Productivity and Competitiveness of the Agricultural Sector in Poland

by

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Abstract

This article attempts to assess the productivity and competitiveness of the agricultural sector in Poland. The data used in the article were provided by Polish FADN (Farm Accountancy Data Network) and the Central Statistical Office, which makes them a representative and reliable source of information on agriculture in Poland. Studies have shown that the agricultural sector in Poland is characterised by low productivity, especially of small and medium-sized farms prevailing in Poland, as well as low internal competitiveness measured by the share of the national agricultural sector in generating GDP. Studies have shown, on the other hand, that the situation of the sector is relatively well presented in terms of the external competitiveness represented by its share in exports.

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Article received: 30 August 2021, accepted: 30 November 2021.

Resumé

Cet article vise à évaluer la productivité et la compétitivité du secteur agricole en Pologne. Les données utilisées dans l'article ont été fournies par le Réseau de données comptables agricoles polonais et l'Office central des statistiques, ce qui en fait une source d'information représentative et fiable sur l'agriculture en Pologne. Des études ont montré que le secteur agricole en Pologne est caractérisé par une faible productivité, en particulier des petites et moyennes exploitations agricoles qui existent en Pologne, ainsi que par une faible compétitivité interne mesurée par la part du secteur agricole national dans la production du PIB.Des études ont montré, d'autre part, que la situation du secteur est relativement favorable en termes de compétitivité externe, représentée par sa part dans les exportations.

Key words: productivity; competitiveness; agriculture; FADN.

JEL: Q1, Q19, D24

I. Introduction

The size of the agricultural sector in Poland, the characteristics of its productivity and competitiveness are the subject of numerous and diverse thematic analyses. The examination and assessment of productivity deserve special attention in this regard. Productivity is an essential element of economic decision-making process (Prandecki et al., 2014). Prokopenko (1987) argues that measures of productivity at the level of the economy of a given country in the sectoral dimension allow to assess the effects of the management process as well as the quality of social and economic policy conducted in the state. Latruffe (2010) indicates the use of productivity to measure and evaluate the competitiveness of agriculture, and the European Commission indicates it as the most reliable measure of long-term competitiveness (EU Commission, 2009).

The acceptance of the idea of the advisability of measuring agricultural productivity is accompanied by a multitude of research approaches. Grochowska and Mańko (2014) use the Total Factor Productivity (TFP) index in their assessment of agricultural productivity, Czyżewski (2012) analyses the productivity of resources in domestic agriculture taking into account the paradigm of sustainability, while Nowak (2017) uses a non-parametric method based on Malmquist productivity index. Piwowar (2017) measured the productivity of labour and land in agriculture using the relation of the gross value added of agriculture (expressed in producer prices) related to

inputs and resources of production factors. With regard to land, the author used the measure of agricultural land in hectares, while the amount of labour inputs was expressed in Annual Work Unit (AWU).[1]

Environmental aspects (Ancev and Azad, 2015) are increasingly being taken into account in productivity indices used to measure the final effects of management. The literature uses the term 'environmental efficiency' (Kumar and Khanna, 2009; Hoang and Coelli, 2011). It refers to standard productivity indices, albeit taking into account the environmental effects of agricultural production. The research carried out on the basis of this indicator allows to obtain an answer to the question whether the most economically effective farms are also farms that are the most harmful to the environment (Góral and Rembisz, 2017).

The adjustment for environmental effects is also taken into account by the revised Luenberger indices (i.e. Luenberger productivity indicator) assuming profit/income maximization in agricultural production. Environmental correction makes it possible to capture regional differences in the abundance of natural values. Luenberger indicator, which takes into account environmental aspects environmentally adjusted productivity), has two characteristics. The first one concerns the inclusion of variables reflecting the level of environmental degradation in the analysis of the production process. The second one concerns comparing the relative productivity of economic entities covered by the study in spatial terms (Ancev and Azad, 2015; Ancev et al., 2017).

Measuring productivity, followed by examining the competitiveness of agriculture, is an extremely difficult task (Świtłyk, 2011; Misiąg et al., 2020). This is already demonstrated by the sheer multitude of methods and approaches to expressing and estimating productivity. Competitiveness is considered in two aspects: dynamic and static (Nosecka, 2011). The static approach is referred to as ex-post competitiveness and refers to the competitive position of the agricultural sector and its products over a specified period of time as a result of the competition process. In turn, the dynamic approach assumes that competitiveness is a process of competition aimed at obtaining the desired state, i.e. being competitive. The indicated point of view naturally directs the discussion to the topic of the competitive potential of agriculture. Gorynia (2009) claims that competitive potential is a kind of contribution (or input) in the process of competition. Skilful use of the production potential through proper management of competitiveness leads to the achievement of a competitive position. Such a point of view is consistent with the concept of

[1] The Annual Work Unit (AWU) is a unit used to measure labour inputs in agriculture. It is the equivalent of full-time self-employment and contract work (1 AWU = 2120 working hours per year). See more about this: https://stat.gov.pl/metainformacje/slownik-pojec/pojecia-stosowane-w-statystyce-publicznej/2616,pojecie.html (accessed on 7 July 2021).

three aspects of competitiveness by Buckley et al. (1988) covering three groups of competitiveness measures, i.e. the results of competition, competitive potential and the competitiveness management process.

Woś (2001) rightly notices that the aspect that distinguishes research on the competitiveness of agriculture from other sectors of the economy is the limited mobility of factors involved in the production process. Agriculture is thus deprived of the benefits of transfers of productive resources. As a result, owners of farms cannot effectively fight for an economic position on the internal market with entities operating in the vicinity of farms. The instruments for competing within their reach are basically limited to improving the quality and efficiency of using the resources held. Secondly, agricultural producers, to a much lesser extent than entities from other branches of the national economy, obtain benefits from increasing the scale of production (Nosecka et al., 2011). The presented specificity of the agricultural sector means that the competitiveness of agriculture is analysed mainly in terms of costs. The reason is that production costs play a key role in shaping the ability to compete in the market of agricultural products. Hence, according to Porter (1980), the source of agribusiness competitiveness is cost leadership and / or product differentiation.

Based on the above information, competitiveness means the ability of any economic system to function and develop effectively under the conditions of existing competition (Daszkiewicz et al., 2008). It is therefore the process by which a given arrangement (or economic sector) gains the attributes of being competitive (Kulawik and Wieliczko, 2012). Competitiveness is thus a relative and gradated category (Pawlak and Poczta, 2011), making it (as well as productivity) applicable in the research of the agricultural sector.

II. Data and research methodology

Productivity analysis, and then the competitiveness of agriculture, will be carried out on the basis of the research conducted for Poland by FADN (Farm Accountancy Data Network). FADN is a European system for collecting accountancy data from agricultural holdings operating throughout the EU and covering over 81,000 farms. Participation in the research is voluntary, and the classification of farms is done based on two criteria: economic size and type of farming.

The economic size of an agricultural holding according to the FADN methodology is defined as the sum of Standard Output, i.e. SO – obtained from all agricultural activities occurring in the agricultural holding. The type

of farming of a farm is defined by the share of the value of Standard Output from individual groups of agricultural activities in the total SO value of a farm. Standard output is defined as the 5-year average production value of a given crop or livestock obtained per 1 ha or 1 animal within 1 year, in the average production conditions for a given region. The type of farming of an agricultural holding is defined based on the share of SO value from individual agricultural activities in the generation of the total SO value of a farm. The type of farming of a farm reflects its level and direction of specialization. The FADN methodology divides farms into the following types: field crops, horticultural crops, permanent crops, dairy cows, herbivores, pigs, poultry, and mixed crops (Stork et al., 2017).

FADN collects data that describes both the economic and financial situation of farms. It is the only database that collects the above-mentioned data in a uniform manner, and the entities included in it form a statistically representative sample of commercial farms operating in the EU. The results presented in the FADN are representative and are weighted averages for a given group of farms. Based on the results of the General Agricultural Census conducted in Poland in 2010, the number of farms with an economic size greater than or equal to EUR 4,000 (730,883 farms) was determined. These farms were included in the FADN survey, and the table (Table 1) below presents the breakdown of these farms according to the economic size class.

Table 1. List of economic size classes of farms according to the FADN methodology

The name of the class	Euro
Very small	4 000 ≤ euro < 8 000
Small	8 000 ≤ euro < 25 000
Medium small	25 000 ≤ euro < 50 000
Medium large	50 000 ≤ euro < 100 000
Large	100 000 ≤ euro < 500 000
Very large	euro ≥ 500 000

Source: Own study based on FADN data.

The presented data are the result of calculations made based on the FADN data. The analysis was carried out for farms grouped according to types of farming and economic size classes. The tables below (Table 2 and Table 3) present the distribution of farms accepted for the study, taking into account two FADN criteria: the type of farm and the economic size class.

Table 2. Number of farms participating in the FADN survey, by a type of agricultural activity

Variable	Total	Field crops	Horticulture Crops	Permanent crops	Dairy cows	Herbivorous animals	Pigs	Poultry	Mixed
Number of represented farms	730 883	180 340	25 931	32 531	82 774	53 857	22 204	4 579	328 667
Number of farms in the sample	12 220	4 263	276	438	2 539	846	598	67	3 193

Source: FADN Report, 2018 Standard Results obtained by farms participating in the Polish FADN, Part I. Standard Results, Warsaw 2019, p. 47.

12,220 farms were analysed in the study. Field crops, mixed farms and dairy farms dominated among the analysed types of activity. These three types of activities corresponded to nearly 82% of farms in the research sample. Poultry and horticultural farms were the smallest in the sample.

Table 3. Number of farms participating in the FADN survey, by economic size

Variable	Total	Very small	Small	Medium small	Medium large	Large	Very Large
Number of represented farms	730 883	273 995	307 441	95 331	35 712	16 320	2 084
Number of farms in the sample	12 220	1 002	4 344	3 454	2 330	1 007	83

Source: FADN Report, 2018 Standard Results obtained by farms participating in the Polish FADN, Part I. Standard Results, Warsaw 2019, p. 53.

The structure of farms covered by the survey was dominated by small and medium-small farms. They accounted for less than 64% of the total number of farms covered by the FADN survey. Very large farms accounted for only 0.68% of the total number of farms participating in the FADN survey. The presented data reflect the structure of domestic agriculture, indicating the domination of small farms with limited production potential

III. Evolution of productivity and competitiveness of agriculture

The FADN collects about a thousand different data characterizing a single farm. Only selected quantities characterizing farms that enable the assessment of productivity and competitiveness of the agricultural sector in Poland will be presented below. The results below are representative for the FADN field of observation and are weighted averages for a given group of farms.

Table 4. Selected values characterizing farms in 2018 by a farm type

Variable	Unit	Field crops	Horticulture Crops	Permanent Crops	Dairy cows
Total production	PLN	115 005	210 438	83 329	175 076
Relation of total production to total costs	times	1,09	1,40	1,11	1,35
Plant production per 1 ha	PLN/ha	4 323	40 642	10 280	961
Net value added per full-time employee	PLN/AWU	35 955	40 984	16 724	49 007

Variable	Unit	Herbivorous animals	Pigs	Poultry	Mixed
Total production	PLN	54 838	247 024	1 255 556	109 981
Relation of total production to total costs	times	0,91	1,10	1,30	0,98
Plan production per 1 ha	PLN/ha	828	2 878	3 114	2 502
Net value added per full-time employee	PLN/AWU	18 867	35 817	122 249	21 887

Source: Own study based on FADN data.

According to the methodology of the FADN total production is expressed in PLN and it involves: sale, household provision, consumption for the needs of the farm, the difference in inventories, the difference in the value of animals resulting from changes in prices and is reduced by the purchase of animals. An average farm covered by the study had a production value of PLN 128,24. Farms representing the group of poultry and pigs generated the most. The worst results were achieved by the farms representing the type of herbivorous animals and permanent crops.

The ratio of total production to total costs proves the possibility of generating profit by individual farms. The value of this ratio for all surveyed households in 2018 was 1.09. The best in this respect were farms representing

horticultural crops and milk production. It should be noted, however, that there are types of agricultural holdings where the value of this indicator calculated as a weighted average for the group is less than 1, which means that the income in 2018 was lower than the costs incurred. The value of the indicator of less than 1 was characteristic of the holdings involving herbivores and mixed production.

Crop production per 1 ha, expressed in PLN/ha, is the value of crop production per 1 ha of agricultural land, excluding leased land and the area of agricultural land excluded from production. On average, farms in Poland were able to generate plant production worth over PLN 3,200 from one hectare of arable land. Not surprisingly, according to this criterion, horticultural and permanent farms performed best.

The net value added per full-time person is expressed in PLN per AWU. The results of the survey showed that the average net value added per full-time person on a farm in Poland was PLN 30,542. It was the highest on poultry and dairy farms and the lowest on permanent crops farms (Table 5).

Table 5. Selected values characterising farms in 2018 by economic size

Variable	Unit	Total	Very small	Small	Medium-small	Medium-large	Large	Very large
Total production	PLN	128 247	31 125	73 177	178 715	360 838	1 061 591	7 419 073
Total production to total costs	Times	1,09	0,95	1,07	1,21	1,25	1,19	0,93
Plant production per 1 ha	PLN/ha	3 267	2 532	2 827	3 017	3 580	4 680	3 958
NVA per full-time employee	PLN/ AWU	30 542	8 406	19 781	43 426	70 702	110 095	87 233

NVA – Net Value Added

Source: Own study based on FADN data.

The size of the farm is very important for total production. The relevant data is shown in Table 5. As the economic size grows, the production volume increases. The relation of total production to total costs is the best for medium-large and medium-small farms. The analysis of the evolution of the value of this indicator shows that in agriculture the economies of scale occur only up to the average farm size. In the case of big holdings, the value of this ratio

decreases, until it falls below 1 in case of very large farms. In terms of crop production per hectare large farms seem the most effective. The value of this indicator increases with the increase of the economic value of a farm, but for the largest farms it is slightly lower than for large ones. The net value added per full-time employee displays a similar characteristic.

The analysis for all types of agricultural holdings in total was only possible between 2013 and 2018, as pigs and poultry had been classified as one group of granivorous animals until 2012.

Due to the fact that these two types of production differ in the scale of their operations, they have been divided into two separate sub-types since 2013. The value of total production in 2018, compared to 2013 decreased by almost 10%. The largest decreases were recorded in permanent crops (around 30%), pigs (around 11%), horticultural crops (around 8%) and mixed crops (around 6%) By contrast, the production of poultry and dairy farms increased. The changes in the production of farms involved in breeding herbivorous animals were minimal.

Table 6. Total production dynamics (in PLN) by a farm type in the years 2013–2018 (in %), 2013 = 100%

Specification	Year					
	2013	2014	2015	2016	2017	2018
Field crops	100,0	97,6	94,4	85,6	90,0	89,6
Horticulture	100,0	92,2	111,6	40,4	89,4	91,3
Permanent crops	100,0	69,5	92,8	77,6	83,7	69,5
Dairy cows	100,0	101,9	88,2	95,6	117,1	120,1
Herbivorous animals	100,0	90,2	88,3	94,9	101,6	100,0
Pig	100,0	89,4	78,6	90,1	96,7	88,7
Poultry	100,0	114,8	112,9	119,2	131,5	104,6
Mixed	100,0	77,9	73,9	78,6	84,7	93,7

Source: Own study based on FADN data.

Plant production per hectare decreased by less than 9 % during the analysed period. Declines were recorded in all types of agricultural activity except field crops, where they increased by just over 4%. The largest decreases were recorded for permanent crops (around 20%), mixed and pig-oriented farms (around 15%), dairy cows (around 12%), and other herbivores (around 9%). In other types of agricultural holdings, the decreases in production during the analysed period were negligible (Table 7).

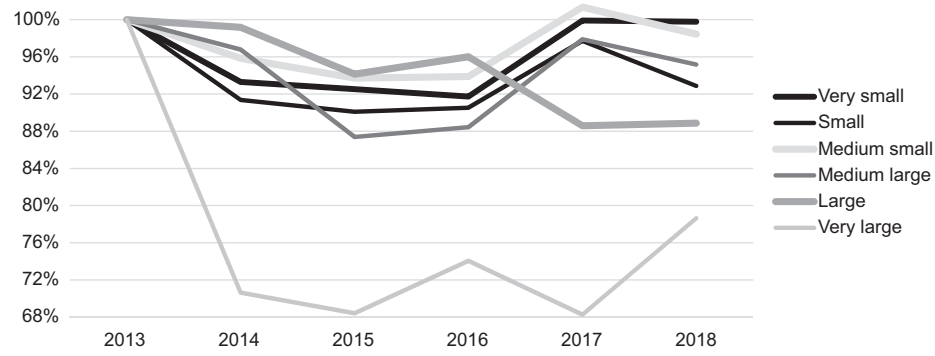
Table 7. Total production dynamics per 1 ha (PLN/ha) by a farm type in the years 2013–2018 (in %), where 2013 = 100%

Specification	Year					
	2013	2014	2015	2016	2017	2018
Field crops	100,00	99,10	96,80	98,20	102,90	104,50
Horticulture	100,00	97,20	110,30	110,80	96,40	95,70
Permanent crops	100,00	66,30	94,70	88,30	85,90	80,20
Dairy cows	100,00	87,40	64,10	92,10	95,50	88,00
Herbivorous animals	100,00	88,30	69,10	92,00	96,30	90,30
Pig	100,00	98,60	83,40	82,80	94,80	85,60
Poultry	100,00	89,00	78,30	89,80	102,60	97,30
Mixed	100,00	90,70	87,90	78,80	83,40	84,90
Total	100,00	93,20	93,50	90,90	93,30	91,30

Source: Own study based on FADN data.

In the case of a division of agricultural farms due to the economic size of the holding, it is possible to analyse all the years in which the FADN survey was carried out in Poland. Nevertheless, for the sake of consistency and to enable the comparison of the results, the analysis will also cover the period from 2013 to 2018. As mentioned above, the total production dropped in the analysed period by less than 10%, however, the biggest drops affected the largest farms. Very large entities lost over 21%, and large farms lost about 11%. The production of small farms decreased by about 7%, while the production of medium-sized farms by about 5%. For medium-sized and small operators, total production decreased slightly between 2013 and 2018. The relevant data is shown Figure 1.

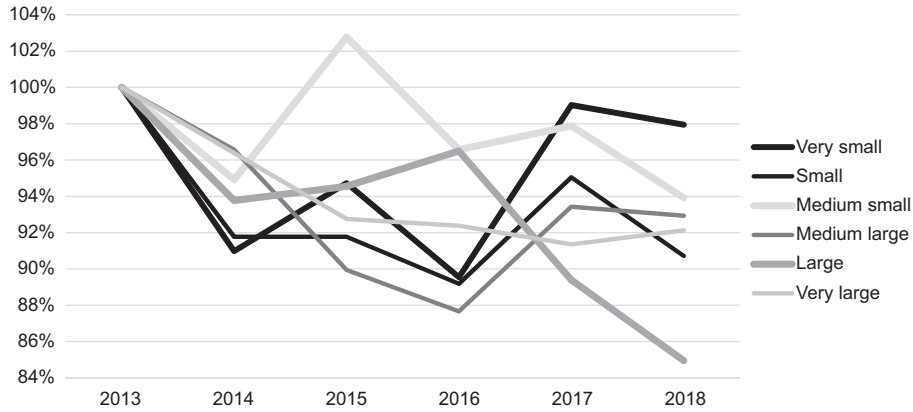
Figure 1. Total production dynamics (PLN) and the economic size of a farm in the years 2013–2018, where 2013 = 100%



Source: Own study based on FADN data.

The largest drops in plant production per hectare were recorded by large farms (approx. 15%) and small farms (approx. 9%). Very large, medium-large, and medium-small farms recorded declines ranging from approx. 6% to approx. 8%. In the smallest farms, the decrease in plant production per 1 hectare was the smallest in the analysed period (Figure 2).

Figure 2. Dynamics of plant production per 1 ha (PLN/ha) and the economic size of a farm in 2013–2018, where 2013 = 100%



Source: Own study based on FADN data.

Despite the fact that Polish FADN collects and records extensive information on more than twelve thousand farms, it does not provide raw data. It is only possible to obtain aggregated data for individual groups of farms in which the sample size is additionally rounded. Despite these limitations, it is possible to calculate the productivity of agricultural land and the productivity of labour in agriculture with relatively high accuracy.

Land productivity is the ratio of gross value added to the area of agricultural land in hectares. Gross value added in the FADN methodology includes total production reduced by intermediate consumption, and then adjusted by the balance of subsidies and taxes related to operating activities.

The highest land productivity in 2018 was calculated for horticultural crops. It was over PLN 30,000 and this value was over fourfold higher than the second largest group of permanent crops. The lowest productivity of the land was achieved by farms from the sheep and goat group and the oilseed and protein grain cultivating farms.

Within the period under the review, three types of farms recorded an increase in land productivity. The highest increase was calculated for dairy farms, at the level of almost 18% (2013 = 100%). An increase of almost nine percent was

calculated for farms dealing with beef and livestock cattle, and a slightly over four percent increase was calculated for farms of the assorted animals type.

The largest decrease in land productivity concerned the farms representing the following groups: permanent crops (almost 23%), sheep and goats (almost 15%) and horticultural crops (almost 13%). The relevant data is shown in Table 8.

Table 8. Land productivity in agriculture by a farm type in 2013–2018 (value added in PLN per 1 ha)

Specification	Year					
	2013	2014	2015	2016	2017	2018
Grain, oilseed and protein crops	2 539,08	2 595,06	2 210,82	2 195,59	2 429,73	2 453,94
Assorted field crops	3 855,86	3 660,13	3 620,15	3 444,92	3 562,93	3 833,37
Horticulture	34 760,47	36 652,72	36 638,61	33 439,16	29 215,37	30 285,54
Permanent crops	9 870,12	6 624,41	10 096,67	8 228,99	10 182,53	7 615,07
Dairy cattle	4 770,07	4 765,97	4 168,56	4 528,35	5 990,66	5 618,57
Sheep and goats	2 287,05	1 896,51	1 986,37	1 721,59	2 394,16	1 950,40
Beef and livestock cattle	2 472,57	2 670,56	2 766,59	2 688,45	2 891,51	2 685,69
Pigs, poultry, and other animals fed with concentrated fodder	6 537,90	5 269,79	4 704,86	6 176,55	6 857,87	5 771,60
Assorted crops	5 556,81	5 348,60	5 754,27	5 532,22	5 879,44	5 525,74
Assorted animals	3 457,52	3 215,41	2 929,71	3 476,72	4 057,28	3 610,49
Versatile production	3 015,40	2 803,67	2 392,25	2 689,31	3 226,58	2 927,95
Total	3 622,06	3 463,45	3 128,98	3 317,86	3 799,52	3 604,50

Source: Own study based on FADN data.

The highest land productivity was calculated for medium-large farms, i.e. those whose economic value according to FADN falls within the range of – 50,000 ≤ EUR <100,000. Large and medium-small farms scored only slightly worse. The farms extreme in terms of economic size, i.e. very small and large, appeared to have the lowest land productivity.

Considering the changes that took place in the analysed period, it should be stated that in the case of medium-large, medium-small and small farms, the productivity increased slightly, by just over 5% and somewhat above 3 %, respectively in the case of the two first groups, and by slightly more than a per mille in reference to the third one.

The largest decrease in land productivity at the level of almost 11% was calculated for very large farms, the result was not much better with the farms from the very small group, where the size studied decreased by slightly more than 8%. A decrease of about 4% was also observed in the class of large farms.

In general, land productivity in agriculture decreased in the analysed period, but the decrease was small, it can be calculated in fractions of a percent (presented as Table 9).

Table 9. Land productivity in agriculture by economic size in the years 2013–2018 (added value in PLN per 1 ha)

The name of the class	Year					
	2013	2014	2015	2016	2017	2018
Very small	2 429,59	2 064,62	2 089,73	2 064,43	2 282,36	2 234,40
Small	3 109,99	2 833,19	2 916,08	2 933,36	3 240,79	3 116,12
Medium small	3 648,47	3 424,53	3 305,81	3 389,33	4 003,23	3 765,24
Medium large	3 930,18	3 826,13	3 407,52	3 639,40	4 421,71	4 139,28
Large	4 039,63	3 921,08	3 390,02	3 712,59	4 163,99	3 880,24
Very large	3 154,54	2 895,42	2 490,39	2 673,78	2 810,08	2 822,36
Total	3 648,67	3 480,11	3 164,10	3 339,44	3 821,38	3 619,46

Source: Own study based on FADN data.

In the case of labour productivity, having the FADN data available, it was only possible to calculate productivity related to a type of farm.

Labour productivity is the ratio of gross value added to total labour input calculated in AWU (Annual Work Unit) units. AWU is a labour conversion unit, a conventional unit of labour input in agriculture, meaning the equivalent of full-time employment. It is calculated by dividing the number of hours worked during the year by the annual number of hours corresponding to full-time employment. Since the 2011 fiscal year, AWU units have been equivalent to 2,120 hours.

The highest labour productivity was calculated for farms representing the following groups: grain, oilseeds and protein crops; pigs, poultry, and other animals fed with concentrated fodder; and dairy cattle. In this respect, the farms from sheep and goat, various crops, as well as beef and livestock cattle groups appear the weakest.

In the period analysed, five out of eleven groups of farms recorded an increase in labour productivity. The highest increase was calculated for dairy cattle farms (the increase by almost 25%), various field crops farms (the

increase by almost 13%) and horticulture farms. The largest drops in labour productivity over the six years were recorded by the following groups: sheep and goats (decrease by almost 33%), permanent crops (decrease by more than 20%) and pigs, poultry and other animals fed with concentrated fodder (decrease by more than 10%).

Taken as a whole, labour productivity in agriculture increased by almost 5% in the analysed period (see Table 10 for a complete summary of the data).

Table 10. Labour productivity in agriculture by a farm type in 2013–2018 (value added in PLN per AWU)

Specification	Year					
	2013	2014	2015	2016	2017	2018
Grain, oilseed and protein crops	116 791,06	119 508,36	103 596,62	97 881,20	106 906,82	107 348,03
Assorted field crops	75 971,76	74 402,01	83 254,93	74 314,96	79 323,53	85 780,24
Horticulture	51 010,47	51 725,60	68 067,44	55 639,35	49 370,06	54 639,43
Permanent crops	50 587,59	36 896,55	67 089,06	42 491,36	56 468,51	40 048,92
Dairy cattle	75 879,85	78 018,36	69 125,87	73 141,25	97 467,83	94 659,51
Sheep and goats	52 260,45	33 423,39	34 490,89	31 299,80	34 724,78	35 450,67
Beef and livestock cattle	49 244,68	52 412,77	53 322,63	48 398,47	52 968,46	46 760,16
Pigs, poultry, and other animals fed with concentrated fodder	111 471,74	90 353,53	84 685,21	107 671,74	119 410,96	99 872,47
Assorted crops	50 954,37	45 529,05	57 997,86	45 870,45	50 481,49	44 738,77
Assorted animals	48 543,84	43 662,05	43 864,82	49 366,48	58 750,94	51 441,75
Versatile production	61 036,45	57 405,90	49 542,30	56 332,72	68 118,52	62 105,43
Total	75 442,76	73 098,50	70 210,19	70 752,67	82 678,19	79 135,64

Source: Own study based on FADN data.

The competitiveness of agriculture, like other economic sectors, can be seen internally (i.e. in the framework of the implementation of activities of a specific national economy) and from an external, i.e. international point of view (Woś, 2001).

When analysing the competitiveness of Polish agriculture from the internal perspective, it is impossible not to notice that it is very low compared to other sectors of the national economy. Even though agriculture employs almost

40% of people working in the entire national economy, this sector generates only 2.2% of Polish GDP. The share of agriculture in generating GDP in the analysed period ranged from 1.7% in 2012 to 3.0% in 2014. The share of employment in agriculture in the total number of people employed in Poland was stable throughout the entire period under study (Table 11).

Table 11. Division of Polish Classification of Economic Activities 2007 sections in generating GDP (in%) and employment in agriculture (% of total employment)

Description	Years								
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Agriculture, forestry, hunting and fishing	2,3	2,8	1,7	1,9	3,0	2,2	2,4	2,8	2,2
Industry	25,2	22,3	23,8	24,8	22,1	23,2	23,4	22,3	21,9
Construction	5,1	4,7	7,1	5,8	5,4	7,1	6,2	6,2	6,7
Trade, motor vehicle repair, transport and warehouse management, accommodation and catering, information and communication	25,2	26,7	25,5	24,7	26,4	26,0	25,8	26,1	26,4
Financial and insurance activities, real estate services	8,6	8,0	7,7	8,6	7,7	7,9	8,5	8,2	8,1
Other services	22,3	23,1	23,0	22,2	22,3	22,3	22,1	22,2	22,2
Taxes on products less subsidies on products	11,3	12,4	11,2	12,0	13,1	11,3	11,6	12,2	12,5
Employment in agriculture	38,6	38,7	38,9	39,1	39,0	39,0	39,5	39,7	39,6

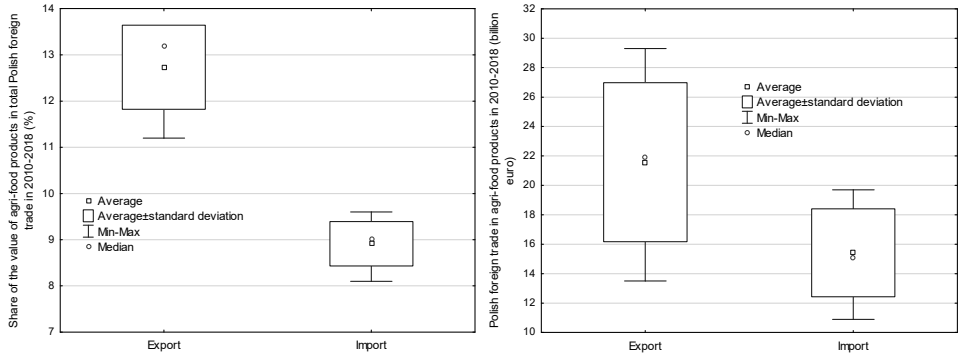
Source: Own study based on Central Statistical Office data[2].

When analysing the external competitiveness of Polish agriculture, it should be stated that despite the low share in the generation of Polish GDP, the share of the value of agri-food products in exports is very high, and at the same time six times higher than the share in the generation of GDP. Therefore, it should be concluded that foreign recipients appreciate the products of this sector more than the goods and services produced in other spheres of the national economy (Figure 3).

The export of Polish agri-food products continued to grow in the period considered. Over the last 10 years, the value of exported agri-food products has more than doubled.

[2] https://stat.gov.pl/obszary-tematyczne/rachunki-narodowe/roczne-rachunki-narodowe/rachunki-narodowe-wedlug-sektorow-instytucjonalnych-w-latach-2015-2018,4,15.html (accessed on 7 July 2021).

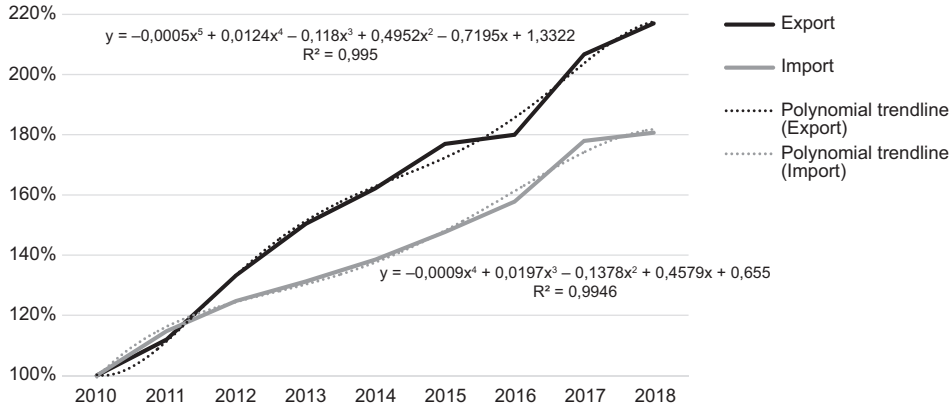
Figure 3. Share of the value of agri-food products in total Polish foreign trade (%) and Polish foreign trade in agri-food products (billion euro) in 2010–2018 – box plots



Source: Own study based on Central Statistical Office data.

Despite the fact that Polish agriculture is characterised by low efficiency, productivity and internal competitiveness, which is primarily due to the fact that it engages much more land and labour resources and less capital, its external competitiveness is growing. The share of agri-food products in the total Polish foreign trade is increasing, as is the value of agri-food exports. Products of the Polish agri-food sector sell very well abroad, where consumers appreciate relatively higher quality and a lower price. It should be noted, however, that despite the improvement of the indicators in question, in relation to the size of the resources employed (especially land and labour), the external competitiveness of Polish agriculture remains unsatisfactory (Figure 4).

Figure 4. The dynamics of exports and imports in the years 2010–2018, where 2010 = 100%



Source: Own study based on Central Statistical Office data.

IV. Summary and conclusions

The data examined on the value of total production, as well as the productivity of farms in Poland clearly show that for many years this area of the national economy is in crisis. It particularly affects the largest farms, which are most restricting their production activities. This might be due to a negative relation of total production to total costs. The conducted analyses showed that although the ratio of revenues to costs increases with the increase in farm size, this tendency is reversed in the case of the largest entities.

The problems of Polish agriculture may result from the fact that the smallest and the largest entities do not provide their owners with decent earnings. The best results of the total production-to-total cost relationship are achieved in crop production per hectare and the best results of net value added per full-time employee are obtained in big-size farms (with an economic value between EUR 100 000 and EUR 500 000).

Agricultural productivity can be described in terms of two variables, land productivity and labour productivity. The productivity of land in agriculture in the six-year period studied slightly decreased, this decrease can be counted in fractions of a percent. The largest increases in land productivity were calculated for farms dealing with dairy cattle, beef and livestock cattle and assorted animals. The productivity decreased the most in the farms from the group of permanent crops, sheep and goats, and horticultural crops.

When analysing land productivity in relation to the economic size of a farm, productivity increased for medium-large, medium-small and small farms. In the remaining groups, land productivity decreased.

The productivity of labour in agriculture was calculated to have increased by almost 5% in the analysed period. As many as five out of eleven groups of farms recorded an increase in labour productivity. The largest growth was calculated for farms from the group of dairy cattle, assorted field crops and horticultural crops. The groups of sheep and goats recorded declines in labour productivity.

The competitiveness of the agricultural sector is very weak compared to other sectors of the Polish economy. The share in the generation of Polish GDP in the analysed period did not exceed 3.0%, despite the fact that almost 40% of the total employed in the national economy worked in agriculture. Polish agriculture engages large amounts of land and workers compared to other EU countries, but small amounts of capital. Poor equipment at work can significantly affect the efficiency and competitiveness of agriculture.

However, the analysis showed that the agri-food sector is getting better at terms of external competitiveness.

The share of the agricultural sector in Polish exports is over thirteen percent and is constantly growing. Poland has a chance to become one of the major food exporters. However, it must not be forgotten that 13% share in total Polish exports is produced from agricultural land which covers approximately 187.6 thousand km^2 of our country, which is approx. 60% of its total area, and almost every fourth person in Poland works in agriculture. Thus (despite the presented positive trends), the result of exports should still be considered unsatisfactory.

The analysis of agricultural productivity and competitiveness presented in this article is an excerpt from a much broader reality describing the economic situation of Polish agriculture. A complete analysis of this issue would require the examination of a number of other, not necessarily economic, aspects related to agricultural issues . Nevertheless, such an approach would go beyond the research objectives set by the authors in this article. Nonetheless, it is worth paying attention to a few important issues. The micro – TFP index shows a decline in agricultural productivity. In addition, it remains in a strong, positive connection with production profile. This relation implies many questions of research, like the link between agricultural production with environmental degradation (and in particular arable land) which is often brought about by large farm owners themselves. Biomass, which consists of different soil organisms and plants, has a huge impact on soil quality, but also shapes a particular type of soil equilibrium, crucial for agricultural production (Doran et al., 1996). Although artificial fertilization can contribute to crop growth, it can also have a destructive effect on soil (through its excessive erosion, nutrient leaching) and on the amount of soil organic matter and on the amount of soil organic matter (Lalfakzuale et al., 2008). The responsibility for this lies particularly with large and very large farms, which not only devastate the environment and produce industrial food, but also lead to the collapse of many both medium-sized and larger farms.

Paradoxically, unfavourable condition of the Polish agriculture is at the same time an opportunity to build solutions that are good for the population, and at the same time attractive for other EU countries, which, like Poland, have problems with agriculture. The authors support the thesis that solving these problems can demonstrate that the production of healthy food is not only a health-promoting, but also economically best solution.

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