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Structural Transformations in Agriculture in Poland and Ukraine: Towards Economic Sustainability

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Abstract:

The paper discusses the topic of production volume of selected agricultural products in Poland and in Ukraine by taking an attempt to assess the market development in the context of the general characteristics of agricultural farms in these countries. The collected information was analyzed with use of the comparative method, by juxtaposing information about the structure of agricultural farms in Poland and in Ukraine in terms of the organization of farms, their number and surface area according to the adopted area groups and the analysis of plant production according to main cultivated crops and their yield. Further factors used to evaluate the extent of changes in structural transformations in agriculture were statistical measures, including the determination coefficient. In Poland, agricultural production is conducted mainly in individual farms (also called family or private farms). This refers both to animal and plant production. On the other hand, in Ukraine, production takes place in agriculture enterprises and households, whose distribution is similar to uniform distribution. In spite of significant differences in the area covered by agricultural land in Ukraine and in Poland, the latter is characterized by a relatively high share of the production of cereal crops and sugar beet, while Ukraine is the leader in the production of sunflower seeds (second largest manufacturer in the world), which is only a marginal crop in Poland.

Keywords: agricultural holdings; agricultural land use; crops; households; plant production; private farms; structure of agricultural production.

JEL Classification: Q00, Q12, Q15.

Introduction

The paper discusses the topic of production volume of selected agricultural products in Poland and in Ukraine by taking an attempt to assess the market development in the context of the general characteristics of agricultural farms in these countries. The analyses were conducted in the context of current globalization processes.

Globalization and integration processes make the problem of comparative analysis of selected economic subjects at the macro-, meso- and microlevel still relevant. Therefore, naturally, modern economic literature provides some studies on this issue in the agricultural sector. For example, Ball and his co-authors investigated the international competitiveness of agriculture in the European Union and the United States. Their research suggests that the relative productivity level was the most important factor in determining international competitiveness (Ball *et al*., 2010; Zos-Kior *et al*., 2014).

Agricultural commodity value chains in developing and transition countries have undergone tremendous changes in the past decades (Swinnen and Maertens, 2007; Swinnen, 2009).

In Poland, the implementation of the Common Agricultural Policy only began with the country's accession to the EU in 2004. The core of the research problem is, therefore, a complete and accurate study of the differences in the spatial structure of farms (Jezierska-Thöle *et al*., 2014). In Ukraine, the transformation process in agriculture is more complex, yet not free from state interventionism, either.

After Ukraine had regained independence, a long-term recession took place in local agriculture. It was caused by the collapse of the previous economic system based on centralized planning, a system of costly large-scale programs that had been realized within the former Soviet Union. Transformations in agriculture proved extremely difficult due to the lack of relevant market experience, investment capital and a coherent vision of the government elites (Sarna, 2014; Hernik *et al*., 2014). Studies indicate availability sizeable potential to improve agricultural production in developing-country from the same level of agricultural inputs through efficiency-enhancing investments (Mekonnen *et al*., 2015), this is especially important for Ukrainian agriculture (Zinych and Odening, 2009).

In Poland, the beginnings of transformation also proved very difficult. However, the situation was different than in such countries as the Czech Republic, Estonia, Latvia, Lithuania, Slovakia or Hungary. Although they belonged to the same group of countries with centrally planned economies, before transformation, the land in these countries had been divided mainly between co-operatives and state-owned agricultural enterprises (Sarris *et al*., 1999; Swinnen, 2001; Lerman *et al*., 2002; Majerova *et al*., 2009; Poczta (ed.), 2013). In Poland, a much larger share of land remained in the hands of the owners of private agricultural farms.

The introduction of the principles of market economy and the privatization of State Treasury-owned agricultural land created a basis for natural land concentration processes, formation of prices and the emergence of agricultural real property market (Hełdak *et al*., 2017).

Political transformations in these countries resulted in a collapse of the agricultural market and led to the search of alternative sources of sustenance for farmers (such as agrotourism, ecological agriculture) mainly in Poland. Issues connected with rational use of land, organic production and its development in the conditions of international co-operation have been emphasized by such authors as Kropyvko and Kovalova (2010); Keyzer *et al*. (2013); Rebryna (2015); Kucher (2016); Borodina and Prokopa (2016); Kazakova and Adamska (2016). The mechanisms that introduce and implement organic production in the light of Polish-Ukrainian co-operation were discussed by Rebryna (2015). Agrarian sustainability and competitiveness of agricultural enterprises is among the most topical issues [Bachev and Terziev (2018); Khromushyna *et al*. (2018); Patyka (2018); Samarets and Nuzhna (2018)]. Increasingly, articles on agricultural transition are written by authors from the European Union in collaboration with authors from Central and Eastern Europe countries (Cramon-Taubadel and Nivyevskyi, 2012).

At the XV Congress of the European Association of Agricultural Economists (EAAE) «Towards Sustainable Agri-Food Systems: Balancing between Markets and Society», which was held in Parma (Italy) from August 28th to September 1st, 2017, in particular, has been identified three themes that leading scientists consider to be of importance and interest to agricultural economist: «(i) sustainability issues in food supply chains and international trade; (ii) consumer responses to sustainability standards and technological innovations and (iii) agricultural policy reform or food systems reform?» (Fraser and Lansink, 2017). In this context, it should be noted that the problem of evaluation the structural transformations in agriculture in Poland and Ukraine: towards economic sustainability is not being sufficiently covered, thus determining the topicality of this research issue and the need for deeper study.

The aim of the present research is to demonstrate the trends of changes in the structure of agricultural farms in Poland and in Ukraine and to provide characteristics and discuss the dynamics of change is the production of fundamental crops towards economic sustainability.

1. Materials and Methods

The authors of the analysis attempted to conduct evaluation, basing on the observations by Pomelov *et al*. (2015) of the question whether it is possible to compare land quality and land use effectiveness in different countries. Unfortunately, there are no unified approaches to comparing the quality of land in different countries, including agricultural and arable land. In most countries, national methods are used to assess and classify land quality according to internal purposes. Typically, to make a cross-country comparison, specialists apply indirect correlation of agricultural land use effectiveness rates in value terms and/or physical terms (Pomelov *et al*., 2015).

The study is based on source materials obtained from the database of the European Statistical Office (Eurostat), the database of the Central Statistical Office in Poland (GUS, 2016) and the State Statistics Service of Ukraine (Prokopenko (ed.) 2016; 2016a; 2016b; 2016c). Eurostat data concerning the agricultural structure in Poland are based on the results of the Agricultural Census of 2002 and 2010, adapted for the methodology used in European statistics (Farm Structure Survey, 2016).

The collected information was analyzed with use of the comparative method, by juxtaposing information about the structure of agricultural farms in Poland and in Ukraine in terms of the organization of farms, their number and surface area according to the adopted area groups and the analysis of plant production according to main cultivated crops.

For determination of tendencies of change of investigated indexes we carried out a mathematical alignment of data by the equation of straight line.

Further factors used to evaluate the extent of changes in structural transformations in agriculture were statistical measures, including the determination coefficient.

The determination coefficient (R^2) is a natural measure of the adjustment of the model to empirical data and it informs us about the extent to which the variability of the explained variable is explained by the model. The determination coefficient takes values from the range <0;1> and it informs us, how many percent of the variability of the explained variable is explained by the model.

2. Results and Discussion

General characteristics of the agricultural farms

As a result of the agricultural reform in Ukraine nearly all state-owned agricultural enterprises were closed down and their property was transferred to be used collectively by newly created, non-state-owned enterprises. According to Sarna (2014), employees of former kolkhozes (approx. 7 mln people, i.e. over 40% of countryside residents) most of whom remained employed by the new enterprises not owned by the state any more, were granted the right to equal share in the land of these enterprises (on the average, on the national scale: approx. 4 ha per person). Additionally, more than 7 mln of countryside residents received ownership titles to small plots of land – on the average, on the national scale: less than 0.4 ha – to manage small, individual household agricultural farms (totally approx. 2.6 mln ha).

Now, there are two types of agricultural enterprises in Ukraine: corporate farms and peasant farms. These farms, unlike households, are registered legal entities. There are about 14,724 corporate farms (mainly the successors of the former collective and state farms) each cultivating about 956 ha of arable land on average and generating 45% of the GAO in 2013. There are about 40,856 much smaller peasant farms (mainly run by individual farmers) with an average of 105 ha of arable land each in 2013 (Nivievskyi *et al*., 2015).

The number and surface area of agricultural farms in specific area groups are presented in Table 1. Such process did not take place in Poland, where the land of agricultural farms owned by the State Treasury still remains in the Treasury Agricultural Property Stock. However, they account for a lower share of land. In Ukraine, it is worth noting the large number of large farms, of a surface area exceeding 100 ha and reaching even up to 10000 ha. The number of farms in the last area group (more than 10000 ha) has even increased in comparison to the year 2010. This is mainly connected with increasing the area of enterprises that had already been large and their transfer from the 7000–10000 ha group to the largest group. The number of agricultural farms has been constantly decreasing (on the average, by approx. 3% annually) both in Poland and in the European Union, due to land and production concentration (Table 2).

In Ukraine, the dominant type of farms are large enterprises with large croplands, often used as arable land. On the other hand, the agrarian structure of Polish agriculture is dominated by the private (individual) sector, and the average surface area of a farm is 7.9 ha (Gawroński *et al.,* 2012). In the years 2010–2015 Ukraine also witnessed a considerable decrease in the number of farms in the smallest area groups, in favor of larger agricultural enterprises. The nature and structure of agricultural farms is very varied in both analyzed countries. Forced

collectivization of agriculture in the Soviet Union and centrally controlled economy of Soviet Russia were of no little importance, either. For Ukraine, coming to terms with the reality of free market economy has been a long process that is still in progress. During the restructuring of agricultural enterprises, special certificates were issued first, only later followed by state-issued ownership titles to the land. This process started, with great difficulties, in the end of the 1990s and only the special act of May 2003 finally put the situation in order. As of the end of 2012, ownership titles were issued for 6.4 mln people (approx. 93% of those entitled) (Sarna, 2014). This resulted in lease becoming the dominant form of land management.

At the same time, in Poland the agricultural real property market was developing freely, apart from the restrictions preventing selling land to foreign citizens and certain limitations of the sale of land belonging to the Treasury Agricultural Property Stock.

Table 1 - Distribution of agricultural enterprises (including family farms) in Ukraine, by agricultural lands size in 2010 and 2015, thousands

Indexes	2010				2015			
	Number of enterprises		Area of agricultural land		Number of enterprises		Area of agricultural land	
	units	percentage to total enterprises	thsd. ha	percentage to total area of agricultural land	units	percentage to total enterprises	thsd. ha	percentage to total area of agricultural land
Enterprises, which had agricultural land	48824	86.4	21585.9	100.0	42052	92.7	19922.7	100.0
including of land, ha								
no more than 5.0	5784	10.2	18.3	0.1	3872	9.2	12.8	0.1
5.1–10.0	4038	7.1	31.9	0.1	3001	7.1	24.2	0.1
10.1–20.0	4925	8.7	76.3	0.4	4129	9.8	64.9	0.3
20.1–50.0	13707	24.3	519.8	2.4	11911	28.3	453.9	2.3
50.1–100.0	4831	8.6	345.2	1.6	4827	11.5	351.9	1.8
100.1–500.0	7181	12.7	1743.1	8.1	6919	16.5	1695.4	8.5
500.1–1000.0	2667	4.7	1919.4	8.9	2467	5.9	1757.9	8.8
1000.1–2000.0	2661	4.7	3822.8	17.7	2446	5.8	3510.3	17.6
2000.1–3000.0	1347	2.4	3295.5	15.3	1099	2.6	2659.1	13.3
3000.1–4000.0	666	1.2	2293.0	10.6	516	1.2	1785.9	9.0
4000.1–5000.0	376	0.7	1670.5	7.6	282	0.7	1259.8	6.3
5000.1–7000.0	332	0.6	1919.6	8.9	281	0.7	1646.4	8.3
7000.1–10000.0	178	0.3	1479.6	6.9	141	0.3	1172.3	5.9
more than 10000.0	131	0.2	2450.9	11.4	161	0.4	3527.9	17.7
Enterprises, which did not have agricultural land	7669	13,6	x	x	3327	7,3	x	X

Source: State Statistics Service of Ukraine.

Table 2 - The structure of agricultural land and utilized agricultural land in Poland in agricultural area groups in 2010 and 2015, thousands

Indexes	2010				2015			
	Number of enterprises		Area of agricultural land		Number of enterprises		Area of agricultural land	
	units	percentage to total enterprises	thsd. ha	percentage to total area of agricultural land	units	percentage to total enterprises	thsd. ha	percentage to total area of agricultural land
Total	1506.6	100.0	14447.3	100.0	1404.9	100.0	14545.3	100.0
0–2	363.2	24,2	474.9	3.3	276.6	19.7	396.0	2.7
2–5	468.2	31,1	1529.3	10.6	453.4	32.2	1462.2	10.1
5–10	335.0	22,2	2387.3	16.5	322.6	22.9	2260.8	15.5
10–20	218.5	14,5	3010.8	20.8	217.2	15.5	2975.8	20.5
20–30	60.0	4.0	1447.4	10.0	63.7	4.5	1532.8	10.5
30–50	35.3	2.3	1331.7	9.2	38.5	2.7	1451.0	10.0
50–100	16.3	1.1	1145.0	7.9	21.6	1.5	1468.0	10.1
More than 100	9.7	0.6	3120.9	21.7	11.30	0.8	2998.7	20.6

Source: own study prepared on data of EUROSTAT and Polish Statistical Office (GUS).

In the years 2010–2015 Ukraine also witnessed a considerable decrease in the number of farms in the smallest area groups, in favor of larger agricultural enterprises. The nature and structure of agricultural farms is very varied in both analyzed countries. Forced collectivization of agriculture in the Soviet Union and centrally controlled economy of Soviet Russia were of no little importance, either. For Ukraine, coming to terms with the reality of free market economy has been a long process that is still in progress. During the restructuring of agricultural enterprises, special certificates were issued first, only later followed by state-issued ownership titles to the land. This process started, with great difficulties, in the end of the 1990s and only the special act of May 2003 finally put the situation in order. As of the end of 2012, ownership titles were issued for 6.4 mln people (approx. 93% of those entitled) (Sarna, 2014). This resulted in lease becoming the dominant form of land management.

At the same time, in Poland the agricultural real property market was developing freely, apart from the restrictions preventing selling land to foreign citizens and certain limitations of the sale of land belonging to the Treasury Agricultural Property Stock.

In Poland, the task consisting in protecting land from purchase has been vested in the Agricultural Property Agency (former Agricultural Property Agency of Treasury), which realizes it by means of developing the land property of former state-owned farms and real property of the National Land Fund as well as by means of exercising the right of first refusal to agricultural real property (until recently, it had applied to agricultural real property of a surface area exceeding 5 ha and recently this surface area has been lowered to 1.0 ha) and by using them to create family farms and to improve the agrarian structure of farms (Hełdak *et al*., 2017).

Structure of agricultural production

During research, the structure of agricultural production was analyzed, separately for corporate farms (agricultural enterprises) and peasant farms (households) for Ukraine and separately for production in Treasury owned enterprises except individual farms and for individual farms in Poland (Tables 3, 4). The organization of agriculture in these countries is different, which makes it more difficult to compare the production methods directly.

Table 3 - Structure of agricultural production by types of agricultural holdings in Ukraine, percentage to total volume

Indexes	2010	2011	2012	2013	2014*	2015*	Trend	R^2
Agricultural enterprises								
Agricultural production – total	48.3	51.8	50.7	54.0	55.3	55.1	y = 1.37t + 47.75	0.854
including crop production	53.6	56.7	55.0	58.6	59.4	59.1	y = 1.12t + 53.15	0.774
animal production	38.8	40.6	41.8	43.5	45.5	45.5	y = 1.43t + 37.63	0.969
Households								
Agricultural production – total	51.7	48.2	49.3	46.0	44.7	44.9	y = -1.37t + 52.25	0.854
including crop production	46.4	43.3	45.0	41.4	40.6	40.9	y = -1.12t + 46.85	0.774
animal production	61.2	59.4	58.2	56.5	54.5	54.5	y = -1.43t + 62.37	0.969

Note: *Here and below – excluding the temporarily occupied territories of the Autonomous Republic of Crimea, also excluding the part of the anti-terrorist operation zone.

Source: author's calculations based on the data of State Statistics Service of Ukraine.

Table 4 - Structure of agricultural production by types of agricultural enterprises and private farms in Poland, percentage to total volume

Indexes	2010	2011	2012	2013	2014	2015	Trend	R^2
Agricultural enterprises without private farms								
Agricultural production – total	11.7	10.3	11.2	11.4	11.2	12.6	y = 0.21t + 10.66	0.277
including crop production	12.0	10.3	11.5	11.2	11.5	11.4	y = 0.009t + 11.29	0.001
animal production	11.7	10.4	10.9	11.6	10.8	13.9	y = 0.37t + 10.26	0.303
private farms								
Agricultural production – total	88.3	89.7	88.8	88.6	88.8	87.4	y = -0.21t + 89.34	0.277
including crop production	88.0	89.7	88.5	88.8	88.5	88.6	y = -0.009t + 88.71	0.001
animal production	88.3	89.6	89.1	88.4	89.2	86.1	y = -0.37t + 89.74	0.303

Source: author's calculations based on the data of Polish Statistical Office (GUS).

Very low coefficients of determination indicate no changes in the structure of agricultural production by types of agricultural enterprises and private farms in Poland.

The above list demonstrates clearly that in Poland, agricultural production is conducted mainly in individual farms (also called family or private farms). This refers both to animal and plant production. On the other hand, in Ukraine, the distribution between agriculture enterprises and households is similar to uniform. However, there was

a noticeable increase in the total production in agriculture enterprises, from 48.3% in 2008 to 55.1% in 2015. In terms of cereal and animal production, an increasing trend is also noticeable for both these types of production in agricultural enterprises, respectively by 5.5 and 6.9%.

Economic sustainability of plant production

Summarizing the results of comparative analysis of effectiveness of the use land in agriculture of Republic of Moldova and the Odessa region of Ukraine, scientists note that only on the basis of growth of agricultural land productivity the level of profitability of sold products can be provided, which will ensure maintenance of the expanded reproduction (Parmakli and Bahchivandzhi, 2016). The table below shows the production of main cereal crops and fodder plants according to type of farms in Ukraine and in Poland (Tables 5, 6). Over the last decade the structure of the harvested area has somewhat changed, mainly as Ukraine's response to the global market developments. In absolute and relative terms, the harvested area of the main crops increased significantly, except for barley. The most impressive expansion was recorded for rapeseed and soybean, followed by sunflower and maize. This expansion occurred at the cost of barley, rye, oats, millet, buckwheat and sugar beet (Nivievskyi *et al*., 2015).

Mathematical leveling of dynamic series for 2010–2015 and parameters of obtained equations indicate the general trend to increase production of grain and leguminous crops, sunflower, vegetables, fruits and berries with a simultaneous reduction in sugar beet and potatoes. For example, in Ukraine agricultural enterprises of average annual increase gross grain harvest totaled 3.3 mln t (R^2 = 0.569), sunflower – 0.75 mln t (R^2 = 0,822). The coefficients of determination for these trends suggest that the actual data of investigated dynamic series by an average of 56.9% and 82.2% respectively coincide with the estimated (theoretical) data, calculated on the chosen trend line. Therefore, with the appropriate level of probability it can be predicted further increase the volume production of the products. For other equations coefficients of determination were significantly lower, indicating that their nonlinear dynamics.

Table 5 - Production of main agricultural crops by types of agricultural holdings in Ukraine, thousands tons

Indexes	2010	2011	2012	2013	2014	2015	Trend	R^2
Agricultural enterprises								
Grain and leguminous crops	29779.3	44219.3	36075.0	49659.0	49902.6	46506.6	y = 3264.9t + 31263	0.569
Sugar beet (factory)	12663.4	17145.4	16837.7	9100.8	14599.4	9553.8	y = -883.51t + 16409	0.224
Sunflower	5585.6	7288.8	7131.1	9445.8	8681.7	9549.2	y = 751.75t + 5315.9	0.822
Potatoes	482.5	751.8	757.0	659.4	758.9	456.0	y = -5.97t + 665.1	0.006
Vegetables	964.6	1540.5	1433.9	1158.7	1340.3	1281.7	y = 20.28t + 1215.6	0.034
Fruits and berries	286.8	299.8	369.0	444.2	332.0	411.7	y = 22.75t + 277.6	0.463
Households								
Grain and leguminous crops	9491.6	12527.5	10141.2	13392.3	13956.7	13619.2	y = 805.05t + 9370.4	0.623
Sugar beet (factory)	1085.8	1595.1	1601.2	1688.6	1134.7	777.0	y = -81.08t + 1597.5	0.171
Sunflower	1185.9	1381.7	1256.0	1604.7	1452.1	1631.9	y = 79.71t + 1139.7	0.681
Potatoes	18222.3	23495.9	22493.2	21599.2	22934.5	20383.3	y = 235.05t + 20699	0.051
Vegetables	7157.8	8292.4	8582.8	8713.9	8297.2	7932.3	y = 114.80t + 7760.9	0.146
Fruits and berries	1459.7	1596.5	1639.7	1851.1	1667.1	1741.1	y = 52.29t + 1476.2	0.546

Source: author's calculations based on the data of State Statistics Service of Ukraine.

Given the need for the development of agricultural production on the basis of economic sustainability, one of the elements of which can be regarded as economic stability, we calculated some indicators that reflect the extent of variation in the results of production in time dynamics. That is, with an increase of volume production great value has qualitative is aspect of growth that characterized the stability of crop production. In terms of weather and climate fluctuations it has significant value to agricultural producers. Temporal dynamics of production of major crop production in the agricultural enterprises of Ukraine for 2010–2015 was the (by the level of variation in %): grain and leguminous crops – 19.0; sugar beet – 26.2; sunflower – 19.5; potatoes – 21.9; vegetables – 15.9; fruits and berries – 17.5. In households these indexes were significantly lower (except sugar beet) and were: grain and leguminous crops – 15.7%; sugar beet – 28.0; sunflower – 12.7; potatoes – 9.1; vegetables – 6.9; fruits and berries – 8.0%. Thus, in some cases, the variation was moderate (6–10%), significant (10–20%) and even high (21–50%). Generally, households are more resilient than agricultural enterprises, but in most cases the variation coefficients indicate an unstable crop production in Ukraine. For comparison, consider the same data from the practice of Poland: grain and leguminous crops – 6.7%; sugar beet – 13.4; potatoes – 14.2; vegetables – 6.4; fruits and berries

– 15.1%. In three out of five described variations was significant (10–20%) and the two cultures was moderate (6–10%). Thus, in Poland a total variation was much smaller in comparison with Ukraine, which indicates a higher economic stability of crop production. This may be due to higher farming culture, the presence of large-scale state financial support (subsidies) and quotas in the EU.

In recent years, Ukraine and the EU-28 have taken leading positions in the global production and export of sunflower seed oil in terms of volume. Although Poland has one of the largest arable land areas in Europe, its sunflower seed and oil production did not increase as quickly as Ukraine's (Parlińska *et al.*, 2015). The list of plant production volume in Poland does not contain separate information about sunflower seed, only total volume for oil plants, due to the small share in production. On the other hand, Ukraine is the top second sunflower seed producer both in Europe and throughout the world.

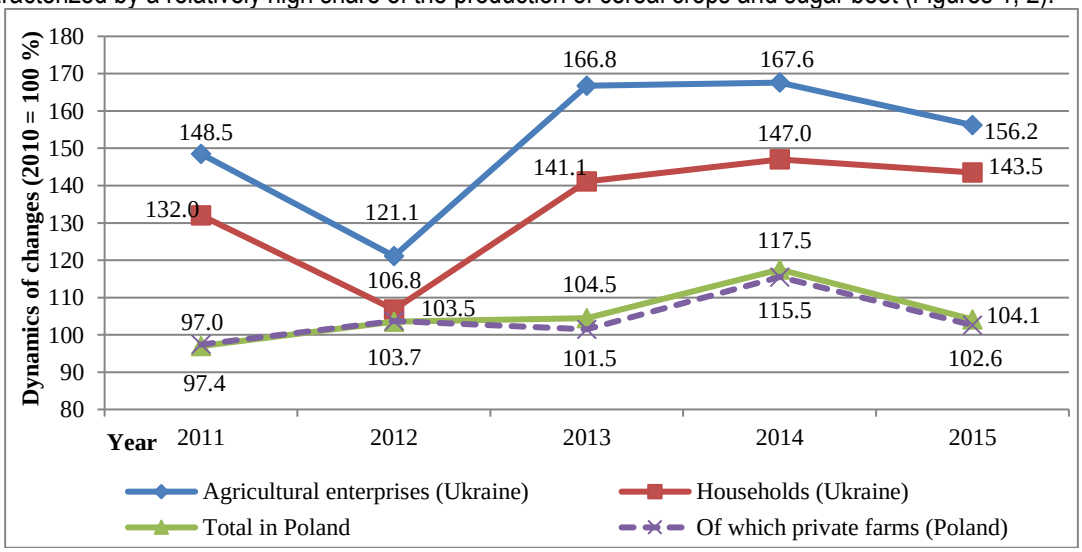
In general, in Poland, as in Ukraine, there is a tendency to increase production of grain and leguminous crops, vegetables, fruits and berries with a simultaneous reduction in potato production. However, in contrast to Ukraine, in Poland increased production of sugar beets, however, this trend was very unstable, as evidenced by a low coefficient of determination ($R^2 = 0.002$), whose value is close to zero. The most significant and stable increase was found production of fruits and berries (average per year increase was 269 thousand t); coefficient of determination ($R^2 = 0.798$) indicates a fairly high level of approximation (79.8%) calculated values of production to actual data, because with high probability we can predict increase this index in the future.

Table 6 - Production of main agricultural crops by types of agricultural holdings in Poland, thousands of tons

Indexes	2010	2011	2012	2013	2014	2015	Trend	R^2
Total								
Grain and leguminous crops	27588	26767	28544	28834	32428	28721	y = 655.4t + 26520	0.399
Sugar beet (factory)	9973	11674	12350	11234	13489	9364	y = 36.7t + 11219	0.002
Potatoes	8188	9111	8740	7111	7425	6152	y = -481.9t + 9474.5	0.668
Vegetables	4878	5575	5430	4986	5607	no data	y = 86.9t + 5034.5	0.163
Fruits and berries	2744	3415	3843	4129	4188.8	4099.8	y = 269.0t + 2798.3	0.798
Of which private farms								
Grain and leguminous crops	24219	23578	25127	24571,5	27963	24841	y =-448,8t + 23479	0.303
Sugar beet (factory)	7972	9440	10062	9224	11184	7798	y = 100,7t + 8927.6	0.022
Potatoes	7757	8619	8252	6674	6880	5674	y = -491.7t + 9030.3	0.697
Fruits and berries	no data	no data	no data	4090.4	4144.3	4055.7		

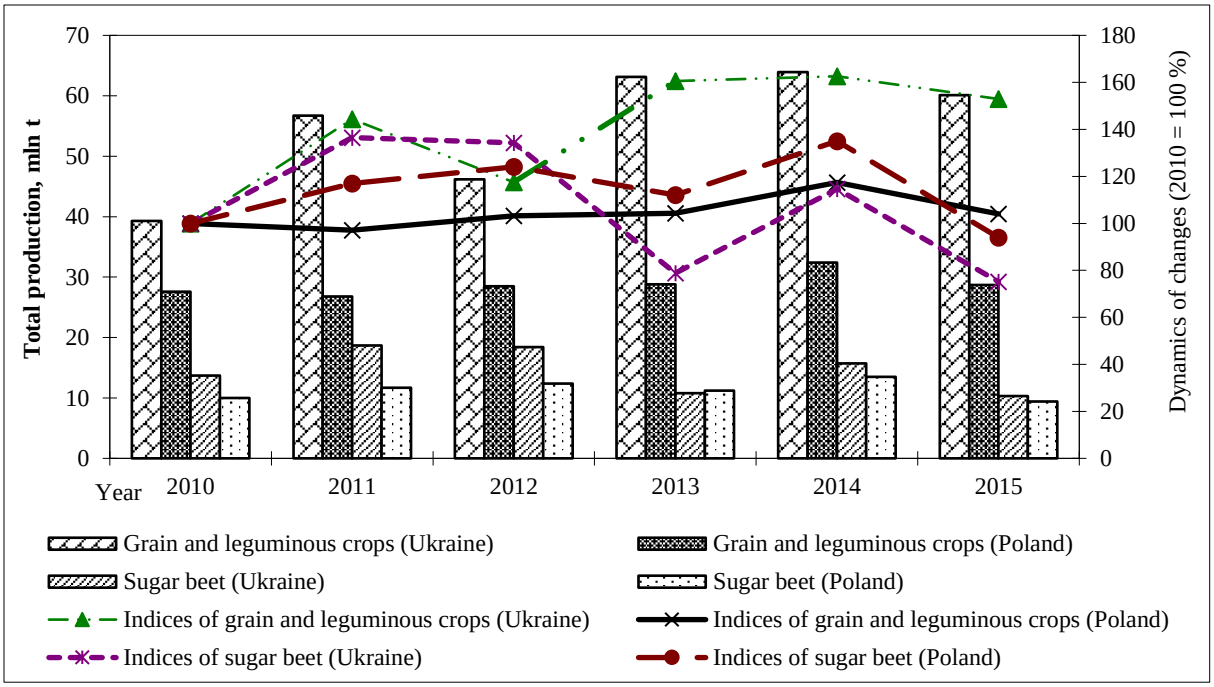
Source: author's calculations based on the data of Polish Statistical Office (GUS).

In spite of significant differences in the area covered by agricultural land in Ukraine and in Poland, the latter is characterized by a relatively high share of the production of cereal crops and sugar beet (Figures 1, 2).



Source: own composition based on the data of State Statistics Service of Ukraine and Polish Statistical Office (GUS).

Figure 1. Comparison of the dynamics of changes of production of cereals and legumes according to types of farms in Ukraine and in Poland (to the 2010 year, %)



Source: own composition based on the data of State Statistics Service of Ukraine and Polish Statistical Office (GUS).

Figure 2 - Comparison of total production of selected plants in Ukraine and in Poland in the years 2010–2015 and dynamics of changes (to the 2010 year)

Ukraine has the second largest (after Russia) area of utilized agricultural land in Europe (approx. 41.5 mln ha, including approx. 32 mln ha arable land), and thus the production of the analyzed crops is considerable higher. The country has beneficial conditions for agricultural production, fertile soils and a mild climate. Production takes place in various conditions – in Ukraine in large area farms, while in Poland a major part of production takes place in individual farms. The crop yield (productivity) of main groups of cultivated plants in Poland and in Ukraine are listed in the table below (Table 7, Figures 3–5).

Table 7 - Crop yield of main groups of cultivated plants in Poland and in Ukraine in the years 2010–2015 (per 1 ha in center)

Indexes	2010	2011	2012	2013	2014	2015	Trend	R^2
Ukraine								
Productivity, c/ha: grain and leguminous crops	27.6	39.0	33.4	43.0	47.5	43.8	y = 3.32t + 27.4	0.706
sugar beet (factory)	281.5	370.9	420.6	419.4	490.2	448.2	y = 34.01t + 286.1	0.779
sunflower	15.4	19.0	17.4	22.8	20.5	23.0	y = 1.37t + 14.9	0.722
potatoes	171.0	216.7	192.0	221.2	256.4	198.6	y = 8.18t + 180.7	0.273
Poland								
Productivity, c/ha: grain and leguminous crops	35.6	34.3	37.0	38.0	42.7	37.3	y = 0,99t + 34.0	0,415
sugar beet (factory)	483	574	582	580	683	520	y = 14,57t + 519.3	0,161
potatoes	211	232	244	211	278	210	y = 2,86t + 221.0	0,039

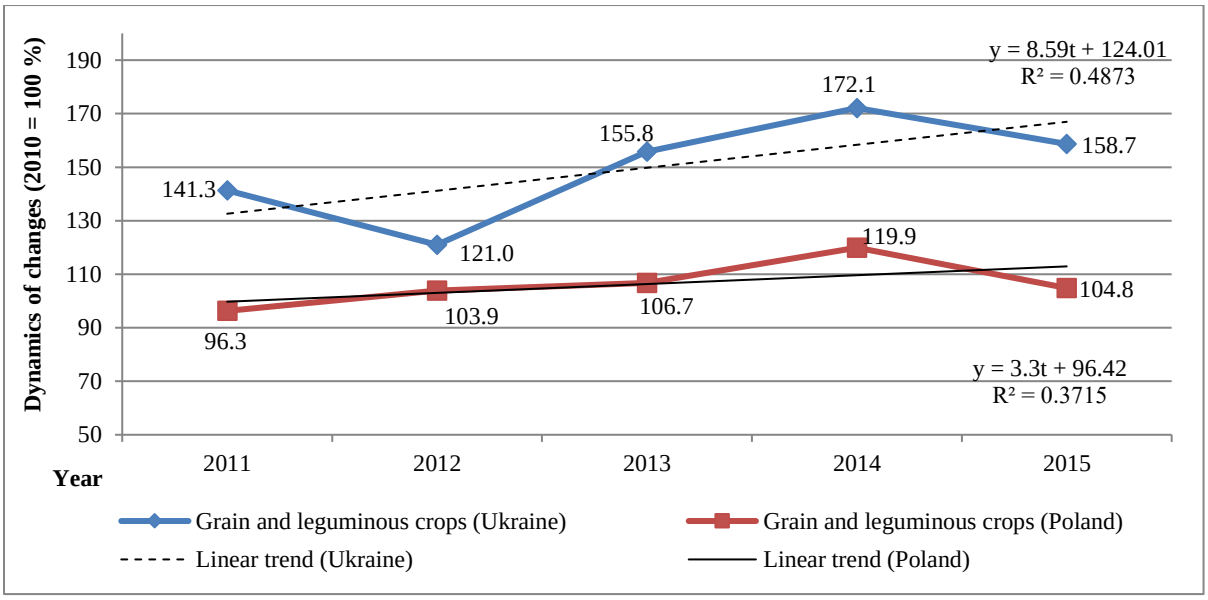
Source: author's calculations based on the data of State Statistics Service of Ukraine and Polish Statistical Office (GUS).

The analysis of yield of grain and leguminous crops in Ukraine shows a clear upward trend from 27.6 c/ha in 2010 to 43.8 c/ha in 2015. Average annual increase of yield for the period was 3.32 c/ha, while coefficient of determination (R^2 = 0,706) indicates that the linear trend quite accurately describes the actual dynamics, therefore with high probability can predict further increasing the yield of grain and leguminous crops, which in 2020 could reach 63.9 c/ha. Parameters of above equation indicates that yield of grain and leguminous crops in Poland although even tends to increase, but its average annual increase (0.99 c/ha) is slowed down and at this stage he had a stabilization. If the identified trend continues, in 2020 yield of grain and leguminous crops in Poland may be 44.9 c/ha. The situation is similar in dynamics of yield of sugar beet. In the case of preservation, the current rate of growth, yield of sugar beet in 2020 in Ukraine could grow to 660 c/ha, and in Poland – up to 680 c/ha.

The correlation between plant crops and the agro technical conditions of production is noticeable. For example, in the vegetation season 2015 these conditions were extremely adverse to the growth and crops of potato.

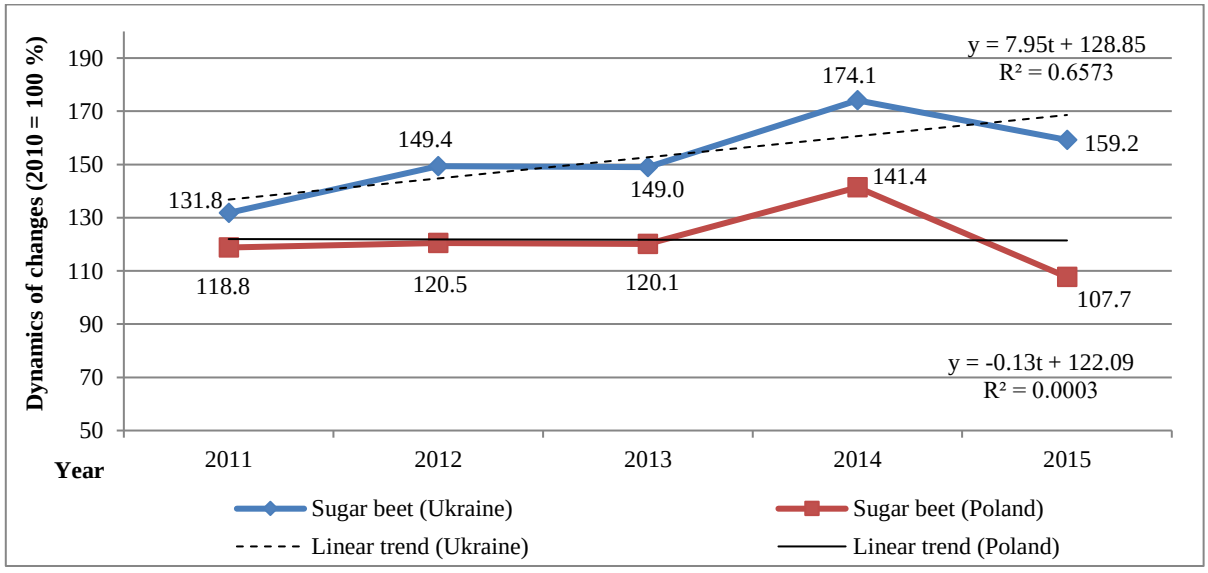
Drought led to reduced potato crops in all regions of Poland. A decrease in crops is also noticeable with respect to other plants, both in Poland and in Ukraine. However, a very low coefficient of determination ($R^2 = 0.039$) indicates no clear directional changes in the dynamics of yields of potatoes in Poland.

For the average annual yield for 2010–2015 grain and leguminous crops (39.1 c/ha) Ukraine has certain advantages over Poland (37.5 c/ha), but by the average annual yield of sugar beet (405.1 c/ha) and potatoes (209.3 c/ha) Ukraine gives way Poland, where these indicators were respectively 570.3 and 231.0 c/ha. At the same time the average annual growth rate of yield of grain and leguminous crops (8.6%, $R^2 = 0.487$), sugar beet (8.0%, $R^2 = 0.657$) and potatoes (1.6%, $R^2 = 0.031$) are in Ukraine significantly higher than the corresponding indicators Poland.



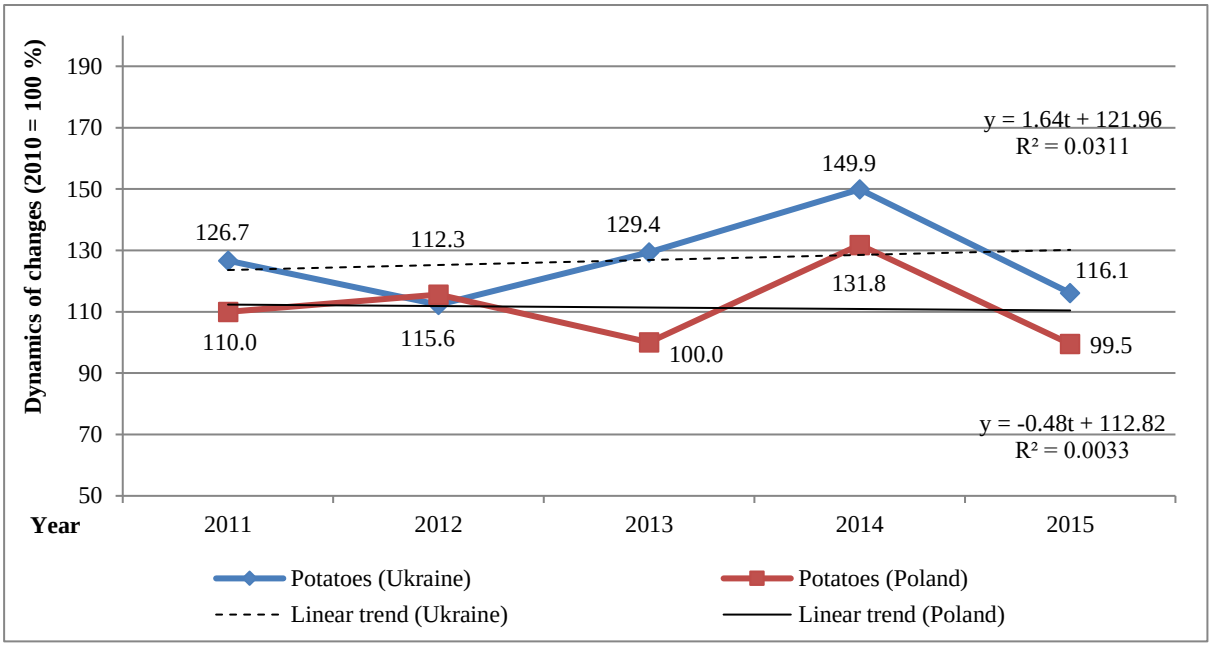
Source: own composition based on the data of State Statistics Service of Ukraine and Polish Statistical Office (GUS).

Figure 3 - Dynamics of changes of yield of grain and leguminous crops in Poland and in Ukraine with a trend line (to the 2010 year, %)



Source: own composition based on the data of State Statistics Service of Ukraine and Polish Statistical Office (GUS).

Figure 4. Dynamics of changes of yield of sugar beet in Poland and in Ukraine with a trend line (to the 2010 year, %)



Source: own composition based on the data of State Statistics Service of Ukraine and Polish Statistical Office (GUS).

Figure 5 - Dynamics of changes of yield of potatoes in Poland and in Ukraine with a trend line (to the 2010 year, %)

Both countries are characterized by an increasing trend in the crops of the analyzed plants. However, in Ukraine the increasing trend of crops per 1 ha in the years 2010–2015 was considerably higher. This results from the relative stabilization of the situation in agriculture. In both countries, the highest crops in center per 1 ha were achieved in 2014, which was influenced by beneficial weather conditions (similar to the optimum for this species) – high air temperatures and good soil moisture content fostered the formation of tubers and intense growth and development of plants. In 2014, potato crops in Poland reached 278 c/ha and increased by 68 c/ha (by 32.4%) in comparison to the preceding year and they were 90 c/ha (by 47.9%) higher than the average crops from the years 2006–2010. Also, in Ukraine, the crops reached a high level of 256.5 c/ha and thy increased by 35.2 c/ha (by 11.6%) in comparison to the preceding year. As a result of outstripping average annual growth, the forecasted yield of potatoes in Ukraine (271 c/ha) in 2020 may even exceed the similar indicator of Poland (252 c/ha).

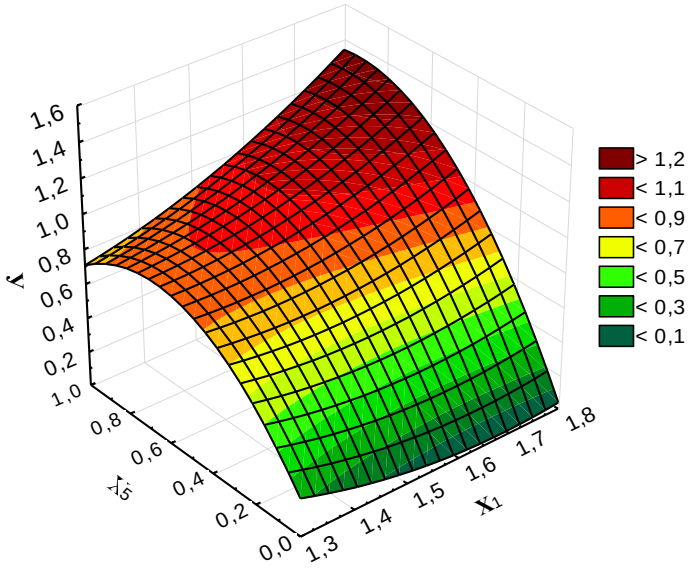
Graphic representation of dynamic series of indices of yield major crops and coefficients of determination demonstrating a very low precision of reflection by linear trend tendencies change of the studied index in Poland (about the potatoes also in Ukraine). One reason for this situation is the fluctuations (volatility) of the yield of studied crops. For example, the maximum increase of yield of sugar beet in Poland observed in 2014: 103 c/ha, but already in 2015, the maximum decrease: -163 c/ha. The maximum yield of sugar beet was achieved in 2014 (683 c/ha), the lowest observed in 2010 – 483 c/ha, that is, the range of variation is 200 c/ha, and the level of variation is 11.9%, indicating a significant fluctuation. In Ukraine the level of variation in yield of sugar beet was slightly higher – 17.8%, falling into a gradation range significant. As expected, in Ukraine the level of variation in yield of grains and leguminous (18.9%), potatoes (14.0%) was higher than in Poland, where these indicators were 7.7 and 11.6% respectively. The above, on the one hand, confirms the earlier conclusion made about higher economic stability of crop production in Poland than in Ukraine, on the other hand, fluctuations in yield largely explains the instability of gross fees. However, both countries should reduce volatility in yield of grains and leguminous in the long term – up to 5%, as in developed countries (Shubravska, 2014), and in the short-term Ukraine should reduce the level of volatility yield of major crops to indicators of Poland.

One of the key factors as increasing yields, so and lowering its fluctuations by years is the intensification of land use and formation of the optimal level of intensity in agricultural enterprises, which involves increasing the size of the cost per unit of land area. A similar view is shared by other researchers (Vynohradenko, 2015). Equally important is the improvement of soil quality, which have a positive impact on the competitiveness of agricultural enterprises. This is convincingly shown by the results of our empirical research carried out on the example of agricultural enterprises in the districts of the Volyn region (Figures 6–7, Table 8). It is a border region of Ukraine, which borders with Poland, therefore its soil and climatic conditions are similar to those in which Polish farmers work.

The obtained mathematical model shows that a relatively higher content of humus in the soil at low

production costs does not guarantee success in competition. However, if a large amount of costs is invested in soils with a higher potential fertility (for example, 1 thousand USD/ha), then their return, and accordingly the sub-index of competitiveness can be 1.7 times more than on soils with relatively low potential fertility.

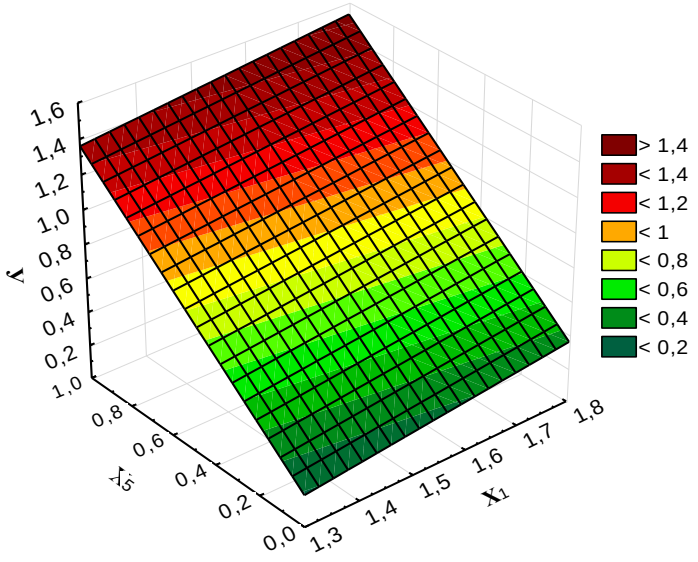
$$У = 3,8756-4,5754x_1-0,1227x_5+1,3573x_1^2+1,6262x_1x_5-1,5046x_5^2$$



Source: own composition based on the own research according to the data form No. 50-s.g. and data of the State institution «Institute of Soil Protection».

Figure 6 - Quadratic model of the dependence of subindex of competitiveness of wheat yield (*y*) from the content of humus in the soil (x_1, %) and production costs per 1 hectare of harvested area (x_5, thousand USD) using the example of agricultural enterprises of districts of Volyn region, 2010–2016

$$У = -0,2555+0,3418x_1+1,171x_5$$



Source: own composition based on the own research according to the data form No. 50-s.g. and data of the State institution «Institute of Soil Protection».

Figure 7 - Linear model of the dependence of subindex of competitiveness of wheat yield (*y*) from the content of humus in the soil (x_1, %) and production costs per 1 hectare of harvested area (x_5, thousand USD) using the example of agricultural enterprises of districts of Volyn region, 2010–2016

In the case of agricultural enterprises of districts of Volyn region we can see positively impact of soil quality and intensity of production on dependent variable (subindex of competitiveness of wheat yield).

Table 8 - Parameters of econometric models of dependence of the subindex of competitiveness of wheat yield from the content of humus in the soil and intensity of its production using the example of agricultural enterprises of districts of Volyn region, 2010–2016

Statistical characteristics	Indicators and their meanings *(n = 93)*	
	Linear model	Quadratic model
Coefficient of multiple correlation (*r*)	$R = 0.713$ (high correlation)	$R = 0.745$ (high correlation)
Coefficient of multiple determination (R^2)	$R^2 = 0{,}509$ (statistically significant because significance $F < 0.05$)	$R^2 = 0{,}556$ (statistically significant because significance $F < 0.05$)
Fisher's F-criterion	$F_{fact} = 46.6$; $F_{tabl} = 2.90$ – at 95% probability level; $F_{fact} > F_{tabl}$	$F_{fact} = 21.7$; $F_{tabl} = 5.87$ – at 95% probability level; $F_{fact} > F_{tabl}$
Student's t-criterion	$t_{fact} = 13.8$; $t_{tabl} = 1.98$ – at 95% probability level; $t_{fact} > t_{tabl}$	$t_{fact} = 15.9$; $t_{tabl} = 1.98$ – at 95% probability level; $t_{fact} > t_{tabl}$
Standard error of estimation	0.219	0.212

Source: author's calculations.

Conclusions

Both Ukraine and Poland have very large land resources that require protection and rational use from the state. The countries are characterized by different agrarian structures. Ukraine is dominated by farms of a large area, even exceeding 10000 ha, while the private (individual) sector has a major share in the agrarian structure of Poland, and in 2015 the average surface area of agricultural farms was 10.49 ha. Apparently, it is difficult to manage and organize of production in such vast agricultural farms in Ukraine. However, the situation of farms in terms of their size and quantitative structure appears more beneficial in Ukraine.

The number of agricultural farms has been constantly decreasing (on the average, by approx. 3% annually) both in Poland and in the European Union, due to land and production concentration. This process is noticeable both in Poland and in Ukraine.

The production of cereals and legumes as well as sunflower seed has been increasing in Ukraine, while in Poland it remains stable, although a significant increase in the production of fruit and vegetables has been noted. The producers respond to demand and to the conditions of the functioning of the agricultural market in both countries.

Basing on the conducted analysis, one may predict a further increase in the crops of potatoes and sugar beet in Ukraine, up to the level achieved in Poland. Both countries witnessed a considerable decrease and rise in plant crops in the same years, which may result from weather conditions.

One of the important components of sustainable development is economic stability of production, quantitative assessment which is carried out by extent fluctuations of indicators in dynamic series. The results showed that the Polish crop production economically more stable than in Ukraine. Meanwhile, in Ukraine there are rapidly growing volumes of major crop production than in Poland. Along with this, households were more economically sustainable in terms of changes in the volume of production than agricultural enterprises. For an average annual yield of grain and leguminous Ukraine had some competitive advantage over Poland, but by the average annual yield of sugar beets and potatoes Ukraine ceded Poland. However, by the average annual growth rate of productivity of these crops Ukraine was significantly ahead of Poland. Despite significant variations in yield observed a general tendency to increase the level of intensity of land use. Both countries should seek to reduce volatility in yield of grains and leguminous in the long term – up to 5%.

In the future research in this area can be directed to study the influence of the size of the cost per unit of land on the main economic indicators of the competitiveness of agricultural enterprises of studied countries.

References

[1] Bachev, H. and Terziev, D. 2018. A Study on Institutional, Market and Natural Environment Impact on Agrarian Sustainability in Bulgaria. *Journal of Environmental Management and Tourism* 9(3): 452-478. DOI: https://doi.org/10.14505//jemt.v9.3(27).06.

[2] Ball, V. E., Butault, J.-P., Juan, C. S. and Mora, R. 2010. Productivity and international competitiveness of agriculture in the European Union and the United States. *Agricultural Economics* 41(6): 611–627. DOI: https://doi.org/10.1111/j.1574-0862.2010.00476.x.

[3] Borodina, O. and Prokopa, I. 2016. The village and peasantry at the juncture of opportunities and the crossroad of hope. *Economy and Forecasting* 2: 129–144. DOI: https://doi.org/10.15407/eip2016.02.129.

[4] Cramon-Taubadel, S. and Nivyevskyi, O. 2012. Twenty years of research on transition in agricultural economics journals. *European Review of Agricultural Economics* 39(2): 335–359. DOI: https://doi.org/10.1093/erae/jbr008.

[5] European Statistical Office 2016. *Farm Structure Survey*. Available at: www.ec.europa.eu/eurostat.

[6] Fraser, I. and Lansink, A. O. 2017. Towards Sustainable Agri-Food Systems: Balancing between Markets and Society. *European Review of Agricultural Economics* 44(4): 539–540. DOI: https://doi.org/10.1093/erae/jbx021.

[7] Główny Urząd Statystyczny w Polsce 2016. Polish Statistical Office *(GUS) 2016*. Available at: http://stat.gov.pl.

[8] Gawroński, K., Kuryltsiv, R. and Hernik, J. 2012. Racjonalne użytkowanie oraz ochrona gruntów rolnych w Polsce i na Ukrainie. *Infrastruktura i Ekologia Terenów Wiejskich* 3/III/2013: 17–30. Available at: http://yadda.icm.edu.pl/yadda/element/bwmeta1.element.agro-3036c887-b6c0-4fda-bdf6-ce5902ff9a38.

[9] Hełdak, M., Stacherzak, A. and Kucher, A. 2017. Analysis of the changes in transaction prices of agricultural land in Poland. *Hradec Economic Days* 7: 287–295. Available at: https://uni.uhk.cz/hed/site/assets/files/1046/proceedings_2017_1.pdf.

[10] Hernik, J., Kuryltsiv, R. and Nawiesniak, M. 2014. Assessment of rural land use development policy in Poland and Ukraine. *Actual Problems of Economics* 8: 50–55.

[11] Jezierska-Thöle, A., Janzen, J. and Rudnicki, R. 2014. Agrarian-economic structure of agricultural holdings in Poland and East Germany: Selected elements of comparative analysis. *Quaestiones Geographicae* 33(2): 87–101. DOI: https://doi:10.2478/quageo-2014-0018.

[12] Kazakova, I. and Adamska, H. 2016. Protection of soil in Poland within implementation of rural development programs (PROW). *Socio-Economic Problems and the State* 1(14): 117–130. DOI: https://doi.org/10.14254/2223-3822.2016.14-1.14.

[13] Keyzer, M. A., Merbis, M. D., Witt, R., Heyets, V., Borodina, O. and Prokopa, I. 2013. *Farming and rural development in Ukraine: making dualisation work*. Luxembourg, Publications Office of the European Union. Available at: http://publications.jrc.ec.europa.eu/repository/handle/JRC80164. DOI: https://doi:10.2791/85743.

[14] Khromushyna, L., Konieva, I. Skrypnyk, Yu. and Shalyhina, I. 2018. Formation of Resource Potential of Agrarian Enterprises on the Principles of Ecological and Economic Security. *Journal of Environmental Management and Tourism*, 9(5): 979-986. DOI: https://doi.org/10.14505//jemt.v9.5(29).09.

[15] Kropyvko, M. and Kovalova, O. 2010. Ecological Diversification of the Agricultural Earth Use is in Ukraine. *Economy of Ukraine, 7*: 78–85.

[16] Kucher, A. V. 2016. Management of soil rational use in the context of European integration. *Economika APK* 5: 66–73.

[17] Lerman, Z., Csaki, C. and Feder, G. 2002. *Land Policies and Evolving Farm structures in Transition Countries. Policy Research Working Paper no 2794.* Washington, The World Bank Development. Available at: http://documents.worldbank.org/curated/en/885151468746704912/120520322_20041117152044/additional/multi0page.pdf.

[18] Majerova, V., Marikova, P. and Herova, I. 2009. *Zmiany strukturalne na obszarach wiejskich i w rolnictwie Czec, in Przemiany strukturalne wsi i rolnictwa w wybranych krajach europejskich.* Warszawa, IERiGŻ, PIB. Available at: https://ierigz.waw.pl/download/1267-128.pdf.

[19] Mekonnen, D. K., Spielman, D. J., Fonsah, E. G. and Dorfman, J. H. 2015. Innovation systems and technical efficiency in developing-country agriculture. *Agricultural Economics* 46: 689–702. DOI: https://doi.org/10.1111/agec.12164.

[20] Nivievskyi, O., Stepanuik, O., Movchan, V., Ryzhenkov, M. and Ogarenko, Y. 2015. *Country report: Ukraine*.

Kyiv, Institute for Economic Research and Policy Consulting. Available at: http://www.agricistrade.eu/wp-content/uploads/2015/06/Agricistrade_Ukraine.pdf.

[21] Parmakli, D. and Bahchivandzhi, L. 2016. Comparative analysis of efficiency of the use land in agriculture Republic of Moldova and Odessa region of Ukraine. *Agricultural and Resource Economics: International Scientific E-Journal* 2(1): 74–85. Available at: http://www.are-journal.com.

[22] Patyka, N. 2018. Priorities ensuring of the Ukraine's agriculture competitiveness in the world markets. *Agricultural and Resource Economics: International Scientific E-Journal* 4(4): 130–145. Available at: http://are-journal.com.

[23] Parlińska, M., Oliinyk, O., Van Der Sluis, E. and Wasilewska, E. 2015. The international trade in sunflower seed oil of Poland and Ukraine. *Electronic Journal of Polish Agricultural Universities* 18(4). Available at: http://www.ejpau.media.pl/volume18/issue4/art-12.html.

[24] Poczta, W. Ed. 2013. *Gospodarstwa rolne w Polsce na tle gospodarstw Unii Europejskiej – wpływ WPR.* Warszawa, Główny Urząd Statystyczny.

[25] Pomelov, A., Pasko, O. and Baranova, A. 2015. Comparative analysis of land management in the world. *Earth and Environmental Science* 27: 1–4. DOI: https://doi.org/10.1088/1755-1315/27/1/012040.

[26] Prokopenko, O. M. Ed. 2016. *Agriculture of Ukraine: Statistical Yearbook of the 2015 year.* Kyiv, State Statistics Service of Ukraine.

[27] Prokopenko, O. M. Ed. 2016a. *Basic economic indicators of agricultural production at agricultural enterprises: Statistics Bulletin of the 2015 year.* Kyiv: State Statistics Service of Ukraine.

[28] Prokopenko, O. M. Ed. 2016b. *Crop production of Ukraine: Statistical Yearbook of the 2015 year.* Kyiv, State Statistics Service of Ukraine.

[29] Prokopenko, O. M. Ed. 2016c. *Gross agricultural output of Ukraine (At constant prices 2010) of the 2015 year.* Kyiv, State Statistics Service of Ukraine.

[30] Rebryna, N. 2015. The development of organic production in Ukraine and Poland. *Economic and Regional Studies* 8(4): 107-118. Available at: http://www.ers.edu.pl/OJS/index.php/erspl.

[31] Samarets, N. and Nuzhna, S. 2018. The modern contribution of the basic categories of producers to Ukrainian agrarian production. *Agricultural and Resource Economics: International Scientific E-Journal* 4(4): 52–71. Available at: http://are-journal.com.

[32] Sarna, A. 2014. Transformacja ukraińskiego rolnictwa: od kołchozów do agroholdingów. *Komentarze OSW,* 127. Available at: https://www.osw.waw.pl/sites/default/files/komentarze_127.pdf.

[33] Sarris, A.H., Doucha, T. and Mathijs, E. 1999. Agricultural restructuring in central and eastern Europe: implications for competitiveness and rural development. *European Review of Agricultural economics* 26(3): 305–329. DOI: https://doi.org/10.1093/erae/26.3.305.

[34] Shubravska, O. V. 2014. Development of Ukraine's agricultural management on the basis of economic sustainability. *Economy and Forecasting* 2: 62–72.

[35] Swinnen, J. F. M. and Maertens, M. 2007. Globalization, privatization, and vertical coordination in food value chains in developing and transition countries. *Agricultural Economics* 37: 89–102. DOI: https://doi.org/10.1111/j.1574-0862.2007.00237.x.

[36] Swinnen, J. F. M. 2001. Implications of EU enlargement for Agri-food Markets and Policy. In: *Outlook for Agriculture, Agribusiness and the Food Industry in Central and Eastern Europe at Budapest* 18th of May 2001, Hungary.

[37] Swinnen, J. F. M. 2009. Reforms, globalization, and endogenous agricultural structures. *Agricultural Economics* 40: 719–732. DOI: https://doi.org/10.1111/j.1574-0862.2009.00410.x.

[38] Vynohradenko, S. 2015. Intensification of land resources using and forming of optimal level of intensity in the agricultural enterprises. *Agricultural and Resource Economics: International Scientific E-Journal* 1(2): 29–39. Available at: http://www.are-journal.com.

[39] Zinych, N. and Odening, M. 2009. Capital market imperfections in economic transition: empirical evidence from Ukrainian agriculture. *Agricultural Economics* 40: 677–689. DOI: https://doi.org/10.1111/j.1574-0862.2009.00407.x.

[40] Zos-Kior, N., Bukreyev, S. and Bondarskaya, A. 2014. Land use of agrarian producers of G20 in context of global food security increase. *The Advanced Science Journal* 1: 58–61. DOI: https://doi.org/10.15550/ASJ.2014.01.058.

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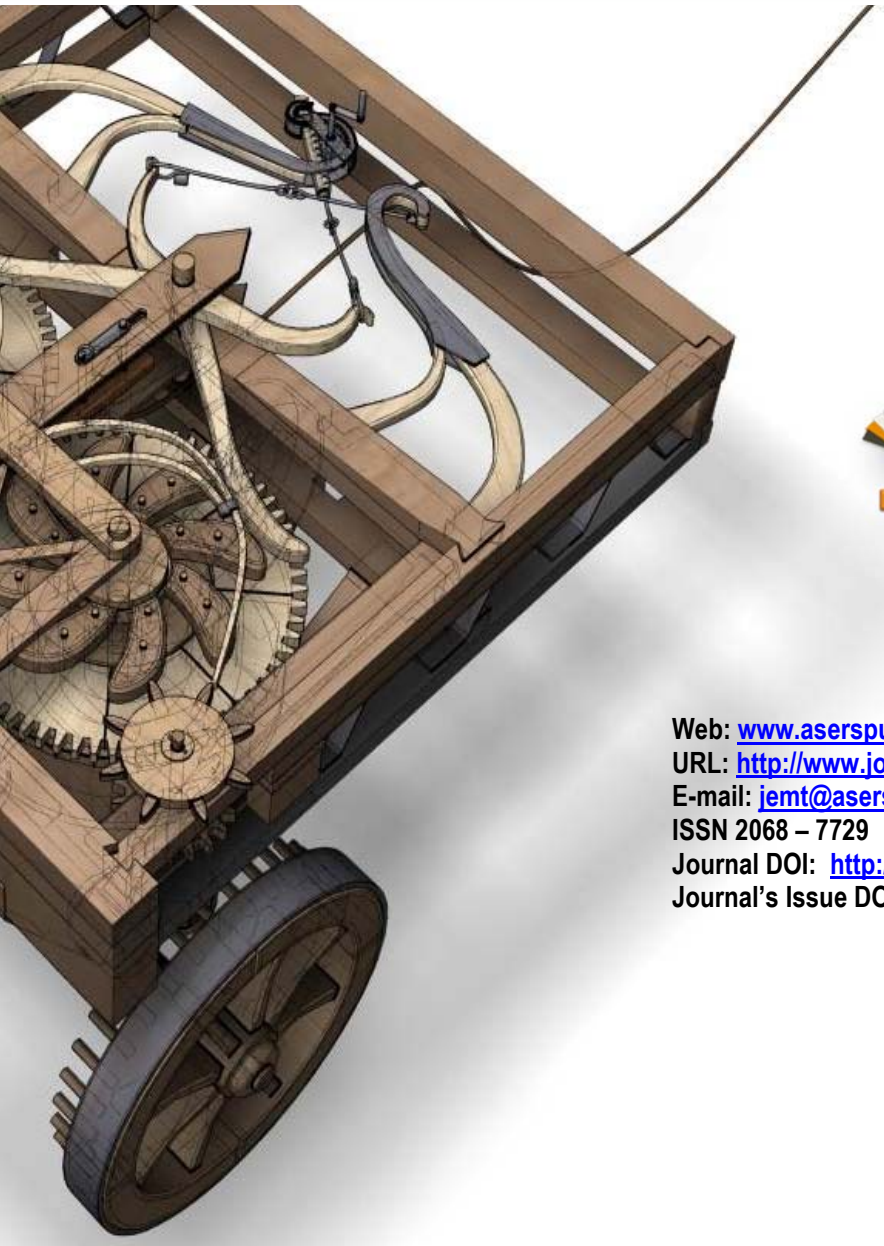

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