

Assessment of the condition and possibilities of organic production in Poland

Renata Tobiasz-Salach, Barbara Stadnik

College of Natural Sciences, Institute of Agricultural Sciences, Land Management and Environmental Protection,
University of Rzeszów, Zelwerowicza 4, 35-601 Rzeszów, POLAND

Abstract. The article analyses the condition of organic farming in Poland on the basis of the data published by the Agricultural and Food Quality Inspection, the Central Statistical Office and available literature sources. The aim of the study was to assess the condition and prospects for the development of organic production in Poland. The results of the analysis indicate that there is a growing demand for organic products among consumers, which may contribute to the development of organic farming and an increase in the processing of organic products. However, in recent years, a decline in the number of organic farms and the total area of organic farming has been observed. Fodder plants, cereals as well as meadows and pastures are predominant in the structure of crops. Orchards, berries and vegetable cultivation as well as industrial crops are of lesser importance. Poultry, sheep and dairy cattle are predominant in organic livestock farming, whereas goats and cattle intended for meat account for a lower percentage. Among the organic agricultural products milk and dairy products are produced in the greatest quantities.

Keywords: organic production, demand and supply for organic products

INTRODUCTION

The definition of organic farming in Poland is provided by the Regulation of the European Community Council No. 834/2007 of June 28, 2007 on organic production and labelling of organic products and repealing Regulation (EC) No. 2092/91 (Council Regulation..., 2007). Organic farming is an agricultural production system based on the use of natural processes taking place within the farm. In accordance with this definition, in the cultivation of plants natural and organic fertilizers produced on the farm are applied, and the livestock farming is based on on-farm produced

feeds. Plant protection is based on preventive measures curbing the occurrence of weeds, diseases and pests. The use of permitted chemical plant protection products for direct application is only possible in exceptional circumstances. As a result of the limited possibilities of human interference in organic farming, the harvest is reported to be approx. 35% lower compared to conventional crops and therefore, more land is needed to produce the same quantity of agricultural crops (Kirchmann, 2019). However, the decline in crop yield is compensated by a lower negative impact on the natural environment and slightly higher prices of organic products. For example, a study conducted by Swiss scientists indicated a 40.2% reduction of N₂O emissions per hectare for organic farming compared to non-organic systems (Skinner et al., 2019).

The development of organic farming is the result of changes occurring in the environmental, health, social and economic spheres, especially in the agri-food complex (Kahl et al., 2010). Due to environmental conditions, Poland is considered to be a country with favourable conditions for organic production. Organic farming is one of the sectors of agriculture in which we can successfully compete with other countries and produce high-quality food. This is supported by a relatively clean environment, unpolluted soils and the agrarian structure of agriculture (Szymona, 2012). Polish agriculture has all the conditions to become a significant producer and exporter of organic food. However, in order to achieve this, the support of an appropriate agricultural policy is required (Drabarczyk, Wrzesińska-Kowal, 2015; Komorowska, 2015).

The aim of the study was to assess the condition and prospects for the development of organic plant and livestock production in Poland. The basic material for the analyses was statistical data published in the reports of the Agricultural and Food Quality Inspection (IJHARS), the Statistics Poland and information contained in the scientific literature. The subject of the analysis during the years 2004–2018 were individual farms employing organic agri-

Corresponding author:
Barbara Stadnik
e-mail: bajda1493@gmail.com,
phone +48 791476723

cultural production methods (which received a certificate granted by a certification body or were in the process of being converted to organic production methods under the control of a certification body). Changes in organic plant and livestock production as well as the processing volume and types of organic products were also analysed.

FOUNDATIONS FOR THE DEVELOPMENT OF ORGANIC FARMING

Organic farming in Poland began to develop after 2000, when subsidies for this production were introduced, and the accession of Poland to the European Union intensified this process. The number of organic farms started to grow systematically since 2003, and at the same time the area of organic farming also increased (IJHARS, 2019). Currently, most organic farms are located in the south-east of Poland (Golinowska, Adamska, 2014). The development of organic farming in Poland is not only the result of subsidies granted to agricultural producers, but also the growing social demand for eco-products (Cichocka, Grabiński, 2009; Piwowar, 2014). The increase in demand results from the fact that consumers are more and more aware of the positive impact of food on health (Szarek, Nowogródzka, 2015). Year by year, organic food enjoys increasing popularity. This is perceived as an opportunity to increase and diversify the range of organic products, which may also contribute to reducing their prices. This may encourage Polish consumers to purchase this type of food more frequently (Kowalska, 2015). An important element influencing the consumers' interest in organic food is appropriate organization of the supply chain. Consumers who are interested in healthy and safe food often live in major urban agglomerations and therefore, it is important that these products are available in the shops which are frequently visited by them (Piwowar, 2011; Kowalska, 2015).

The basic legal act regulating the principles of organic production in Poland is the Act of June 25, 2009 on organic farming (Ustawa z dnia 25 czerwca 2009 r. o rolnictwie ekologicznym), which defines the tasks and competence of public administration bodies and organizational units in organic farming in the scope of implementing the provisions of Council Regulation No 834/2007 (Council Regulation..., 2007) and European Union regulations issued pursuant to the provisions of the regulation (<https://www.gov.pl/web/rolnictwo>). All legal instruments provided in the abovementioned normative acts intend to guarantee the consumer that food products on the market have been produced in accordance with the applicable regulations on organic farming and are free from contamination, such as residues of plant protection products (pesticides) and hormones, and no artificial fertilizers or genetically modified organisms were used during their production (Szarek, Nowogródzka, 2015; Olkiewicz, 2017).

In individual regions of Poland there is a wide variation in the number of farms and area of utilised agricultural land. This is mainly due to the natural conditions occurring in a given region. It is also important that organic farming is developing dynamically in the regions of Poland characterized by particular abundance of environmental resources, which are under protection of the system of legally protected areas (Makowska et al., 2015). Organic farming is actually recommended in those areas (Bera, 2014).

Organic food market in Poland is constantly developing. The increase of the share of organic food products results from the fact that consumers are interested in buying good quality food and such purchase does not constitute a financial barrier for them. The purchase of food produced using conventional methods is often associated with negative impact of high-input agriculture on the natural environment and food contamination by plant protection products (pesticides). Consumers are aware that organic products do not contain residues of agricultural chemicals used in cultivation and that these raw materials processed to a minimal extent (Szarek, Nowogródzka, 2015). The demand for organic products exhibits a growth tendency, which is mainly observed in big cities. Unfortunately, the considerable structural fragmentation of farms in Poland causes difficulties in managing production and sales market supply (Smoluk-Sikorska, Łuczka-Bakuła, 2014). In our country, there is a low level of concentration in agricultural raw materials supply, as well as its low adaptation to the needs of the processing sector. Therefore, it is important to take measures aimed at creating links and establishing cooperation between producers. Better organisation of this sector, which will enable its potential to be used, is also indispensable (Golik, Żmija, 2017; Jezierska-Thöle, Biczkowski, 2017). According to organic farms owners, positive external and internal elements related to organic farming should be used and strengthened, such as the increasing demand for food produced from organic raw materials, which may be related to the increased awareness of the society, furnishing an opportunity to extend operations and production. Internal limiting factors are, above all, lower crop yields and livestock production compared to conventional production, higher labour inputs and production costs, and lower market penetration power (Pawlewicz et al., 2010).

ORGANIC PRODUCERS AND ORGANIC AGRICULTURAL AREAS IN 2004–2018

From 2004 to 2013, a dynamic increase in the number of organic farms in Poland was observed. During this period, the number of organic producers increased over 7-fold, from 3,760 in 2004 to 27,093 in 2013 (Fig. 1). In the following years, a gradual decrease in the number of farms was recorded due to the reduction of EU subsidies for or-

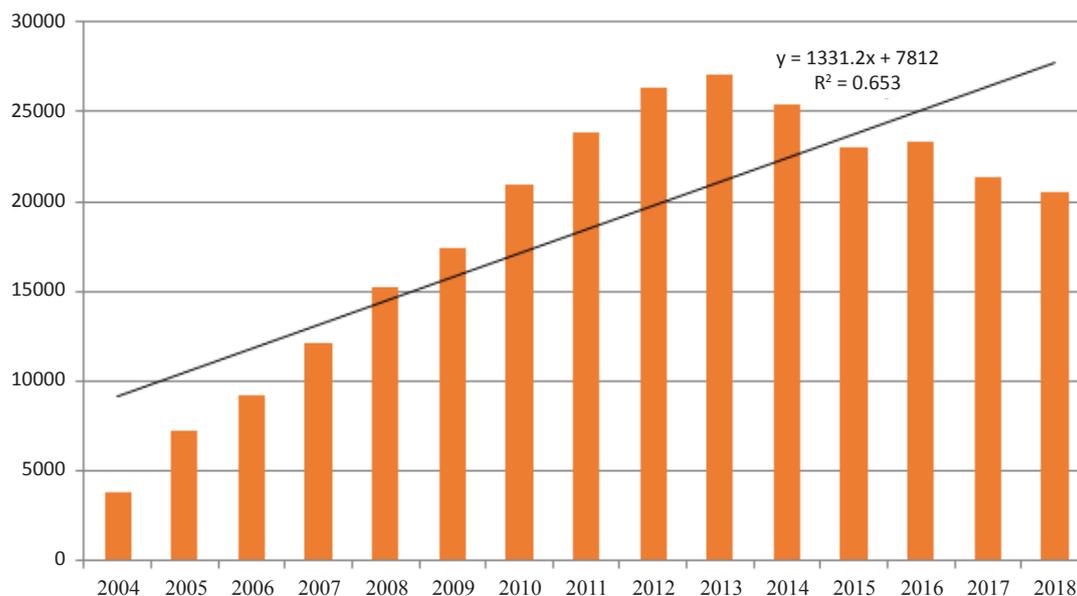


Figure 1. Number of organic producers in Poland in 2004–2018 (IJHARS, 2019).

ganic production, which determined production profitability on many farms (Jeziarska-Thöle, Biczkowski, 2017).

According to reports presented by IJHARS the number of organic producers in Poland was 21,400 in 2017 and 20,549 in 2018, respectively. In 2017, the number of organic producers decreased by 8.4% compared to 2016, and in 2018 by 4.0% compared to 2017. The multiple regression model was adapted to empirical data in 65% (Fig. 1).

The most numerous groups of organic producers were agricultural producers – 19,207 people (i.e., 93.5% of all organic producers). The remaining ones were active in organic products preparation (910 entities) and launching organic products on the market, excluding the ones imported from third countries (933 producers), and launching organic products imported from third countries on the market (208 producers). 181 producers were involved in the supply of certified seed and vegetative propagating material, whereas 41 and 27 producers, dealt with foraging for naturally grown food and with beekeeping, respectively. The lowest number of producers was engaged in aquaculture and/or seaweed growing operations – 7 entities (IJHARS, 2019).

In 2017, the area of agricultural land which was used for organic production accounted for approximately 3.7% of all agricultural land in Poland (no change in relation to the state in 2016), but in 2018 this share was approximately 3.3% (0.4percentage points less than in 2016 and 2017) (IJHARS, 2019). At the end of 2017, in Europe, this indicator was at the level of 2.9%, while in the European Union it reached 7.2%. Presently, Spain, Italy, and France possess the largest areas of organic farming (IFOAM, 2020).

The area of organic agricultural land in Poland changed together with the number of organic producers, (Fig. 2). From 2004 to 2013, a rise in ecologically utilised agricultural areas was observed. In comparison to 2004, the area of organic farming in 2006 increased by over 145 000 hectares, which gives an increase of 176%. The growth peaked in 2013. In the following years, the area of organic agricultural land decreased. In 2017, it was 494,978 ha, while in 2018 it decreased to 484,676 ha. The empirical data fit reached 59.7% (Fig. 2). The growth in the number of organic farms and the area of organic agricultural land, as well as the nature of production clearly indicate that the main determinant of the organic farming development in Poland is the level of financial support under the Common Agricultural Policy implemented in the Rural Development Programme called PROW (Brodzińska, 2014), currently in the 2014–2020 edition.

According to the IJHARS report from 2019 on organic production in 2017–2018, the farms pursuing only plant production prevail in our country. Their percentage share in the total number of farms was over 88%. In those years, slightly more than 11% of farms conducted only organic production, with regard to both plants and animals. In contrast, many organic farms also carry out conventional farming and traditional livestock husbandry. Their share in the total number of organic farms in recent years is estimated at over 50% (IJHARS, 2019). It is presumed that conducting organic and conventional production by farmers may stem from the wish to make farm's income independent from one type of production so as to have financial security in the event that one of the sectors – organic or convention-

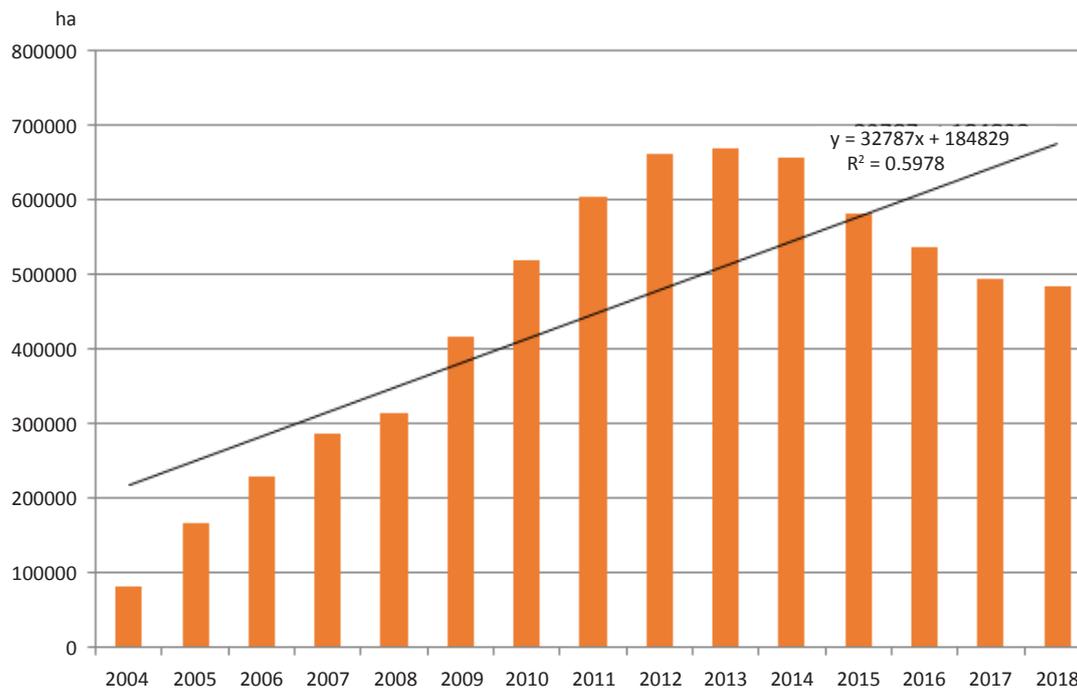


Figure 2. Agricultural area under organic farming in Poland in 2004–2018 (IJHARS 2019).

al production – does not generate the expected income in a given year. Furthermore, the farmers who choose organic farming (regarding it as an opportunity for gaining profit) do not give up conventional crops, as in the case of the latter, it is easier for them to predict the size of the yield and profits from the production on the farm.

STRUCTURE OF ORGANIC AGRICULTURAL LAND AND ITS DETERMINANTS

In Europe, the main categories of organic farming are arable land (48.1%) and permanent pastures (39.7%). Arable land is mainly used for the cultivation of cereals and green fodder (IFOAM, 2020). Similarly, in Poland, the main organic crops are plants intended for fodders, cereals, meadows and pastures. Vegetables, fruit and berry plants account for a much smaller proportion of crops (Fig. 3). It is most likely that the low proportion of fruit and vegetables in organic production is caused by difficulties in the selection and number of plant protection treatments (high cost and time-consuming treatments), and therefore obtaining a yield at a level that would secure production profitability.

While analysing the structure of crops from 2009 to 2013, a significant increase was noted in the area of organic plants intended for fodder. In 2013, in the structure of organic agricultural land, the plants intended for fodder covered over 35% of the area. In 2009, meadows and pastures accounted for over 45% of all organic crops. In

the following years, this proportion declined considerably. Compared to 2009, in 2018 the share of meadows and pastures decreased by 25 percentage points (Fig. 3).

While analysing the share of cereals on organic farms in the total area of organic farming in 2016–2018, a rise of 4.7% was reported compared to 2009–2015. Their percentage share accounted for more than 27% (Fig. 3). The growth in the production of organic cereal grains is a response to the growing consumer interest in organic cereal products. Flour, groats or cereal flakes obtained from organically produced grain are products which are increasingly often used in the modern society. The quantity of organic cereals subjected to milling increases every year and it currently amounts to over 14,000 tonnes (IJHARS, 2019). The demand for organic cereal products is caused by the fact that it has been proved that bakery products, as well as other products produced on the basis of organic cereals are characterized by a lower content of nitrates, nitrites and pesticides. On the other hand, the content of such ingredients as vitamins (group B), carbohydrates and valuable proteins is higher (Staniak, 2014). Organic cereal grain is gaining popularity thanks to its nutritional and health-promoting properties.

Regardless of the greater workload and problems with plant protection, the agricultural land intended for organic vegetables exhibited an upward trend until 2016 (Fig. 3). On the other hand, the share of industrial crops in the structure of organic farms is over four times lower than in conventional farms (GUS, 2019). This results from the

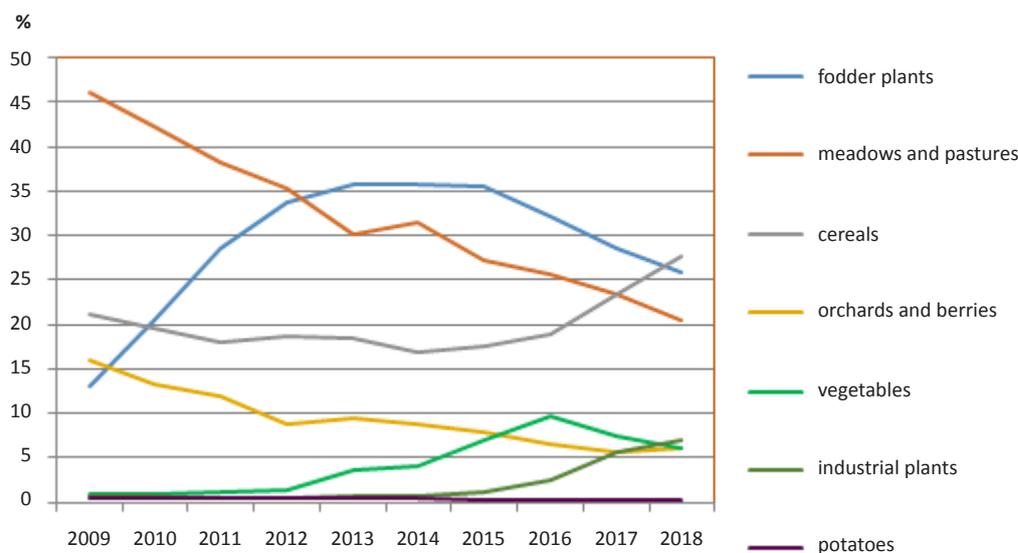


Figure 3. The structure of the area under organic farming in 2009–2018 (own elaboration based on IJHARS 2010–2019).

fact that processing plants are not interested in organic raw materials. The main industrial crops in Poland are sugar beet and rapeseed. There are no sugar mills producing organic sugar in our country. However, rapeseed is rarely cultivated on organic farms due to the difficulties in its protection against pests. The low share of potatoes in the structure of organic farms is mainly caused by the lack of effective methods of reducing and eradicating the potato beetle (*Leptinotarsa decemlineata*) and potato blight (*Phytophthora infestans*) (Szymona, 2012).

While analysing the scale of fruit and vegetable processing in 2009–2018, we may note two clear increases in the production size in 2015 and 2016 (Fig. 4). Compared to 2014, when fruit and vegetable processing was at the level of less than 400,000 tonnes, in 2015 the size of this industry increased threefold and reached over 1,200,000 tonnes. In 2016, we may note another high increase in the production of processed organic fruit and vegetables, which amounted to almost 4,000,000 tonnes. Between 2016 and 2017, there was a significant drop – below 1,000,000 tonnes (Fig. 4). The scale of organic processing of fruit and vegetables depends on the crop area and harvest of fruit and vegetables in particular years. In 2016, the harvest increased by approx. 26.3% compared to 2015; while in 2017 and 2018 it decreased by approx. 15.7% compared to the previous years. The decrease in the production of organic fruit and vegetables has led to the reduction in their processing (IJHARS, 2019). Increasing the area under organic fruit and vegetables as well as increasing their processing would provide an opportunity for the development of organic farming as these products are most often sought after by the consumers interested in organic goods (IFOAM, 2020). A greater share of organic fruit and vegetable cultivation would sup-

port the growth of smaller farm businesses and possibly improve the use of the labour force in Polish agriculture (Komorowska, 2015; Szarek, Nowogródzka, 2015).

ORGANIC LIVESTOCK PRODUCTION

Organic production does not refer only to plants but also to animals. The major species of organically raised livestock is poultry (mainly laying hens and broilers). Sheep and cattle (dairy cows and beef cattle) constitute a smaller percentage (Fig 5). The number of organically raised laying hens has been steadily increasing over the years 2015–2018. This proves that organic eggs are very popular among consumers. In 2018 the number of laying hens kept on organic farms increased by as much as 52% compared to 2017 (Fig. 5). Compared to conventionally produced eggs, organic eggs have, among other advantages, a better ratio of omega-3 to omega-6 fatty acids in the yolk and greater shell resistance to damage during production and sale. This resistance does not decrease with hen age, unlike in intensive rearing (Sokołowicz et al., 2012). These features have a positive effect on the quality of the product and the profitability of production.

Over the years 2015–2018, there was a large decline in organic pork, beef and lamb production. Compared to 2015, 2018 saw a decrease in the number of beef cattle (by 18.13%), pigs (by 48.9%) and sheep (by 36.93%). The number of organically raised goats remained constant during the period – over 3,000 heads (Fig. 5).

According to the research conducted by Kosicka-Gębska et al. (2017), the contemporary consumers pay attention not only to the appearance, quality and price of meat, but also to the place and type of livestock rearing. In

Poland, the overall consumption of beef is low; mainly due to cultural reasons and tradition (Wojnar, Kasprzyk 2014). Hence the low number of organically raised beef cattle (Fig. 5). The development of the organic beef sector is limited. This is due to low profitability, poor sales and the poor development of the domestic processing sector (Walczak, Pomykała, 2014).

Consumers more often buy poultry as it is relatively quick and easy to prepare, has high nutritional value and low-fat content (Augustyńska-Prejsnar et al., 2018). Therefore, for organic farming, increasing organic broiler production is an opportunity for growth.

The analysis of the selected branches of organic livestock production has shown that milk and eggs are the most manufactured animal products. The production of organic

cow's milk remains constant at approx. 250,000 hectolitres (Fig. 6). The most milk was produced in 2011 – almost 400,000 hectolitres. Since 2013, the production has been fluctuating around 250,000 hectolitres (Fig. 5). This branch has a chance to develop in the conditions of the Polish farming, mainly in the areas with a high share of grasslands. However, this largely depends on the access to dairies processing organic milk and obtaining higher sales prices as compared to conventional milk (Koperska, 2014).

According to IJHARS (2019) data, the scale of milk processing and cheese production in Poland had also increased, from slightly over 900 tons in 2013 to 196,090 tons in 2018. On the other hand, the processing volume of meat and fish was small and amounted to slightly over 2,000 tons (IJHARS, 2014-2019).

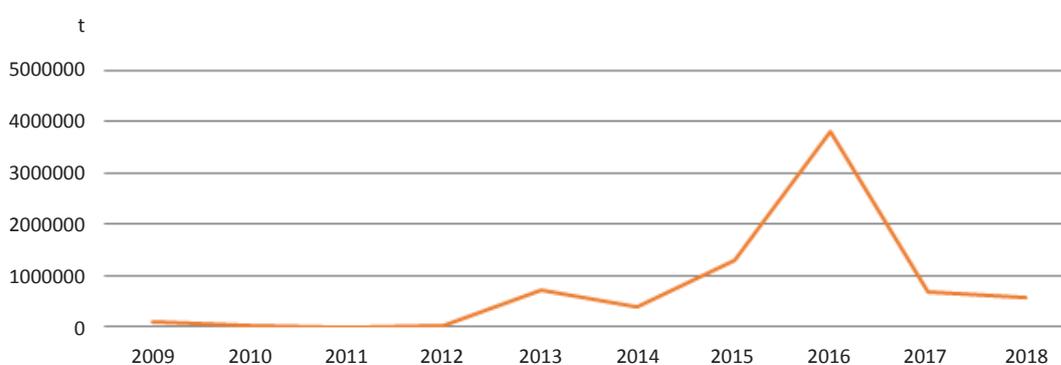


Figure 4. Processing of organic fruit and vegetables in 2009–2018 (own elaboration based on IJHARS 2010-2019).

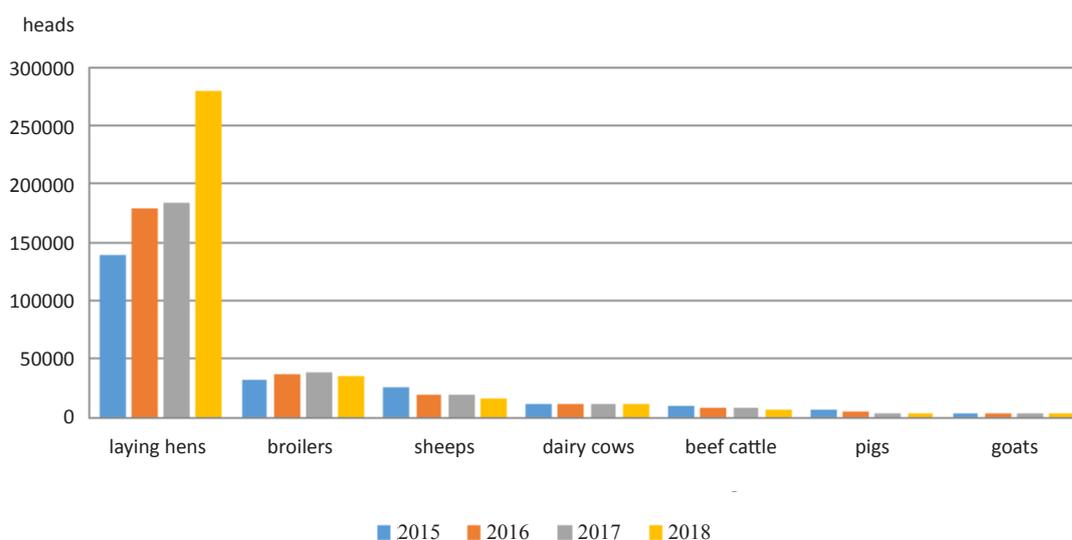


Figure 5. Organic livestock in 2015–2018 (as of day of control CB) (own elaboration based on IJHARS 2016-2019).

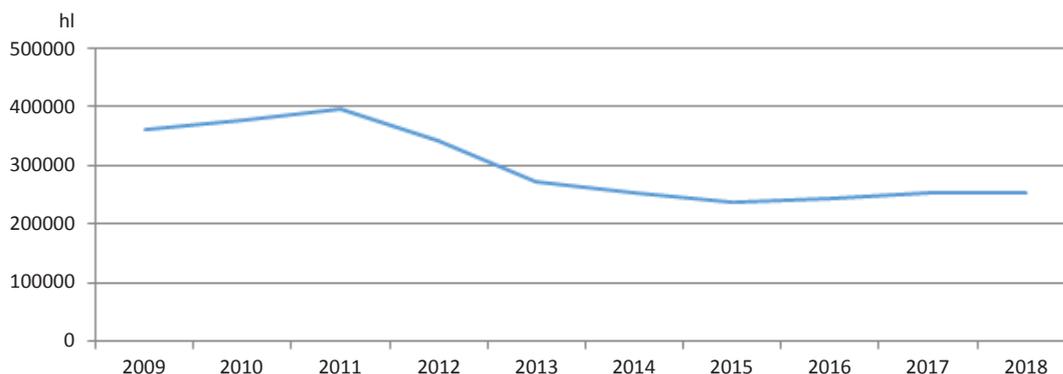


Figure 6. Production of organic cow's milk in 2009-2018 (own elaboration based on IJHARS).

SUMMARY

Recent trends show a decline in the number of organic farms and decrease in the total area covered by organic farming. Apart from organic farming, many farms also operate conventional production and livestock rearing. This is due to the lack of sufficient income from organic production. The farming area is dominated by fodder plants, cereals as well as meadows and pastures. Orchards, berries and vegetable cultivation as well as industrial crops are of lesser importance. There is also a decline in the processing of organic fruit and vegetables, even though the demand for organic products keeps growing, which is observed mainly in large cities. Organic livestock rearing is dominated by poultry (mainly laying hens), sheep and dairy cattle, while goats and beef cattle accounts for a smaller percentage. The organic products of animal origin whose production volume is the highest are dairy products and eggs. The research indicates that the Polish agricultural sector has all the necessary conditions to become a significant producer and exporter of organic food. However, it requires support from appropriately designed national and EU agricultural policies. In Poland, there is a low level of concentration in the supply of agricultural raw materials and it is poorly adjusted to the needs of the processing industry. Therefore, it is important to undertake measures aimed at creating links and establishing cooperation between producers and consumers of organic food.

REFERENCES

- Augustyńska-Prejsnar A., Ormian M., Sokolowicz Z., 2018.** Characteristics that affect the quality of poultry meat. *Postępy Techniki Przetwórstwa Spożywczego*, 2: 90-96. (in Polish + summary in English)
- Bera M., 2014.** Ecological farming in protected areas as a factor in local development. *Progress in Economic Sciences*, 1: 121-129, doi: 10.14595/PIES/01/009. (in Polish + summary in English)
- Brodzińska K., 2014.** Organic farming - trends and directions of changes. *Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego w Warszawie, Problemy Rolnictwa Światowego*, 14(3): 27-36. (in Polish + summary in English)
- Cichocka I., Grabiński T., 2009.** Psychographic – motivating profile of the Polish consumer of eco-food. *Żywność, Nauka, Technologia, Jakość*, 5(66): 107-118. (in Polish + summary in English)
- Drabarczyk K., Wrzeńska-Kowal J., 2015.** The development of organic farming in Poland. *Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego. Ekonomika i Organizacja Gospodarki Żywnościowej*, 111: 19-31, doi: 10.22630/eiogz.2015.111.31. (in Polish + summary in English)
- Golinowska M., Adamska H., 2014.** Support for organic farming in Poland after 2004. *Journal of Agribusiness and Rural Development*, 1(31): 31-41. (in Polish + summary in English)
- IJHARS 2005. *Rolnictwo ekologiczne w Polsce w 2004 r.* Warszawa.
- IJHARS 2007. *Raport o stanie rolnictwa ekologicznego w Polsce w latach 2005-2006.* Warszawa.
- IJHARS 2009. *Rolnictwo ekologiczne w Polsce. Raport 2007-2008.* Warszawa.
- IJHARS, 2011. *Raport o stanie rolnictwa ekologicznego w Polsce w latach 2009-2010.* Warszawa
- IJHARS, 2013. *Raport o stanie rolnictwa ekologicznego w Polsce w latach 2011-2012.* Warszawa.
- IJHARS, 2015. *Condition of organic farming in Poland. The report 2013–2014.* Warszawa. (in Polish)
- IJHARS, 2017. *The report on organic farming in Poland in 2015–2016.* Warszawa. (in Polish)
- IJHARS, 2019. *The report on organic farming in Poland in 2017–2018.* Warszawa. (in Polish)
- Golik D., Żmija D., 2017.** Organic farming and the prospects for its development in Poland in the light of the European Union's experience. *Zeszyty Naukowe Uniwersytetu Ekonomicznego w Krakowie*, 1(961): 117-129, doi: 10.15678/znuek.2017.0961.0108.
- GUS, 2019. *Statistical Yearbook of Agriculture, 2018.* Warszawa.

- IFOAM** – Organics International, Research Institute of Organic Agriculture FiBL, 2020. The world of organic agriculture. Statistics and emerging trends 2020.
- Jezierska-Thöle A., Biczowski M., 2017.** Financial funds from European Union funds as a chance for the development of the sector of organic farms in Poland. *Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu*, 19(2): 95-101, doi: 10.5604/01.3001.0010.1166.
- Kahl J., Van den Burgt G.J., Kusche D., Bügel S., Busscher N., Hallmann E., Kretzschmar U., Ploeger A., Rembi-alkowska E., 2010.** Organic food claims in Europe. *Food Technology*, (3.10): 38-46.
- Kirchmann H., 2019.** Why organic farming is not the way forward. *Sage Journals. Outlook on Agriculture*, 48(1): 22-27, doi: 10.1177/0030727019831702.
- Komorowska D., 2015.** Importance of organic farming in Poland. *Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu.*, 17(2): 119-126. (in Polish + summary in English)
- Koperska N., 2014.** Market and marketing of organic milk products in Poland and level of meet consumer's expectations. *Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego, Polityki Europejskie, Finanse i Marketing*, 11(60): 90-103. (in Polish + summary in English)
- Kosicka-Gębska M., Gębski J., Kwiecińska K., Jeznach M., Tul-Krzyszczuk A. 2017.** Contemporary trends in meat consumption. *Przemysł Spożywczy*, 1(3): 8-12, doi: 10.15199/65.2017.3.2. (in Polish + summary in English)
- Kowalska A., 2015.** Organic farming as a development factor of sustainable consumption. *Journal of Agribusiness and Rural Development*, 3(37): 467-476. (in Polish + summary in English)
- Makowska M., Gotkiewicz W., Pawlewicz A., 2015.** Organic agriculture in spatial and environmental terms in Poland. *Stowarzyszenie Ekonomistów Rolnictwa i Agrobiznesu Roczniki Naukowe*, 17(4): 160-165. (in Polish + summary in English)
- Olkiewicz A., 2017.** Legal conditions of organic farming in Poland. *Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu*, 19(4): 148-153, doi: 10.5604/15083535. (in Polish + summary in English)
- Pawlewicz A., Kaczmarczyk T., Oczyńska S., 2010.** Chances and the barriers of functioning of ecological agriculture in opinion of owners of ecological farms. *Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego w Warszawie. Ekonomika i Organizacja Gospodarki Żywnościowej*, 85: 81-85. (in Polish + summary in English)
- Piwowar A., 2011.** Spatial variability in development of organic farming in Poland. *Ekonomický rozvoj a management region. Univerzita Hradec Kralove, Hradecké Ekonomické Dny, Gaudeamus Hradec Kralove*, 1: 233-238.
- Piwowar A., 2014.** Spatial variability in development of organic farming in Poland in 2004-2012. *Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu*, 16(2): 217-222. (in Polish + summary in English)
- Sokolowicz Z., Krawczyk J., Herbut E., 2012.** Quality of eggs from organically reared laying hens during their first and second year of production. *Żywność. Nauka. Technologia. Jakość*, 4(83): 185-194. (in Polish + summary in English)
- Skinner C., Gattinger A., Krauss M., Krause H-M., Mayer J., van der Heijden M. G. A., Mäder P., 2019.** The impact of long-term organic farming on soil-derived greenhouse gas emissions. *Scientific Reports*, 9(1): 1702, doi: 10.1038/s41598-018-38207-w.
- Smoluk-Sikorska J., Łuczka-Bakuła W., 2014.** Uwarunkowania handlu detalicznego żywnością ekologiczną. *Difin*, ISBN: 978-83-7930-332-8, 174 pp.
- Staniak S., 2014.** Characteristics of food produced in organic farming. *Polish Journal of Agronomy*, 19: 25-35, doi: 10.26114/pja.iung.214.2014.19.04.
- Szarek S., Nowogródzka T., 2015.** Regional differences in development of organic farming in Poland. *Journal of Agribusiness and Rural Development*, 1(35): 125-135. (in Polish + summary in English)
- Szymona J., 2012.** Organic production problems on the example of some farm. *Fragmenta Agronomica*, 29(1): 134-139. (in Polish + summary in English)
- Walczak J., Pomykała D., 2014.** National determinants of organic beef farming. *Wiadomości Zootechniczne*, 3: 4-7. (in Polish + summary in English)
- Wojnar J., Kasprzyk B., 2014.** Trends and forecasts of meat consumption in Poland in the years 1989-2016. *Stowarzyszenie Ekonomistów Rolnictwa i Agrobiznesu. Roczniki Naukowe*, 16(4): 335-340. (in Polish + summary in English)
- Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) No 2092/91 [Rozporządzenie Rady (WE) nr 834/2007 z dnia 28 czerwca 2007 r. w sprawie produkcji ekologicznej i znakowania produktów ekologicznych i uchylające rozporządzenie (EWG) nr 2092/91 (Dz.Ur.z.UE, L 189/1 z 20.07.2007 r.)].
- Ustawa z dnia 25 czerwca 2009 r. o rolnictwie ekologicznym (Dz.U. 2009, nr 116, poz. 975).
<https://www.gov.pl/web/rolnictwo> (accessed 28.08.2020).

Author	ORCID
Renata Tobiasz-Salach	0000-0002-9894-4012
Barbara Stadnik	0000-0002-9408-9733

received – 8 October 2020
revised – 20 December 2020
accepted – 9 April 2021



This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution-ShareAlike (CC BY-SA) license (<http://creativecommons.org/licenses/by/4.0/>).