemical plant production products or genetic modifications used in production make consumers reluctant to buy. According to the analysis carried out within the project entitled "Food and diet in the 21st century - a vision for growth of the Polish food sector", demand for eco-foods and pro-health foods will be increasing rapidly on the global markets during the upcoming ten or more years. Poland is already taking advantage of this development direction - both the number of eco-farms and the areas of such crops are increasing year by year. During the upcoming year, demand for design foods adapted to the needs of specific consumer groups (e.g. obese people, diabetics, people with gluten intolerance) will be

increasing as well [Michalczuk 2013]. These directions should be taken into account by Polish manufacturers.

During the upcoming years, exports to EU Member States will foster growth of the food industry. On the other hand, increased exports of food to Asian markets and Balkan states is expected to compensate for the losses incurred by Polish producers as a consequence of the embargo imposed by Russia.

Summary

1. In terms of food production value, Poland held a very distinctive position in the perspective of the entire Community. This value would be 4 to 34 times higher than the production values in the remaining countries under review on average.
2. Employees were most productive in Cyprus and Slovenia. The level of employee productivity was higher in Poland than the average productivity in the studied countries.
3. In all the countries of study, micro-enterprises prevailed in the overall number of business establishments, but enterprises with 50 or more employees produced over 80% of total production value.
4. Employment in manufacture of food products was the highest in Poland. Fewest employees were working in Cyprus, but this is the only country where the number of employees increased in the perspective of the studied years.
5. In all the studied countries, salaries earned in food production were lower than the average salary in the European Union. During the period of study, employee salaries decreased in Lithuania only.
6. Poland is among the most competitive countries in terms of cost of employment per 1 employee, which is an encouragement for investment in the food sector.
7. Investment in new technologies to enhance efficiency is an opportunity for growth of businesses; it is possible with the extensive EU aid received by the Polish food manufacturers. The increase in eco-production appears as a response to increasing health awareness among consumers, and this direction should be specifically taken into account.

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Telework and personnel risk

Abstract. Flexibility is currently gaining in significance in the field of employment. The ability to freely select the time and the place of work is of great help for both the employee and employer. One of the forms of flexible employment that facilitates such solutions is teleworking. In addition to the many benefits brought forth by this form of employment, employees and employers must also take into consideration the personnel risk associated with telework. The article focuses on the problem of risks faced by a teleworker and those borne by the employer in connection with the introduction of teleworking. The study is theoretical and empirical nature, taking advantage of materials in literature covering personnel risk and telework, articles from the Internet and empirical data contained in reports from PARP [Polska Agencja Rozwoju Przedsiębiorczości – Polish Agency for Enterprise Development] and PBS DGA [market research company] studies. The basic methods of preparation consist of analysis and synthesis, as well as induction, deduction and reduction. The conducted study reveals, among others, that the implementation of teleworking carries with it personnel risk that applies to two entities - the teleworker and the employer. In order to reduce or minimise such risk, it is necessary to create new rules for teamwork coordination and supervision, as well as make amendments to some legal solutions aimed at encouraging employers to conclude employment contracts.

Key words: personnel risk, telework, teleworker risk, employer risk.

Introduction

Telework is one of the manifestations of fundamental changes in the redefinition of work organisation and employment. This atypical form of work emerged and spread throughout the information society thanks to the development of modern telecommunication and information technologies. Telework is an extremely important element of information society. It has become a useful tool for labour market institutions, the government, businesses and other organisations.

Telework is a subject of discussion abroad, particularly in Western Europe and the United States, where its implementation began much earlier than in Poland. Analyses of this issue are also conducted in Poland. A large number of studies and much research on this form of work relate to its implementation by enterprises. Advantages and disadvantages are presented, especially for potential employers. In contrast, the threats and risks posed by this form of employment to the employee are covered relatively infrequently.

The aim of this study is to present the risks faced by a teleworker and the risks that are borne by the employer in connection with the introduction of telework. The study is of theoretical and empirical nature, taking advantage of materials provided in literature in the field of personnel risk and telework, articles from the Internet and empirical data contained in reports from PARP [Polska Agencja Rozwoju Przedsiębiorczości – Polish Agency for Enterprise Development] and PBS DGA [market research company] studies. The basic

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methods of preparation consist of analysis and synthesis, as well as induction, deduction and reduction.

Personnel risk in the organisation

Personnel risk and methods for its management have recently become a new point of interest for scientists and human resources managers in organisations. Personnel risk stems from the inability to accurately determine the value of all the results of employees' work, as well as the effects of measures undertaken within the scope of a specific personnel policy applicable to employees [Lipka et al. 2014].

Personnel risk should not be associated exclusively with events responsible for the need to find a smaller or larger number of new employees in order to satisfy the so-called reproductive labour demand (demand induced through the loss of human resources) [Lipka 2002]. It is primarily associated with human capital at the disposal of the employer - capital of which the employers are not absolutely sure, but one that allows them to benefit and achieve success. This success lies in the ability to determine the level of personnel risk and limit or minimise it, which will make it possible to protect the organisation against tangible and intangible losses.

At risk value (one exposed to risk) can, in the case of personnel risk, take both tangible (increased costs, decreased profit, loss of competitiveness) and intangible (loss of reputation) form, but the latter also usually includes implications of a financial nature. In other words: the cost-effectiveness of personnel risk of the organisation has more than a strictly economic dimension. This is due to the nature of human resources [Lipka 2002].

In literature on the subject it is possible to find various definitions of personnel risk, which may include: uncertainty, probability of loss, size of potential losses and, finally, the type of danger.

Personnel risk of an organisation (also known as staffing risk, personnel and organisational risk or company operational personnel risk) is a measure of the variation of results of an uncertain situation [Lipka 2002]. It pertains to human capital management, constituting a kind of economic, as well as behavioural risk [Urbanowska-Sojkin 2013].

X. Zaho and Z. Jia distinguish two aspects of human capital: personnel risk and human capital risk management. They define human capital risk as "the possibility of loss or deviation from the company's target as a result of the participation of personnel in operations [Zoho & Jia 2006]. The relationship between the highlighted aspects of human capital risk lies in the fact that making wrong decisions within the scope of management of such capital or using imperfect procedures can lead to errors committed by employees in the performance of their work, which consequently expose the company to the risk of unpredictable employee behaviour (personnel risk) [Zahao & Jia 2006].

Personnel risk considered from the perspective of an organisation's human capital can be divided into [Król 2010]:

1. risk related to an incorrect quantity of human capital in the organisation (deficit or surplus of human capital) - this personnel sub-risk is synonymous with the risk of planning personnel needs,
2. risk of "over-competence" of human capital in the organisation (overqualified employees),

3. risk of competency gaps in the organisation (insufficient or improper competencies of employees),
4. information security risks pertaining to information that employees have access to (risk of "outflow" of information from the organisation),
5. risk of "human error",
6. risk of knowledge loss due to an employee leaving the organisation.

Personnel risk is a multi-dimensional and dynamic (changing over time) category. In addition to the above mentioned personnel risk there is a risk of conflict between employees, risk in communication, risk of employee segmentation or risk associated with the incompatibility between the information system supporting the personnel system and the needs of the organisation.

According to A. Pocztowski personnel risk is the risk of creating value within the scope (area) of human capital management, which is related to the need to answer the following questions [Pocztowski 2003]:

1. Which activities lead to the creation of value and which do not?
2. What risks are associated with the use of IT tools in the various personnel processes?
3. What are the risks of investing in human capital and the expected return on such investments?
4. What is the risk of globalisation in relation to human capital management?

Personnel risk is a type of micro-organisational or micro-social risk, i.e. risk associated with the organisation's social structure. It is determined by macro-scale (exogenous) factors, including those related to the functioning of the labour market and other elements of the external environment, as well as micro-scale (endogenous) factors, resulting from the organisation's strategy, culture and organisational structure or the way the human capital management process is implemented [Król 2010].

The following personnel risk characteristics are distinguished [Ledig 2008]:

1. It is directly related to decisions;
2. It is a threat, but also an opportunity for the organisation;
3. It is associated with uncertainty related to decision-making objectives;
4. It arises due to information deficits;
5. It refers to the shaping of employee behaviour and the organisation's entire system.

Personnel risk can also be understood as a potential threat to the objectives of a company, resulting from negligent and/or improper use of human capital [Kroop 2004]. Solutions related to telework and employment within a flexible framework in a particular organisation mean that personnel risks appear related to both employers and employees. According to the author the risks associated with telework should be understood as its failures and threats.

Telework in selected countries and in Poland – results of studies

The idea of telework appeared in the USA in the early 1970s. The United States have the highest share of teleworkers, where in 2006 30 million people were working remotely (about 30% of all employees). According to the European Commission telework is

performed by about 10 million people in the EU. More than half of them are self-employed. Approximately 4.5 million employees working remotely perform work under an employment relationship [Spytek-Bandurska 2013].

In contrast, cross-cultural studies on telework from 2000 show that most teleworkers in Europe are located in Germany (2.13 million) and the UK (2.03 million), while percentage-wise, of the total population employed, the highest number of teleworkers is employed in Finland (17%), Sweden (15%), the Netherlands (15%), Denmark (10%) and the United Kingdom (8%), while in Poland this is only 2% (Figure 1).

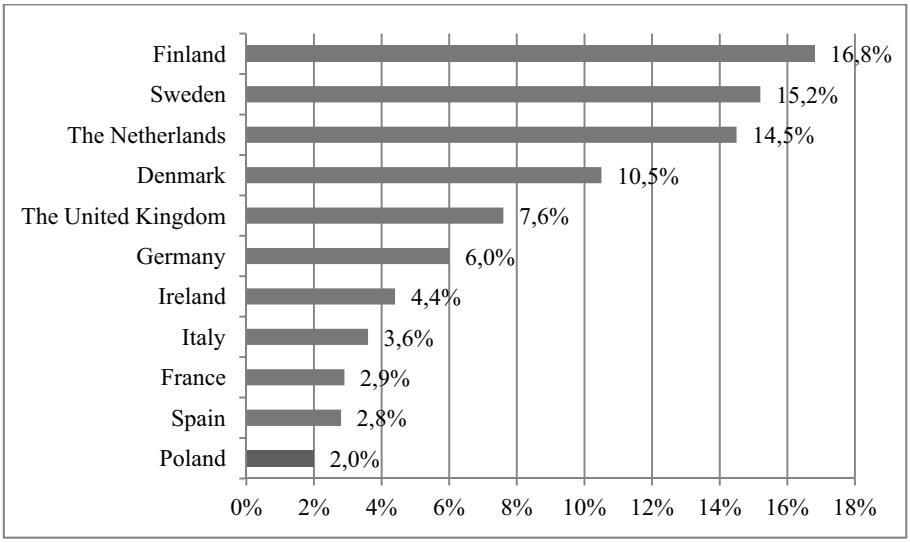

Figure 1. Percentage of teleworkers in selected European countries and in Poland

Source: [Spytek–Bandurska 2013].

In a report on the Polish telework market conducted in 2007 by Doradztwo Gospodarcze DGA S.A. it has been found that teleworkers in Poland accounted for only 1% of all employees. Despite this, up to 19% of surveyed companies declared that at that time they are considering the introduction of teleworking in their company in the near future. Studies conducted by PBS DGA in 2009 showed that the number of people teleworking increased 5-fold in 2008, so it should be assumed that it is approximately 500-600 thousand of employees, which amounts to about (5% of all employess). Telework is employed in about 18% of companies and institutions in Poland [www.dga.eu].

Results of PARP studies on a sample of 800 respondents indicate that only 3.2% of entrepreneurs employed teleworkers, 11.2% of employees declared an interest in teleworking, while 36.6% would like to work in a mixed system (PARP report). Similar research conducted by Pracownia Badań Społecznych in 2005 based on a sample of 1000 companies confirms slight interest in telework, as it was implemented in 16% of companies, while in 2/3 of them only one member of staff was employed using this form - most often in financial services, information technology and accounting (Figure 2).

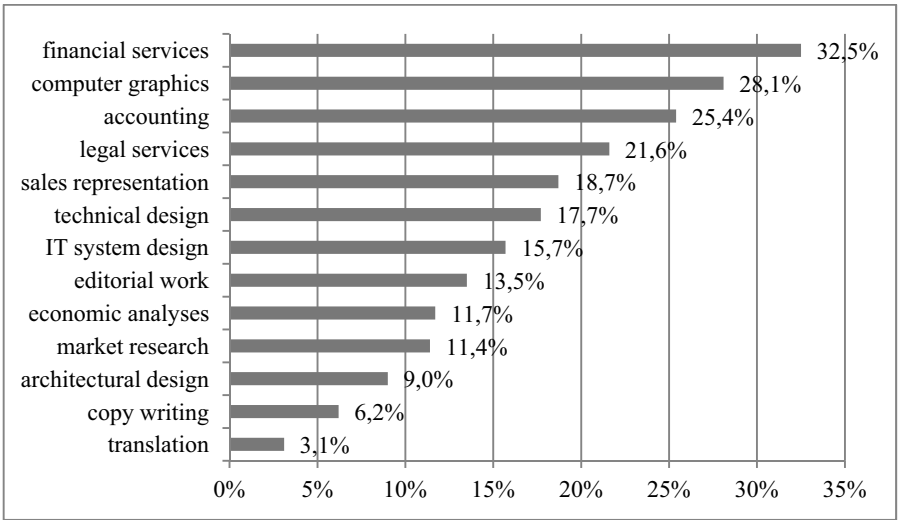

Figure 2. Activities performed by teleworkers in Poland (%)

Source: PBS study "Telepraca – raport z badania 1000 przedsiębiorstw" from 2005. [www.telepraca-1000-firm].

Not every type of work can be done from outside the office. Operating specialised machinery and equipment, or customer service, require the employee to be present at the workplace. IT multinationals were the first to do this in Poland. IBM has allowed telework for over a decade and flexible working time has been possible for even longer, over twenty years. Some divide time between their home and the office, working at home three days a week and spending two in the office. Others work at home all the time and use a "hot desk" [Dawid-Sawicka 2010].

The benefits of telework have also been noticed in PZU, where about 300 claims adjusters work this way. The idea of telework has gained in significance in PZU following the centralisation of claims handling and the reduction in the number of offices from three hundred sixty to nine across the country. For some this meant an approximately two-hour daily commute each way [Golik 2013].

The vast majority of working Polish women aged 25-49 years must come to work every day. Only 13% take advantage of teleworking. In the UK, Denmark and Austria, one in four women performs work at home. It should be no wonder that Poland ranks among the five countries of the European Union with the least frequently used flexible working arrangements for women [Golik 2013].

Increasing Poland's competitiveness level and reducing the distance separating it from other countries, as well as ICT-related (information and communication technology) trends, force the reinforcement of information society development and modern forms of work organisation. In line with the Lisbon Strategy which aims to build a knowledge-based economy, documents have been developed in Poland defining the framework and direction of the country's computerisation (e-Polska), and the building of an information society. These are: the National Development Strategy 2007-2015, the National Strategic Reference Framework 2007-2013 and the Strategy of Information Society in Poland for the years

2007-2013 [Pizło 2005]. Telework is increasingly often being identified as one of the key areas of development of an information society. Its popularisation has become one of the elements of the European Employment Strategy. An institution was established dedicated to monitoring solutions used in telework - European Telework Online.

It is important to note the factors stimulating telework development, such as: increasing competition on a global scale, limited resources of skilled labour in certain regions, socio-demographic changes, deteriorating working conditions, environmental pollution and, finally, the focus on restructuring and cost reduction. The development of teleworking can also be seen as an organisation adapting to growing uncertainty. This stems from the fact that it contributes to increasing the flexibility of companies and this enables risk compensation. In conditions of uncertainty, flexibility is an essential attribute of the operations of modern organisations. It allows them to adapt to constantly changing needs. However, solutions becoming more widespread along with the rise in popularity of the Internet, i.e. telework, are also a source of threats.

Operations based on the Internet imply interdependence, flexibility, openness, equality, trust, learning and partnership. The above mentioned methods of thinking about the Internet entail the following consequences in relation to the organisation: individualisation, the disappearance of hierarchy, delegation of: authority, responsibility and risk.

Risk to the teleworker

Telework carries a risk, both for the employer and for the people performing work via telework, i.e. teleworkers. The risk associated with the use of telework is shown in Table 1. It has been identified based on the attributes of teleworking, namely: spatial dislocation, temporal dislocation and the use of information and communication technologies. The proposed considerations cover two entities: the teleworker and the employer.

One of the most significant consequences of spatial dislocation is social isolation. Isolation means that the employee is separated from the world of discussions, gestures, interactions. Opportunities to communicate, express emotions, discuss work-related issues, create solutions, share successes are limited. Teleworkers may go unnoticed and unappreciated in a team. They reap no benefits from daily team meetings because these either do not exist or are held via video- or teleconferences.

Isolation means no contact with superiors, which reduces the possibility of career advancement. It also results in difficulties in mobilisation and motivation, accelerates burnout. Over time, the isolation leads the worker to become alienated in the organisation. A state of isolation can influence the health of an employee, for example cause: anxiety, nervousness, mood swings, depression.

An important consequence of spatial dislocation is the transfer of work to the home. This leads to work life and private life becoming intertwined, a lack of free time, an imbalance between private and professional life. A teleworker usually dedicates more time to thinking about work. He or she is often unable to concentrate on neither work nor family. In addition, telework involves stress related to working at home and assertiveness towards loved ones, who are not always able to understand that someone is working at home. This aforementioned work-related stress intensifies when the employee has little autonomy and their actions are dictated by the requirements of the supervisor.

Table 1. The risk associated with the use of telework

Risk of the teleworker	Risk of the employer
1. Social isolation and mental/physical deterioration.	1. Initial implementation costs of the teleworking system.
2. Problems of teleworkers related to the separation of their home life (personal) and stress in the family.	2. Lack of team integration, as well as employee and employer synergy - trust.
3. Threat of "workaholism" - working "around the clock" and Internet addiction - a long workday.	3. No direct control over the performed work.
4. Increased autonomy and accountability, and the need motivate oneself.	4. Loss of image and potential customers of the organisation.
5. Shifting the burden of professional training from the employer onto the employee - stagnation.	5. Possibility of valuable documents and data being leaked outside the company.
6. Shifting the cost of creating and maintaining positions onto the employees.	6. No return on investment in human capital - training.
7. Job insecurity, inadequate labour law.	7. Problems with management, which concern, among others, monitoring progress, health and safety regulations, motivating employees, which occurs rarely.

Source: Own preparation.

The mentioned effects are compounded by temporal dislocation. The risk to a teleworker may be related to time management. An increase in the productivity and quality of performed work can be obtained through the lengthening of working time beyond existing standards, as well as shortening or even eliminating breaks. As a result working time and private time merge. Teleworkers tend to work, even if their health does not allow it. Furthermore, it happens that employees working standard hours contact teleworkers at any time, seeing them as always available. As a result, teleworkers are at risk of workaholism**.**

As a consequence of spatial and temporal dislocation and the use of information and communication technologies, addiction to information and communication technologies can occur, manifesting itself as Internet addiction.

Telework means a transfer of risk onto teleworkers by increasing their autonomy and responsibility. Teleworkers are responsible for the fate of the company, as well as for their own development.

The use of teleworking leads to a shift of tasks related to professional development away from the organisation and onto the teleworker. For this reason the risk level of the teleworker within this area is high. The development risk of the teleworker consists of, among others: risk of slowed or inhibited professional development (due to lack of financial resources or motivation to develop), risk of incurring expenditure on development, risk of choosing the wrong direction of development (incompatible with the predispositions of the teleworker or labour market demand). Career risk exists in conjunction with development risk. As a result, a risk of professional stagnation may appear [Król 2010].

Spatial dislocation necessitates ergonomic adaptation of the workplace. Risks associated with the following are often transferred onto the employee: equipment, incurring fixed costs or application of health and safety principles that may lead to organisational problems for the teleworkers and control problems for their employer. In the long term this could lead to various deficiencies.

From the point of view of the teleworker, economic risk is a very significant type of risk. It consists of specific risks, including reduced employment security risk (risk of a lack

of employment continuity), risk of loss of livelihood and social risks. The first of these risks stems from the limited duration of contracts and the lack of certainty of repeat conclusion of a specified period contract (e.g. contract work, mandate or self-employment), for the duration of a particular job or individual employment. Although there is an increased interest in telework, which promotes professional activation of many groups of people (e.g. young people, women, the disabled), parties still choose to cooperate under civil law contracts that give them a lot of freedom and independence, but do not provide sufficient protection and employee privileges. A secondary risk is associated with the primary by being its direct consequence. In contrast, social risk pertains to, among others, limited access to employee benefits or total lack thereof, lack of effective legal protection related to remuneration for work and a lack of guaranteed minimum wage [Król 2010]. Very often employers consider teleworkers as second-class employees, do not trust them and therefore do not sign employment contracts with them.

Risk of the employer

The employer's risk is the risk incurred by organisations in connection with their employment of teleworkers, regardless of the form.

Despite the unquestionable advantages of teleworking, employers refrain from organising it because they fear the inconvenience and problems, especially those unidentified, which may arise suddenly and cause severe losses to the company. In particular, one should keep in mind the high cost of establishing a work position in the place of residence of the employee, which is much more difficult and takes more effort than in the workplace, whose location and equipment are chosen to facilitate business operations. Meanwhile, the intended use of homes is completely different, so housing conditions and infrastructure must be present that allow the installation and smooth operation of equipment, implementation of security measures against unauthorised access, as well as assure health and safety at work. Due to the spatial dispersion of teleworker positions, the use of the latest ICT technologies increases cost, while the risk of hardware failure and communication difficulties is increased [Spytek-Bandurska 2013].

As a result of the isolation of employees, opportunities for integration and creation of synergies are limited - the team spirit fades. The possibilities of building trust and creating "silent knowledge" within the organisation are limited. In addition, a short cooperation period (e.g. in the case of civil law contracts) results in a risk of reduced employee involvement in the affairs of the organisation and diminishes loyalty. Employee isolation also leads to the disappearance of organisational culture and corporate identity loss risk. The disappearance of an organisation's culture also limits the use of so-called indirect forms of control.

Another risk consists in the inability to provide ongoing supervision over teleworkers. In a traditional workplace, there is an opportunity to observe the employee. Therefore interactions with other employees occur. This is an important component of traditionally exercised control. According to employers, telework can lead to neglect of duties and untimely fulfilment of assigned tasks, as well as failure to maintain standard working hours [Spytek-Bandurska 2013]. Temporal dislocation often means a return to piece-based forms of remuneration. Employers are aware that not everyone is able to function in isolation, without the constant presence and control of supervisors, as well as the possibility of direct

contact with staff in order to obtain assistance, exchange of experiences, consultations. Therefore, they would have to further verify persons for their ability to provide telework, which means they must demonstrate: independence, creativity, diligence, an ability to cope in difficult situations.

Limited control or lack thereof can raise the risk of degraded work quality (risk of errors) and the risk of untimely performance of tasks. The increase in the aforementioned risk can be affected by the frequent change of persons performing work on a particular position and an inability on the part of employees to get accustomed to actions related to the work performed. This can lead to the emergence of additional risks, including the risk of customer dissatisfaction, the risk of losing customers or the risk of an increase in the number of complaints. Existing and potential new customers (co-operating parties or individual customers), despite being aware of the development of new and innovative methods of operations and improvements in the forms of business contact, very often prefer traditional (direct) means of communication with the employer and its employees. They are not convinced by alternative forms of employment and fear the unreliability and particularism of companies that take advantage of such forms. These employer risks are closely associated with the risk of the organisation losing its image on the market. It has a number of repercussions for the relationship between the organisation and external stakeholders (e.g. clients, partners or potential recipients of work) and consequently adversely affects the competitive position on the market [Król 2010].

Despite the development of technology and the constant improvement of security systems, there is a risk of uncontrolled disclosure of important information, increased risk of competitive espionage, loss of customer confidence. Such fears apply to manufacturers of state-of-the-art technology, employers in industries that are particularly sensitive to public opinion (banking, insurance), as well as those with departments and laboratories of strategic importance for the company [Spytek-Bandurska 2013]. The use of information and communication technologies carries with it a risk of loss of control over information resources. This includes the following categories: a) disclosure of information, for example, as a result of activities of family members or electronic surveillance, b) interruptions at work - e.g. due to power cuts, operating system errors, c) destruction of information, d) deletion of information.

Investing in human capital is increasingly perceived by the organisation as an investment in bringing it specific benefits. However, not all employees participate in training to the same degree. Training is provided primarily to permanent employees. Teleworkers employed under civil law contracts are not included in training and development plans due to their relatively quick departure from the organisation and, consequently, the risk of no return on investment in human capital and the risk of knowledge acquired during the training being used to aid competing entities. At the same time, the lack of investment in human capital may lead to a risk of competency gaps and employees not reaching the expected level of productivity.

Telework also entails changes in the field of human resources management. A new, individualised approach means that the employee profile becomes standardised, with the employee being characterised by flexibility, independence, autonomy, accountability and efficiency. At the same time, it is also an exclusion mechanism. What about less autonomous or assertive employees? At this point a question might be posed: does the

transfer of responsibility and risk onto employees, which means independence in relation to career development, competency management and work organisation, lead to a change in the scope of management? Does this process not lead to a shift from managing teams to individual management? In practice, limiting these risks requires the use of different methods, such as [Stroińska 2012]:

1. Combining management by trust with management by objectives;
2. Work result;
3. Participatory management;
4. Time management;
5. Talent and knowledge management.

Conclusions

Rapid economic changes and the progress of civilisation mean that the development of telework is inevitable. A decision on its implementation requires awareness that in addition to the many advantages, economic and social benefits, it also has drawbacks and carries risks applicable to not only teleworkers, but also to their employers.

From the perspective of potential and current teleworkers the greatest risks associated with the introduction of telework are:

1. A strong fear of losing interpersonal contacts, of social isolation, of the new, being accustomed to the traditional method of work at the employer's office, which is seen as more "natural" than telework.
2. Job insecurity - employers consider teleworkers as second-class employees, have no trust in them and therefore do not sign employment contracts with them. This leads to insecurity and fear for regular remuneration.

For organisations and teleworker employers risks associated with the implementation of teleworking are primarily:

1. Substantial financial outlays on ICT networks and a fear of losing control over information resources.
2. Lack of trust in teleworkers with whom the employer has occasional contact.
3. Difficulties in planning and control over work processes, as well as the risk of identity loss for the company.

Telework requires changes in management philosophy and work organisation methods, in management style, specific changes in organisational culture, the formation of an appropriate relationship between superiors and subordinates, the implementation of appropriate working time organisation systems. Most importantly, it is necessary to implement other than personal forms of supervision over the employee - work should be measured by productivity, not the number of hours spent at a desk. In addition, amendments should be made to some legal solutions to encourage employers to conclude employment contracts.

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