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The assessment of production organization of farms conducting animal production in Lubelskie and Podlaskie voivodeships

Ocena organizacji produkcji gospodarstw prowadzących produkcję zwierzęcą w woj. lubelskim i podlaskim

Abstract. Organic system is a farming model based on the harmonious realization of ecological, economic and social objectives together. This system is defined as a farming system with sustainable crop and livestock production. Organic production should combine environmentally friendly management practices, support a high degree of biodiversity, use natural processes and ensure proper animal keeping. This article presents the organizational and production results of organic livestock farms: dairy and meat farms, located in two regions of Poland: in the Lubelskie and Podlaskie voivodeships. The results showed that the production and economic efficiency of the tested farms depended on the organization of plant and animal production. The tested farms differed slightly in the organization of crop production, including its basic determinant, as cropping pattern. Dairy farms were characterized by a higher crop productivity expressed in terms of grain units, which amounted to 688 units and was 53% higher than on farms with meat production. On the other hand, the crop productivity index per unit area was respectively: 20.7 and 22.3. cereal units·ha^{-1}. Organic farms keeping beef cattle achieved lower levels of production performance than dairy farms. Greater economic efficiency in the management of land resources was achieved by farms with a dairy farms.

Keywords: farms, organic system, animal production, milk production

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INTRODUCTION

In Poland, the last 30 years have observed high dynamics in the development of organic farming. One of the main factors that have influenced the development of this sector has been the entirety of the legal conditions, the launch of the subsidy system within the Common Agricultural Policy, but especially the size of the rates and the requirements for area payments under organic production [Kisiel and Grabowska 2014]. The increase in the number of farms and the area of organic land in Poland is closely related to the needs of the internal market, the promotion of Polish organic food on the EU market and the dynamic development of agrotourism services combined with organic production. The development of agriculture, including organic agriculture, is favoured by the fact that Poland is predominantly a lowland country and 60% of its area is occupied by farmland used directly for agricultural or horticultural production [Zuba-Ciszewska and Zuba 2016]. An equally decisive factor determining the development of organic farming in Poland was the situation on the organic food market. The results of recent years show a dynamic increase in the value of this market, which illustrates the increasing importance of this factor. It is estimated that in the coming years, and especially by 2027, i.e. by the end of the current edition of the Strategic Plan of the Common Agricultural Policy, the size of subsidy rates and the requirements of organic area payments will be a key factor determining the dynamics of organic farming development in Poland [Stalenga 2023].

The only period in the last three decades of the 21st century was 2014–2020, during which the number of organic farms in Poland decreased by 28.3% (from 25.9 thousand to 18.6 thousand) [Willer and Lernoud 2018, Stalenga 2023]. This was the largest regression compared to the most countries in the European Union. The most important factor for the reduction in the number of organic farms during this period was the tightening of rules and requirements for beneficiaries applying for payments, mainly the introduction of the obligation to have animals in sufficient numbers when applying for payments for permanent pasture and forage crops grown on arable land [Rozporządzenie… 2015]. During the same period, the area of permanent grassland almost doubled (by about 100 000 ha), whose share in the agricultural land structure decreased from 30.2% to 16.9%, with a decrease in the share of forage crops from 36% to 23% [IJHARS 2019, 2021, Stalenga 2023]. In the above timeframe, along with a decrease in the area of permanent grassland, a twofold decrease in the number of farms keeping livestock organically was also found (from 44% in 2014 to 22% in 2020) [IJHARS 2021]. According to studies, the share of public support in the net added value of organic farms has reached 75% in recent years. The long farm conversion period (3 years) and the problematic procedures for obtaining certification are also a major challenge for organic producers. Poorly organized market, limited distribution and processing network and low consumer purchasing power are also limiting factors.

In 2022, the area devoted to organic production in Poland was 554.6 thousand hectares (i.e. about 3.6% of the total agricultural area, against an EU average of 8.5%) [IJHARS 2023, EUROSTAT 2024].

Currently, both in Europe and around the world, organic farming is in a period of rapid development. The amount of land certified as organic land is increasing every year. In 2019, 72.3 million hectares of land were certified worldwide, which accounted for 1.5% of all crops. In Europe, meanwhile, the percentage of organic land accounted for 3.3% of all crops. The total area under organic farming in the EU continues to increase and in 2022

covered 16.9 milion hectares of agricultural land [EUROSTAT 2024]. In the last decade, the area utilized by organic crops increased by 102.4% worldwide, while in Europe, the increase came to 64.8% [Willer et al. 2021].

In Poland, the organic dairy farming is located in: Warmia and Mazury (18%), Podlasie (16%), Masovian (12%). These regions also have the largest area of organic farming [IJHARS 2023]. Production in organic farms is mostly concentrated in northern and southern voivodeships of Poland (Kujawsko-Pomorskie, Pomorskie, Podlaskie, Warmińsko-Mazurskie and Zachodniopomorskie) and in the Dolnośląskie Voivodeship. These regions are famous for dairy production, have highest potential, and local conditions that are excellent not only for organic farming, but also for agritourism and other environmentally friendly agricultural activities [Bórawski 2021].

According to a report by the IJHARS [2023], there were 21 795 organic producers in Poland as of 31.12.2021, an increase of 7.5% compared to 2020, while in 2022 the number of organic producers increased by 5% to 22 882. The average farm size was 26.2 ha.

The number of organic food preparation operators also increased (by 4%) in 2022 (from 1174 in 2021 to 1216 in 2022) [IJHARS 2023]. At the end of 2022, there were 354 registered organic producers with export activities and 314 with import activities.

Poland is the main producer of cow's milk in the EU, but only 0.2% of this production is organic. During the period 2010–2020, the number of farms producing organic milk and the number of farms with organic pastures and meadows decreased significantly in Poland. A limited number of certified farms sell their milk as organic. Organic milk processing is highly concentrated which is an obstacle to the development of organic milk farming [Zuba-Ciszewska et al. 2023].

The total milk production and average milk yield per cow have increased in recent years, both in Poland and in the EU, whereas the number of cows has decreased [Bórawski et al. 2020, 2021]. In 2021, Poland's production of cow's milk was 14.9 million tons, the third biggest producer in the EU27, but the production of organic milk was 33.4 thousand tons, just 0.22% of its total milk production.

Organic dairy products have almost a 30% share of the entire milk market. Milk and dairy organic products are mainly sold in countries of Northern European. The increase of organic dairy cows is associated with an increase in organic farmland and the increased demand for organic products [Komorowska 2016, Zuba-Ciszewska i Bojarszczuk 2017]. Organic milk production is strongly linked to permanent pastures, which deliver fodder, preserve soils, and do not destroy organic matter and organisms. The environmental, economic, and legal objectives are important for the progress of sustainable development and are present in the public debate [Matuszczak et al. 2020].

The European Commission (EC) in 2019 set a target for the countries that make up the European Union (EU) to achieve a 25% share of organic farmland in the total agricultural area by 2030 [From Farm to Fork Strategy 2019]. In Poland, where land under organic farming in 2022 covered about 3.7% of total agricultural land, achieving such a level in the next few years seems unlikely to be realized and met.

Given the importance of organic farms in the country, the study attempts to analyze and evaluate the production and economic performance of organic farms with a dairy and meat production profile.

MATERIAL AND METHODS

The study was based on the results of questionnaire surveys carried out in 2017–2018 on farms keeping dairy (10 farms) and beef cattle (10 farms), producing milk and beef livestock by organic methods. Farms are located in the Lubelskie (milk farms) and Podlaskie (meat farms). The selection of farms for the study was purposive. The method for obtaining information was an interview with the use of a questionnaire. The farms in the Lubelskie Voivodeship produced cheeses from organic milk, while the farms produced beef in the Podlaskie Voivodeship.

In order to determine the organization of crop and livestock production on the farms surveyed, an indicator analysis of the selected farms was carried out.

The production assessment included: crop yields in dt ha^{-1}, crop and livestock production in cereal units per ha utilised agricultural area (UAA), livestock density in LU ha^{-1} UAA. The intensity of production organization was also assessed according to the method of Kopeć [1987]. Cattle density in LU (stocking density expressed in LU – animal unit according to FADN methodology equivalent to 1 dairy cow, or cull, or bull at 2 years of age or older) per 1 ha of UAA, which is one of the indicators of the production assessment, livestock unit conversion factors were used [Duer et al. 2002].

Annual total labour input per full-time employee per year was determined in AWU (labour input conversion unit according to the FADN methodology: 1 AWU = 2120 total labour hours per year. Total labour input includes the farmer's own and his family's labour input as well as hired labour input).

The study uses data from the IJHARS and the Statistics Poland (GUS). The paper presents the economic performance of farms based on the economic category of agricultural income. The productivity of land, was also determined.

RESULTS AND DISCUSSION

Organic farming is a farming system that activates natural production mechanisms through the use of natural, technologically unprocessed inputs, thus ensuring sustainable soil fertility and animal health and high biological quality of food. Organic food is produced without the use of chemical fertilizers and chemical plant protection products while preserving soil fertility and biodiversity.

In 2017–2018, in Lubelskie Voivodeship, an average of 1,926 producers were engaged in organic farming, while in 2023 their number increased by 7% to 2,062 farms, which accounted for 9% of all organic agricultural producers in Poland (tab. 1). On the other hand, in Podlaskie Voivodeship, the number of organic agricultural producers in 2017–2018 was 3100, while in 2023 it increased at 50% [IJHARS 2019, 2023].

In the period under review (2017–2018), the total area of organic farms in the Lubelskie Voivodeship averaged 28.7 thousand ha, accounting for 5.6% of the total farms in Poland dedicated to organic production. In 2023, the agricultural area will decrease by 2% to 30,4 thousand ha. However, in the Podlaskie Voivodeship, 52.6 thousand ha were used in organic production, accounting for 9% of the agricultural area managed organically in the country [IJHARS 2019]. In 2023, the agricultural area used for organic production increased by 67% (tab. 1). The process of supervision and cooperation with certification

bodies is the responsibility of IJHARS. From 1 January 2022, the rules are regulated by the new EU regulation of 30 May 2018; and from 7 July 2022, the new law (of 23 June 2022) on organic farming and production.

Table 1. The number of organic producers operating in the field of agricultural production, area of organic agricultural land in Poland in 2017–2018 and in 2023

Voivodeship	The number of organic producers operating in the field of agricultural production		Organic agricultural area at the end of the conversion period (ha)		Total area of organic agricultural land (ha)	
	2017–2018	2023	2017–2018	2023	2017–2018	2023
Dolnośląskie	727	853	21 002	30 207	27 450	36 039
Kujawsko-Pomorskie	407	443	5 781	6 383	7 993	9 236
Lubelskie	1 926	2 062	22 682	25 389	28 715	30 352
Lubuskie	913	1 206	26 651	34 265	37 549	56 694
Łódzkie	484	653	6 955	9 087	9 084	11 249
Małopolskie	852	739	7 548	6 824	9 768	8 227
Mazowieckie	2 250	3 015	32 064	39 150	43 199	52 589
Opolskie	59	92	2 501	1 882	3 172	2 691
Podkarpackie	1 163	882	11 435	10 127	14 489	11 125
Podlaskie	3 100	4 636	41 789	55 485	52 579	87 592
Pomorskie	575	693	15 586.5	18 399	21 197	24 862
Śląskie	155	239	2 301	2 872	3 339	3 904
Świętokrzyskie	710	589	7 618	6 949	9 528	8 406
Warmińsko-Mazurskie	3 569	3 834	76 076	94 255	105 820	130 429
Wielkopolskie	732	1118	18 501	24 966	25 692	36 431
Zachodniopomorskie	2113	2941	65 985	90 251	90 256	126 197
Poland	19 732	23 995	363 565	456 789	489 828	636 021

Source: based on IJHARS 2019, 2023

The area of organic farmland in the European Union is 14.7 thousand hectares or 9.1% of the total agricultural area [GUS 2023]. The largest area of organic agricultural land is occupied by cereal crops. The average farm area was 26.2 ha. The largest number of organic farms was located in the Podlaskie, Warmińsko-Mazurskie and Mazowieckie Voivodeships.

In 2021 compared to 2020, in the area of organic livestock production, the production of cow's milk increased significantly and the stock of animals, especially poultry and pigs, increased. In addition, the number of operators preparing organic products increased significantly. Their number in 2021 was 1174 [IJHARS 2023].

In 2019, there were 550 organic farms with a total of 25.94 million liters of milk produced. In 2020, there were 499 farms, but 28.81 million liters of milk were produced.

The farms selected for the study, in addition to their different agricultural production structure, were also characterized by different natural and organizational conditions and production intensity levels. The average agricultural area of the tested organic farms rearing dairy cows was larger than the average agricultural area of a farm in the country. A larger farm area was at the disposal of farmers running farms with a meat production

profile for livestock (43.5 ha on average). The average agricultural area was respectively: 20.5 and 30.8 ha (tab. 2). Arable land occupied 15.0 ha and 24.2 ha, respectively, constituting in the structure of agricultural land of the farms respectively: 73.55% and 78.6%. Grassland in the total farms structure accounted for 26.5% on dairy farms and 21.4% on meat farms. A high share of grassland on cattle farms is also indicated by studies by Harasim and Madej [2008] and Harasim and Włodarczyk [2008]. Farms varied in the number of plots of arable land and grassland they owned.

Table 2. The farm area (ha) and cropping pattern (%) in analyzed farms

Specification	Farms	
	dairy	meat
Farm area (ha)	22.4	43.5
Area of agricultural land (ha)	20.5	30.8
Area of arable land (ha)	15.0	24.2
Area of grassland (ha)	5.4	6.60
Number of plots of arable land	10	15
Number of plots of grassland	8	3
The distance of furthest plot (km)	3.5	1.8
Soil valuation index of arable land (points)	0.86	0.62
Soil valuation index of grasslands (points)	0.43	0.52

Source: author's calculation

The highest suitability for organic production, covering various environmental criteria (including soil, climate, relief, landscape, water relations, pollution), are characterized by the Warmińsko-Mazurskie, Kujawsko-Pomorskie, Lubelskie, Podkarpackie and Pomorskie voivodeships [Krasowicz 2009].

Crop production results depend mainly on a conditions of habitat, agrotechnical and economic-organizational factors, as well as on the specificity of the regions in which they are located [Gołębiowska 2001]. An expression of the organization of crop production in an agricultural holding is the sowing structure, which is at the same time an exponent of natural conditions (soil quality and climate), internal conditions of the holding and those independent of the farmer (prices of agricultural products, prices and availability of means of production, possibilities to sell products, etc.).

Soil quality varied regionally. The higher soil quality index of arable land was characteristic for dairy farms and amounted to 0.86 points, while in meat farms it was 0.62 points. The soil quality index of grassland was at: 0.43 and 0.52. The soil cover index for winter vegetation was: 41.0% and 51.4%. The higher level of the index in meat farms was influenced by the high share of perennial fodder crops and winter cereals in the sowing structure (tab. 2).

Cereal crops accounted for a large share in the sowing structure (on average in dairy farms and meat farms: 34.0% and 30.8%). A group of crops that plays a significant role in the case of farms with animal production are fodder crops [Bojarszczuk 2014]. They supplement the natural fodder resources of farms, which are grasslands. Legumes (12.9%

and 7.6% respectively in cropping pattern) and legume and grass mixtures (12.5% and 18.5% respectively) also accounted for a significant share in the sowing structure. In dairy farms (Lubelskie Voivodeship), clover for silage (20%) accounted for a significant share in the sowing structure, while in meat farms (Podlaskie Voivodeship) grasses on arable land (17.8%). Maize for silage occupied, respectively, 5% and 15% of the sown area of arable land in the studied regions (tab. 3).

Table 3. The cropping pattern (%) and yields of crop (dt ha^{-1}) in the studied farms

Specification	Cropping pattern (%)		Yield (dt ha^{-1})	
	farms			
	dairy	meat	dairy	meat
Winter wheat	5.84	–	35.8	–
Rye	18.3	7.10	28.8	19.5
Triticale	1.57	3.90	30.0	32.0
Oat	5.53	3.62	31.7	15.0
Cereal mixture	2.72	16.2	20.0	30.0
Total cereals	34.0	30.8	–	–
Maize for silage	5.0	15.0	440.0	465.0
Cerela-legume species	12.9	7.20	–	–
Total legume crops	12.9	7.60	–	–
Red clover for green matter	20.0	–	143.0	–
Alfalfa for green matter	–	3.10	–	250.0
Grasses on arable land	2.90	17.8	230	220
Legume-grass mixture	12.5	18.5	240.0	220.0

Source: author's calculations

Data from the Statistics Poland (GUS) and from data on organic farms included in FADN agricultural accounting [Nachtman 2013] show that organic farms generally have low-quality land resources [Komorowska 2017].

Higher yields of most cultivated cereal species were obtained on farms with a dairy type of production. This was due to having better soil quality. Only the cereal mixture yielded higher in farms with a meat type of production.

The number of natural persons per 100 ha of agricultural land and total annual labour input per full-time employee per year (in AWU) on dairy farms (Lubelskie Voivodeship) were higher than on meat farms (Podlaskie Voivodeship), despite the smaller number of animals kept on these organic farms (tab. 4). As the rearing of animals on organic farms should provide them with natural living conditions in terms of feeding, stocking density and housing, including access to open paddocks and pastures [Tyburski and Żakowska-Biemans 2007], the number of animals kept on organic farms is usually lower than on individual farms [Komorowska 2016].

The intensity of the organization of crop production, measured according to Kopeć's method, determined by the percentage of labour- and material-intensive crops in the farm-land structure, was 27% higher on meat farms (tab. 5).

Table 4. The employment in the tested farms

Specification	Farms	
	dairy	meat
Number of people on a farm	5.4	3.0
Employment (number of natural persons per 100 ha UAA)	19.5	11.5
Labour input (100 ha^{-1} UAA)	17.8	6.2
Age of farmers	41.0	50.0
Labour input (AWU)	2.53	1.45

Source: author's calculations

Table 5. The chosen production index of tested farms

Specification	Farms	
	dairy	meat
Agricultural production intensity (points according to Kopeć)	361.4	318.5
Plant production intensity (pts)	119.2	86.1
Animal production intensity (pts)	242.1	232.4
Plant production (cereal units)	449.4	688.1
Plant production (cereal units ha^{-1} UAA)	20.7	22.3
Number of cattle (unit)	15.5	21.3
The cattle density (LU 100 ha^{-1} UAA)	93.1	65.0
Milk production (1 ha^{-1} UAA)	1668.1	–
Production on meat (kg ha^{-1} UAA)	–	130.8
Animal production (cereal units)	410.7	555.8

Source: author's calculations

The intensity of organization of livestock production was higher on organic dairy farms. The intensity of the organization of livestock production, determined on the basis of the level of stocking density of productive animals per unit area, was 232 points and rated at the so-called high lower level.

Total cattle density on dairy and beef farms was respectively: 15.5 and 21.3 LU, and per unit area 93.1 and 65.0 LU per 100 ha UAA. The level of production indices was a derivative of the amount of inputs incurred on agricultural production. As the leading specialization of the analyzed farms was cattle rearing, therefore the indicators for milk and beef livestock production are important in the analysis of these farms. Milk production amounted to 1,668 l per ha of UAA, while beef livestock production was 131 kg per 1 ha of UAA. Livestock production expressed in cereal units per unit area was 411 and 556 livestock units, respectively, on the surveyed farms.

Komorowska's [2016] research shows that organic farms manage a smaller area of farmland and maintain much smaller herds of cows and achieve much lower productivity in milk production compared to individual farms their production performance is lower than other farms.

According to Runowski [2009], organic livestock production was undertaken with a lag compared to organic crop production. Hence also the delay in the development of processing of organic livestock products.

Dairy farms were characterized by a higher crop productivity expressed in cereal units, which amounted to 688 units and was 53% higher than in meat farms. On the other hand, the plant productivity index per unit area was respectively: 20.7 and 22.3 cereal units ha^{-1}.

The basic economic category of farms that determines the efficiency of their management is agricultural income. It represents the charge of the involvement of productive factors in their production processes. Higher agricultural income was obtained by farms with a meat type of production. Organic farms keeping beef cattle achieved a lower level of production performance than dairy farms. Relating the production results of the compared farms to the input of the production factors involved in obtaining them made it possible to calculate the resource productivity of the analyzed groups of farms. Higher economic efficiency of land resources management, i.e. profitability of land resources, was obtained by farms with a dairy type of production (tab. 6).

Table 6. Economic indicators of tested farms

Specification	Farms	
	dairy	meat
Agricultural income (thous. PLN)	107.7	113.9
Income from non-agricultural activities (PLN)	280.0	0.0
Land productivity (PLN ha^{-1})	8.265	7.860
Agricltural income (thous. PLN ha^{-1} UAA)	5.398	3.702
Income from farm (thous. PLN)	154.2	179.4

Source: author's calculations

CONCLUSIONS

1. The analysis showed that the production and economic efficiency of the dairy farms studied depended on the organization of crop and livestock production.

2. The tested farms differed in their organization of crop production, including its basic determinant, i.e. the cropping pattern. Dairy farms were characterized by a higher crop productivity expressed in terms of grain units, which amounted to 688 units and was 53% higher than on farms with livestock production. On the other hand, the crop productivity index per unit area was respectively: 20.7 and 22.3 cereal units ha^{-1}.

3. The intensity of the organization of livestock production, determined on the basis of the level of stocking density of productive animals per unit area, was 232 points and was set at the so-called high lower level.

4. Organic farms keeping beef cattle achieved a lower level of production performance than dairy farms.

5. Greater economic efficiency in the management of land resources, i.e. profitability of land resources, was achieved by farms with a dairy type of production.

6. Although Poland, in terms of the number of organic producers and the area of organic farms, already holds a strong position in the EU organic farming sector, there is still considerable potential for further development of the sector.

7. More difficult and more expensive ecological dairy production has a barrier of lower profitability. The most important barrier is the sales systems and prices that are more expensive than traditional products, which discourages consumers. The prices of ecological products are 84% higher than traditional products. The organic dairy farms achieve lower production levels than conventional farms. However, they have other advantages in terms of sustainability, fertility, and animal longevity. Animal production on organic farms depends on the variables such as: cow numbers, value of fixed assets, value of current assets, long-term debt and short-term debt. Production on organic farms depends on many variables that are common for farms. To achieve stable production, farmers must take into account many factors that are different for each farm.

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