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Efficiency of Polish Organic and Conventional Farms – Pilot Study Results

Keywords: organic farms; conventional farms; efficiency; DEA; motives; barriers

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Abstract

Theoretical background: Organic farming is still a niche in Polish agriculture (but not only in Polish agriculture). According to Eurostat data, in 2020 only 2.7% of agricultural land (utilized agricultural area excluding kitchen gardens) was fully converted to organic farming. Efficiency is one of the most important issues when considering organic activities. Research often shows higher efficiency among conventional farms compared to organic, which may explain the limited interest among farmers in organic activities. The article addresses the problem of low interest in organic activities in Poland and contains the results of a pilot study conducted in 2023.

Purpose of the article: The article aims to assess and compare the economic efficiency of conventional and organic individual farms, as well as to characterize the basic motives and barriers to the conversion of conventional agricultural activities to organic ones on Polish farms from three voivodeships: Warmian-Masurian, Masovian and Lublin.

Research methods: The achievement of the goal formulated at the beginning of the article was possible by surveying a sample of farms that provided their accounting data through the Polish FADN (Farm Accountancy Data Network). Survey in the form of CATI was conducted in 2023 on a total sample of 55 farms (27 entities conducting certified organic activity and 28 entities conducting conventional activity). Financial data were obtained from individual reports provided by FADN. The efficiency of farms was assessed using

DEA (Data Envelopment Analysis). The DEA input-oriented model was applied and it used total revenue as output, and agriculture area, total cost, and fixed assets as inputs.
Main findings: The analysis showed, first of all, differences between organic and conventional farms. It turns out that in the tested sample, organic farms are more effective than conventional entities. The most important motives for the surveyed farmers are economic ones, including higher subsidies than in the case of conventional activity and sales at higher prices. Before deciding to change their activity to organic farming, Polish farmers were afraid of low yields and high labor inputs. Importantly, the majority of conventional farmers are concerned about low yields.

Introduction

The demand for organic food is growing every year. In Poland, retail sales of organic food reached EUR 314.12 million in 2021 (FiBL, 2021). This is influenced by ongoing climate change and increasing consumer awareness. When purchasing organic products, Poles pay attention to health issues and the lack of harmful substances in these products (Wojciechowska-Solis & Soroka, 2017). Polish consumers (at least some of them) want to eat properly and believe that organic vegetables are healthier (Mazur-Włodarczyk & Gruszecka-Kosowska, 2022). However, education still plays the most important role (Polat, 2015) and people should never stop at what they have done so far. Moreover, the rate of vegetable consumption depends – unfortunately – on social status (Mazur-Włodarczyk & Gruszecka-Kosowska, 2022). Organic food is much more expensive than traditional products, and this is an insurmountable barrier for the majority of society.

Polish agriculture has the potential and opportunity to meet the growing demand for organic food. However, if actions to encourage and support Polish organic farming are not taken immediately, Poland may lose this potential, and importing food from abroad may turn out to be expensive due to its deficit (Baraniak, 2022). Organic farming is still a niche in Polish agriculture (but not only in Polish agriculture). According to Eurostat data, in 2020 only 2.7% of agricultural land (utilized agricultural area excluding kitchen gardens) was fully converted to organic farming (Eurostat, 2023). For comparison, in the Czech Republic, it was 14.3%, and the highest percentage was in Sweden – 18.9%.

The article addresses the problem of low interest in organic activities in Poland and contains the results of a pilot study conducted in 2023. The aim of the study includes, among others:

– checking the correctness and eliminating defects in the research procedure, including selection of the surveyed farms or the methods, research and statistical tools used, and

– checking the suitability and correctness of the constructed interview questionnaire in terms of understanding the questions contained therein and the attached instructions for completing it, as well as checking the empirical validity of the adopted assumptions.

The article aims to assess and compare the economic efficiency of conventional and organic individual farms, as well as to characterize the basic motives and barriers to the conversion of conventional agricultural activities to organic ones on Polish farms from three voivodeships: Warmian-Masurian, Masovian and Lublin.

The rest of the paper will proceed as follows: the first part presents a review of the literature on the efficiency, motives and barriers to conversion of agricultural activity to organic one. Then, the research methods and statistical tools used in the conducted analysis are demonstrated. The next section presents the results of the conducted research. The results of the research and the literature review were juxtaposed in the "Discussion" section. The article ends with "Conclusions", containing a summary of the conducted analysis as well as recommendations and premises for further research.

Literature review

The basic problem of Polish agriculture is its severe fragmentation, which results in low efficiency and loss of productivity (Blaikie & Sadeque, 2000; Rahman & Rahman, 2009; Wan & Cheng, 2001). In Poland, farms with an area of up to 5 ha still dominate, which constitutes over 50% of all farms (Statistics Poland, 2022). Additionally, small farms that diversify crops are characterized by lower land productivity and profitability than entities focused on a single production profile (Kurdyś-Kujawska et al., 2021). Poland is among the countries whose land fragmentation (LF) indicators are extremely unfavorable (Hartvigsen, 2014). Unfortunately, the high level of fragmentation favors the phenomenon of deagrarianization, which most often occurs in the subregions of south-eastern Poland (Stanny et al., 2018; Wojewodzic, 2014). One solution to this problem is land consolidation, which increases economic efficiency by reducing labor and production costs (Heinrichs et al., 2021; Hiironen & Riekkinen, 2016), and thus influences the growth of income (Demetriou et al., 2012). However, the land consolidation procedure in Poland is long, expensive, and requires mandatory land development after combining the plots (Janus & Markuszewska, 2017). Additionally, Polish farmers have a strong emotional attachment to land that may have been in the family's possession for many generations (van Dijk, 2004). For this reason, land consolidation may be an action that arouses greater public opposition than in Western European countries. Sometimes land consolidation may simply be impossible due to unfavorable topography (Wojewodzic et al., 2021; Wollni & Andersson, 2014). Another solution to the unfavorable agrarian structure of Polish agriculture may be the conversion of conventional production into organic agricultural activity. Higher production profitability and increased profitability may encourage farmers to convert their activities (Łuczka & Kalinowski, 2020; Vasile et al., 2015). Additionally, the quality of production is increased (Koesling et al., 2008), which, concerning the growing demand for organic products (Jensen et al., 2011;

Wier et al., 2008), may result in higher profitability than in the case of conventional production. Moreover, Polish agriculture has an advantage over most EU countries in terms of natural features of agricultural production: less contaminated soils, lower use of mineral fertilizers and pesticides, dominance of natural technologies, greater biological diversity of agricultural space (Zalewa, 2015).

Efficiency is one of the most important issues when considering organic activities. Research often shows higher efficiency among conventional farms compared to organic ones (Aldanondo-Ochoa et al., 2014; Badgley et al., 2007; Baer-Nawrocka & Błocisz, 2018; de Ponti et al., 2012; Pimentel & Burgess, 2014), which may explain the limited interest among farmers in organic activities. However, organic farming is more environmentally efficient (Aldanondo-Ochoa et al., 2014). Therefore, conventional and organic farming complement each other: the former meets the demand for basic food through economies of scale, whereas the latter brings environmental benefits. Organic farming may also become an opportunity for farms that operate in unfavorable conditions, which makes conventional farming difficult and economically unprofitable (Baer-Nawrocka & Błocisz, 2018).

Efficiency measurement on farms can be performed using an index (Baer-Nawrocka & Błocisz, 2018) or multiple regression (Bórawski et al., 2015). However, it is most often performed by means of the DEA method (Aldanondo-Ochoa et al., 2014; Alkahtani & Elhendy, 2012; Casolani et al., 2021; Oude Lansink et al., 1994; Świtłyk et al., 2021). The efficiency of farms can be examined in the economic, technical, and environmental context (Skarżyńska, 2017). The use of the DEA method involves measuring technical efficiency (Domagała, 2007), defined as the quotient of the weighted sum of outputs to the weighted sum of inputs (Ćwiąkała-Małys & Nowak, 2009).

The output variable in farm efficiency models is farm revenue (Casolani et al., 2021; Świtłyk et al., 2021), quantity index, obtained by dividing the value of output by the output price index (Oude Lansink et al., 1994), total production (Alkahtani & Elhendy, 2012). Input variables are more diverse and depend on the research goal, type of farms, and availability of data.

By examining farmers' preferences regarding the type of activity, the authors analyze the economic (Łuczka & Kalinowski, 2020; Vasile et al., 2015) and environmental (Best, 2010; Blaće et al., 2020; Mzoughi, 2011) motivations for converting to organic activities. Additionally, in their surveys, the authors ask about economic, market, and institutional barriers to organic activity in agriculture (Łuczka & Kalinowski, 2020).

The basic motives for Polish farmers to abandon conventional activities in favor of organic ones are financial benefits. In a study conducted in 2019 on 262 organic farms, farmers most often indicated access to financial support, sales at higher prices, and increased profitability of production as the motives for switching to organic activities (Łuczka & Kalinowski, 2020). Environmental issues were declared by less than half of the respondents. One of the most important barriers to the development of organic activities are a decline in yields. But, some models have already shown that it is possible to produce enough food using organic methods to support the current human population (Badgley et al., 2007).

Other research on the motives and barriers to organic activity was conducted twice (in 2011 and 2019) in two groups of farmers: owners of conventional farms and owners of organic farms (Kociszewski et al., 2020). The latest research (conducted in 2019) shows that some of the most important motives are care for the environment, increasing sales opportunities, and profitability. The most common obstacles for respondents were too high labor costs, low profitability, and too much bureaucracy (in the case of organic farms). Please note that converting to an organic operation and obtaining certification takes time and money. The support of external entities and the certification body is necessary (Miśniakiewicz et al., 2021).

In addition to the motives for changing activities to organic ones, indicated by farmers themselves, some factors may influence such a decision (Chmielinski et al., 2019). Land-related factors owned by the farm are of great importance. The income obtained from the family farm has a positive impact but it does not significantly determine the farmer's decision to convert his business to organic one. Importantly, support for agri-environmental purposes has a positive impact on transformation decisions, but direct payments have a negative impact on this decision. The region in which the farm operates also determines the decision to change the activity (Chmielinski et al., 2019).

Mazurek-Kusiak and colleagues decided to compare the motives and barriers of organic activity of Polish farmers with Hungarian farmers, which was justified by the similar demand for organic products in both countries (Mazurek-Kusiak et al., 2021). The research was conducted from 2017 to 2019 among 400 Polish and 400 Hungarian farmers engaged in organic activities. Respondents stated that the most important motive for organic activity is a convenient location (more important for Poles), subsidies/political support (more important for Poles), the desire to innovate (more important for Poles), the desire to protect the environment (more important for Poles) and the fashion for organic products (more important for Hungarians). It appears that the most significant obstacles were adaptation to EU requirements (more important for Hungarians), the use of special plant protection products (more important for Hungarians), the use of only natural plant protection products (more important for Poles) and low yields (more important for Poles).

One of the most important factors of organic activity in Poland is financial support in the form of EU subsidies (Łuczka & Kalinowski, 2020; Mazurek-Kusiak et al., 2021), and especially support for agri-environmental purposes (Chmielinski et al., 2019). For many farmers, they are even more important than financial factors (Kociszewski et al., 2020; Pejnović et al., 2012; Zrakić et al., 2017). Research has shown that RDP payments are an important factor in the development of organic farms (Casolani et al., 2021; Stolze et al., 2016), and the existence of two tools to support organic farming (to stimulate the conversion from conventional to organic and then to support organic life) seems to be appropriate (Alkahtani & Elhendy, 2012; Casolani et al., 2021). However, taking into consideration the conversion costs and the much lower demand for organic food than for conventional one, it can be concluded that the economic situation of organic farms is, to a greater extent, dependent on subsidies that compensate for lower efficiency (Baer-Nawrocka & Błocisz, 2018). Moreover, in the case of less efficient organic technologies, more restrictive legal regulations may undermine the profitability of farms, thus, minimizing the benefits of organic farming (Aldanondo-Ochoa et al., 2014).

Research methodology

The aims of the article can be achieved by analyzing the financial data of individual farms from individual reports collected by the Polish FADN (Farm Accountancy Data Network), which is the only network that collects sensitive data on farms. Participation in the FADN is voluntary, so farms can resign from keeping the accounts after a year. Failure to continue recording revenues and expenses makes it difficult for researchers to compare and analyze results. The set of agricultural entities keeping the accounts as part of the Polish FADN in 2021 included 11,053 farms of natural persons and 151 farms of legal persons. The total number of 11,204 entities constitutes a statistically representative sample in terms of agricultural type and economic size class, as well as the FADN region for the Polish FADN observation field of 749,305 commercial farms in Poland (Pawłowska-Tyszko et al., 2022). In 2021, only 262 organic farms participated in FADN (Juchniewicz & Zagaja, 2023).

The sample of farms was selected by the Institute of Agricultural and Food Economics – National Research Institute and comes from a survey conducted in the form of CATI[1] in 2023 with a total of 55 farms (27 entities conducting certified organic activities and 28 entities conducting conventional activities). Conducting this type of research was possible thanks to cooperation with Agricultural Advisory Centers (ODR) because only ODR employees have access to data on farms from the Polish FADN sample.

In the part discussing the motives and barriers of ecological activity, a total sample of 55 farms was used. In the part analyzing the efficiency of agricultural farms, this sample was smaller. After eliminating entities that did not consent to the use of their accounting data, the sample consisted of 48 farms (24 entities conducting certified organic activities and 24 entities conducting conventional activities). The sample is dominated by farms engaged in field crops – 54% of organic entities and half of conventional farms respectively (Table 1). A smaller percentage of entities engage in mixed activities (13% conventional and 21% organic), breeding dairy cows (17% conventional and 13% organic), other grazing livestock (13% conventional and 8% organic), other permanent crops (8% conventional and 4% organic).

[1] The research data has been posted in the University of Łódź Repository and is available at http://hdl.handle.net/11089/48022

Table 1. Analyzed individual farms by type of farming (TF8)

Type of farming	conventional		organic	
	number	percentage	number	percentage
Field crops	12	50%	13	54%
Mixed	3	13%	5	21%
Milk	4	17%	3	13%
Other grazing livestock	3	13%	2	8%
Other permanent crops	2	8%	1	4%
Total	24	100%	24	100%

Source: Author's own study based on data of the Polish FADN.

The study included voivodeships with the highest number of organic farms to enable testing the questionnaire on all types and sizes of entities. These voivodeships included: Warmian-Masurian, Lublin, and Masovian. The results of the survey enriched the analysis and helped explain some of the phenomena observed during the efficiency analysis.

The efficiency of agricultural farms was examined using DEA (Data Envelopment Analysis), one of the most important methods for analyzing efficiency in agriculture (Dimara et al., 2005; Reig-Martínez et al., 2011; Moutinho et al., 2018; Casolani et al., 2021). Variables for efficiency analysis using the DEA method were selected based on a literature review.

The DEA input-oriented model was applied and it used total revenue (SE420) as output, and agriculture area (SE025), total cost (SE270), and fixed assets (SE441) as inputs. Efficiency (θ) in the DEA method is relative efficiency because it is constructed concerning the entire group of objects under study. An object in DEA terminology is called a decision-making unit (DMU). Determining the efficiency index for DMU involves solving the DEA model, i.e. an appropriately constructed linear programming task in which the decision variables are weights – multipliers. An object is considered effective if its relative efficiency index is 100%. The remaining units with an indicator lower than 100% are ineffective (Domagała, 2007). It is assumed that the study group includes *n* DMUs. Each object uses *m* the same inputs (albeit in different amounts) and obtains the same outputs (also in different amounts). The efficiency index of the *j*-th decision-making unit is calculated according to the formula (Ćwiąkała-Małys & Nowak, 2009):

$$\theta = \frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=1}^{m} v_i x_{ij}}, \tag{1}$$

where: u_r – the weight for the *r*-th output; v_i – the weight for the *i*-th input; x_{ij} – *i*-th input used by *j*-th decision-making unit; y_{rj} – *r*-th result obtained by the *j*-th unit; wherein: $i = 1, 2, \ldots, m$; $j = 1, 2, \ldots, s$.

The DEA model used in this article is the CCR model assuming constant return-to-scale (CRS) and the BCC model with variable return-to-scale (VRS). In the CCR model, the efficiency measure is not influenced by the size of the unit. In the model assuming constant returns to scale, the relative efficiency of a given unit is the same in the case of output orientation and input orientation.

In the BCC model, which assumes variable returns to scale, three assumptions are made: (1) all observed plans are possible, (2) if a given plan is possible, then any plan that uses more input or produces less output is also possible, (3) a convex combination of existing plans is possible (Ćwiąkała-Małys & Nowak, 2009).

Results

Table 2 presents basic annual statistical measures describing the distribution of the analyzed farms using variables that were used to measure the efficiency of individual farms. The average size of conventional entities is 36.41 ha. Organic farms are characterized by a smaller average farm area, which is 30.02 ha. In the group of conventional entities, the average farm income is PLN 132,347.95 with average costs of PLN 146,877.22 and an average value of fixed assets at PLN 973,909.46. In the case of organic farms, all values are lower, starting with the average income, which is almost twice lower than the average income achieved by conventional entities and amounts to PLN 77,825.17. The average total costs are PLN 101,116.50 and they are only about 30% lower than the costs of conventional entities. Organic farms have assets with an average value of PLN 489,722.29, which is 50% of the average value of assets of conventional entities.

Table 2. Basic annual statistics of variables selected for the model

Year	Variable	Unit	Conventional			Organic		
			mean	*SD*	Me	mean	*SD*	Me
2021	SE420	PLN	132,347.95	180,589.25	67,936.00	77,825.17	59,912.00	59,966.54
	SE025	ha	36.41	47.09	20.66	30.02	38.39	18.32
	SE270	PLN	146,877.22	154,355.55	88,101.00	101,116.50	100,441.53	63,712.50
	SE441	PLN	973,909.46	1,156,828.26	471,530.50	489,971.38	436,722.29	460,176.00

Source: Author's own study based on data of the Polish FADN.

DEA applied to conventional and organic farms in three Polish voivodeships is presented in Table 3. The VRS and CRS columns contain the efficiency index calculated for the model with variable returns to scale and constant returns to scale, respectively. This indicator shows how much less input an effective unit would use to achieve the same level of results as a given unit (Ćwiąkała-Małys & Nowak, 2009). For example, an indicator of 0.76 means that a given unit will be more effective if it achieves its current result (total revenue) by using 24% fewer inputs (agriculture area, total cost, fixed assets) than it actually uses.

The analysis using the VRS model showed that the studied groups of conventional and organic farms have the same number of effective units (9). Interesting results were provided by the DEA analysis in the CRS model, where more effective units (4) are found in the group of organic farms than in the group of conventional farms (2).

The highest average efficiency index in the group of conventional farms for the VRS and CRS models occurs in the Warmian-Masurian Voivodeship (0.83 for VRS and 0.57 for CRS). This region also stands out with the highest average efficiency index for the CRS model in the group of organic farms (0.63). For the VRS model, this is the Lublin Voivodeship (0.86).

Table 3. Efficiency of conventional and organic farms by voivodeships

Conventional				Organic			
Number	Voivodeship	VRS	CRS	Number	Voivodeship	VRS	CRS
1	Warmian-Masurian	1.0000	1.0000	1	Warmian-Masurian	0.9000	0.6504
2	Lublin	0.7595	0.4711	2	Warmian-Masurian	1.0000	1.0000
3	Lublin	0.5310	0.5101	3	Lublin	0.2870	0.3452
4	Warmian-Masurian	0.7475	0.2916	4	Lublin	0.8533	0.7173
5	Warmian-Masurian	1.0000	0.7612	5	Warmian-Masurian	0.9655	0.7371
6	Warmian-Masurian	0.7184	0.6738	6	Warmian-Masurian	1.0000	0.7108
7	Warmian-Masurian	0.3640	0.1908	7	Warmian-Masurian	0.6885	0.4700
8	Lublin	1.0000	1.0000	8	Lublin	0.6165	0.4309
9	Warmian-Masurian	0.9479	0.3711	9	Warmian-Masurian	0.7090	0.4136
10	Warmian-Masurian	1.0000	0.6706	10	Lublin	0.9850	0.5899
11	Lublin	0.9651	0.3952	11	Lublin	1.0000	1.0000
12	Lublin	0.3079	0.3064	12	Lublin	1.0000	1.0000
13	Lublin	1.0000	0.9913	13	Lublin	0.9630	0.2806
14	Lublin	0.8591	0.4872	14	Lublin	1.0000	0.5668
15	Lublin	1.0000	0.5255	15	Lublin	1.0000	0.7016
16	Lublin	0.2587	0.2433	16	Warmian-Masurian	0.4556	0.4307
17	Lublin	1.0000	0.7120	17	Warmian-Masurian	0.7033	0.6471
18	Masovian	0.6339	0.4513	18	Masovian	0.4062	0.3643
19	Masovian	0.6431	0.3398	19	Masovian	1.0000	0.7578
20	Masovian	0.7048	0.3027	20	Masovian	1.0000	0.5785
21	Masovian	0.4931	0.1094	21	Masovian	0.7985	0.6757
22	Masovian	0.7052	0.1817	22	Masovian	0.8307	0.2907
23	Masovian	1.0000	0.0878	23	Masovian	0.6312	0.1623
24	Masovian	1.0000	0.4775	24	Masovian	1.0000	1.0000
eff = 1		9	2	eff = 1		9	4
eff < 1		15	22	eff < 1		15	20

Source: Author's own study based on data of the Polish FADN.

Of course, each analyzed entity is characterized by its relative efficiency. However, from the point of view of the purpose of the article, the most important are the average differences between conventional and organic farms. In the case of both analyzed groups, the average value of the efficiency index is higher in the VRS model, assuming variable returns to scale, and amounts to 0.7766 for conventional farms and 0.8247 for organic entities. The efficiency index calculated in the CRS model is lower by 30–40% and amounts to 0.4813 for conventional farms and 0.6051 for organic entities.

Table 4. Statistics of efficiency of conventional and organic farms

Statistics	Conventional		Organic	
	VRS	CRS	VRS	CRS
mean	0.7766	0.4813	08247	0.6051
SD	0.2443	0.2693	0.2163	0.2423
median	0.8093	0.4612	0.9315	0.6185

Source: Author's own study based on data of the Polish FADN.

The motives in the study were divided into three categories (based on the literature review): economic, environmental, and other. The distribution of respondents' answers in this category along with the *V*-Cramer coefficient is presented in Table 5. In the case of some responses, significant differences between conventional and organic farms are visible, hence the division visible in Table 5. Economic motives appear to be the most significant for respondents when considering conversion to organic farming. The most frequently indicated answer in this category is "higher subsidies than in the case of conventional activities". What is important here is the difference between the number of indications on conventional farms (39.3%) and organic farms (92.6%). This difference likely results from a greater familiarity with the subsidy system for organic farming among certified farms. The relationship between both groups of farms regarding this motive, measured by the *V*-Cramer coefficient, is moderate ($V = 0.560$) and statistically significant ($p < 0.001$). On the other hand, "sale at higher prices" is a more important motive for conventional farms (67.9%) than for organic farms (40.7%). These differences were again confirmed by the presence of a statistically significant relationship between the analyzed groups of farms ($V = 0.272$; $p = 0.043$). In the category of economic motives, farmers also pay more attention to "reducing production costs".

Environmental motives for conversion to organic activities turn out to be much less important for respondents. No significant relationship was observed between conventional and organic farms in this regard. However, attention should be paid to "healthy food production" and "willingness to protect the environment" as the factors most often indicated by farmers in this category.

In the category of other motives, "help and support from the institutions I cooperate with" stands out, but this answer was chosen by only 22.2% of organic farms. The process of converting agricultural activities into organic activities is time-consuming and complicated in terms of required documentation (including the certification process). Therefore, the help of external institutions, such as Agricultural Advisory Centers, is necessary. Organic farms have already completed this process, so they appreciate the external support provided to them to a greater extent.

Table 5. Motives for conversion to organic activities

Motives	Type of farm:		*V*	*p*
	conventional	organic		
ECONOMIC				
Higher subsidies than in the case of conventional activities	39.3%	92.6%	0.560	<0.001*
Sale at higher prices	67.9%	40.7%	0.272	0.043*
Reducing production costs	28.6%	51.9%	0.238	0.078
Access to financial support	25.0%	22.2%	0.033	0.808
Good organization of the market for organic products	25.0%	0.0%	0.375	0.005*
ENVIRONMENTAL				
Production of healthy food	21.4%	18.5%	0.036	0.787
The desire to protect the environment	7.1%	7.4%	0.005	0.970
Love for nature	10.7%	0.0%	0.236	0.080
Improving soil fertility	0.0%	3.7%	0.139	0.304
Revitalization of farmland	0.0%	0.0%	–	–
OTHER				
Help and support from the institutions I cooperate with	0.0%	22.2%	0.356	0.008*
Increasing the quality of produced food	7.1%	3.7%	0.076	0.574
Fashion for organic products	7.1%	3.7%	0.076	0.574
The desire to produce high-quality products	7.1%	3.7%	0.076	0.574
Improved animal welfare	7.1%	0.0%	0.191	0.157
A better lifestyle	3.6%	0.0%	0.134	0.322
Tradition	3.6%	0.0%	0.134	0.322
Conducting organic activities by my neighbors	0.0%	0.0%	–	–

*statistically significant result.

Source: Author's own study based on own research.

Barriers to conversion to organic activities were also divided into three categories (based on the literature review): production, market, and institutional (Table 6). The greatest obstacles to abandoning conventional activities from the first category are "high labor intensity" and "low yields". The first barrier was indicated more often by organic farms (51.9%) than by conventional farms (39.3%). Traditional entities (64.3%) are more likely to be afraid of "low yields" than organic farms (29.6%). This may be the case due to insufficient knowledge and exaggerated fears about reduced organic production. Therefore, in this case, there is a weak, although statistically significant relationship between the analyzed types of farms ($V = 0.347$; $p = 0.010$). Farmers conducting traditional agricultural activities are also afraid of "high production costs" – this answer was given by ¼ of respondents from the conventional group and 3.7% of respondents from the organic group.

In the group of market barriers, respondents most often indicated "prices too low in relation to costs". Here, there is also a slight difference in responses between conventional farms (46.4%) and organic farms (25.9%). Respondents also noted "insufficient demand" and "difficulties in selling organic products".

Institutional obstacles were the least chosen by farmers participating in the study. In this group, respondents most often chose "high degree of bureaucracy/cost of certification".

Table 6. Barriers to conversion to organic activities

Barriers	Type of farm: conventional	Type of farm: organic	V	p
PRODUCTION				
Low yields	64.3%	29.6%	0.347	0.010*
High labor intensity	39.3%	51.9%	0.126	0.349
Availability of organic seeds and fertilizers	17.9%	18.5%	0.009	0.949
Use of natural fertilizers and special plant protection products	10.7%	18.5%	0.111	0.412
High production costs	25.0%	3.7%	0.302	0.025*
MARKET				
Prices too low in relation to costs	46.4%	25.9%	0.213	0.114
Insufficient demand	14.3%	25.9%	0.145	0.281
Difficulties in selling organic products	14.3%	18.5%	0.057	0.671
A large number of intermediaries in the supply chain	3.6%	14.8%	0.196	0.147
High margins charged by intermediaries	3.6%	7.4%	0.084	0.531
Low market power of organic farms	0.0%	7.4%	0.198	0.142
INSTITUTIONAL				
High degree of bureaucracy/cost of certification	17.9%	29.6%	0.139	0.304
Insufficient level of financial support	7.1%	3.7%	0.076	0.574
Frequent amendments to legal regulations regarding organic farming	3.6%	7.4%	0.084	0.531
Legal uncertainty	0.0%	7.4%	0.198	0.142
Adaptation to EU requirements	0.0%	3.7%	0.139	0.304
High standards of organic production	0.0%	0.0%	–	–
Insufficient level of advisory support	0.0%	0.0%	–	–

*statistically significant result.
Source: Author's own study based on own research.

As shown in Table 6, organic activity is associated with numerous obstacles, although at the same time, there are factors that may motivate people to pursue it (see: Table 5). Therefore, farmers were asked about their plans regarding their agricultural activities for the next 5 years (Table 7). It turns out that among the analyzed entities, only one farm out of 28 plans to convert to organic farming. However, in a group of 27 organic entities, 2 farms are considering returning to conventional operations.

Table 7. Farm plans for the next 5 years

Farm plans	Type of farm: conventional	Type of farm: Organic
I will continue my current type of farming activity	92.9% (26)	85.2% (23)
I plan to return to a conventional activity	–	7.4% (2)
I plan to convert to an organic activity	3.6% (1)	–
No answer	1	2
n	28	27

Source: Author's own study based on own research.

Environmental issues are not among the primary motivations for carrying out ecological farming activities by the analyzed farms (see: Table 5). However, the majority of respondents are aware of the impact of human activity on climate change and this is

85.7% of conventional farms and 70.4% of organic entities (see: Table 8). Interestingly, over ¼ of the group of organic farms believes that "climate change is a natural process".

Table 8. Causes of climate change according to the surveyed farms

Causes	Type of farm:	
	conventional	organic
Natural – climate change is a natural process	14.3%	25.9%
Human – climate change is the result of human activity	85.7%	70.4%
Supernatural causes	–	3.7%
Sum	100.0%	100.0%

Source: Author's own study based on own research.

Table 9. "Do you think agriculture contributes to climate change?"

Answers	Type of farm:	
	conventional	organic
Definitely yes	10.7%	14.8%
Probably yes	60.7%	48.1%
I have no opinion	7.1%	14.8%
Probably no	21.4%	18.5%
Definitely no	0.0%	0.0%
Sum	100.0%	100.0%

Source: Author's own study based on own research.

Respondents were also asked whether agriculture contributes to climate change. The majority of farmers believe that agriculture has an impact on climate change: 71.4% of conventional farms and 62.9% of organic farms (see: Table 9). However, some entities (21.4% conventional and 18.5% organic) believe that agriculture does not contribute to climate change.

Discussions

The analyses show that organic farms are, on average, more efficient than conventional farms in the surveyed sample. This confirms the results of research conducted among Finnish farms, where the authors showed that organic farms engaged in plant production are characterized by a higher efficiency index than conventional entities (Oude Lansink et al., 1994). According to these results, "organic crop farms could reduce the use of all inputs relative to their frontier, on average by 9 percent, whereas conventional farms could reduce the use of all inputs on average by 33 percent" (Oude Lansink et al., 1994). Importantly, the authors also conducted analyses using the CRS and VRS models. The results were similar for both models. However, these results are in contrast to most of the research results already published (Aldanondo-Ochoa et al., 2014; Badgley et al., 2007; Baer-Nawrocka & Błocisz, 2018; de Ponti et al., 2012; Pimentel & Burgess, 2014).

The conducted pilot study shows also that, among the respondents, the most important motive for conversion to organic activities is higher subsidies compared to conventional activities. This is confirmed by the results obtained by Łuczka and Kalinowski (2020) and the Mazurek-Kusiak team (2021). The study by the author of this article additionally has shown a statistically significant relationship between conventional and organic entities. Thus, it turns out that this factor is more important for farms that are already involved in organic activities. This may result from a better knowledge of financial support programs for organic farms and the ability to compare them with previous subsidies for conventional activities. It is worth paying attention to the work from 2019 (Chmielinski et al., 2019), where it was shown that support for agri-environmental purposes has a positive impact on conversion decisions while direct payments have a negative impact. In Kociszewski et al.'s (2020) work, support from subsidies did not appear among the motives that could be indicated by respondents.

The second most frequently mentioned motive is selling at higher prices, which also appeared as one of the most important factors in the work of Łuczka and Kalinowski (2020).

Environmental issues appeared in some works as one of the basic motives for deciding to change to an organic activity (Kociszewski et al., 2020; Mazurek-Kusiak et al., 2021). However, in the case of the entities analyzed in this article, they are less important than economic motives, which again confirms the research results presented in Łuczka and Kalinowski's work (2020).

Among the barriers, surveyed farmers most often indicated high labor intensity (this barrier also appeared in the work of Kociszewski et al., 2020), low yields (Łuczka & Kalinowski, 2020) and too low prices in relation to the costs. The last obstacle did not appear as one of the most important ones in the studies discussed.

The barrier of bureaucracy, which is highlighted in the works of Kociszewski et al. (2020) or Miśniakiewicz et al. (2021), is less important for respondents than market or production issues.

Conclusions

The first aim of the article was to assess and compare the economic efficiency of conventional and organic individual farms from three voivodeships: Warmian-Masurian, Masovian and Lublin. The DEA method was used to assess effectiveness, which showed primarily the existence of differences between organic and conventional farms. It turns out that in the analysed research sample, organic farms are more effective than conventional entities. It should be emphasized that the analyzed research sample was dominated by farms engaged in field cultivation. This is therefore an important signal for farmers who are considering converting to organic farming. It turns out that organic entities can more effectively use available inputs, such as fixed assets, farm area, and total costs. The study also showed differences between the individual analyzed regions (voivodeships) of Poland. Due to the analysis, it was also possible to check the application of the DEA method to assess the efficiency of Polish organic and conventional farms.

Broader conclusions and the formulation of precise recommendations require further research which will take into account all sizes and types of activities of individual farms in all voivodeships.

The second aim of the article was to characterize the basic motives and barriers to the conversion of conventional agricultural activities to organic ones in Polish farms from three voivodeships: Warmian-Masurian, Masovian and Lublin. It turns out that for the surveyed farmers the most important motives are economic ones, including higher subsidies compared to conventional activities and sales at higher prices. The process of converting to an organic business is time-consuming and cost-intensive. The final result of an organic product should cover the conversion costs. The farmers also have the opportunity to obtain subsidies from the EU, which is of great interest to Polish agricultural farms. Unfortunately, frequent changes in regulations and complicated administrative procedures make this process difficult. For this reason, many farmers do not decide to change their current activities to organic ones. It is necessary to simplify the regulations and make them stable so that the farmer has full transparency and clarity of the requirements he must meet when applying for EU funding. Currently, the help of supporting institutions such as ODRs seems to be a necessity.

Before deciding to change their business to an organic activity, Polish examined farmers were afraid of low yields and high labor inputs. There is no doubt that organic production, free from artificial fertilizers, pesticides, and herbicides, is characterized by lower efficiency. However, the quality of these products is several times higher than conventional products. Importantly, concerns about low yields are mostly expressed by farmers engaged in conventional production. In many cases, such concerns may be exaggerated or may simply be the result of ignorance. In this respect, education seems to be a necessity. In addition, it is necessary to develop sales markets for organic products with a limited number of intermediaries. A lack of knowledge about the distribution channels for ecological products makes farmers reluctant to produce them. Conventional production gives them relative certainty of sales, especially since most of the population currently cannot afford organic products.

The main limitation of the presented study is the small group size and lack of representativeness. However, it should be remembered that the aim of the study was, among others:

– checking the correctness and eliminating defects in the research procedure, including selection of the surveyed farms or the methods, research and statistical tools used, and

– checking the usefulness and correctness of the constructed interview questionnaire in terms of understanding the questions contained therein and the attached instructions for completing it, as well as checking the empirical validity of the assumptions made.

The pilot study has shown that there are differences in views between respondents from conventional farms and respondents from organic farms. Therefore, it is justified to conduct more extensive research taking into account both types of agricultural activity and all regions of Poland. Thanks to this, it will be possible to formulate recommendations for Polish agriculture, taking into account its development while respecting environmental standards. A thorough comparative analysis is necessary, which will indicate differences in particular groups of farms and different regions of the country. Due to a rich topographic and production diversity, it is not possible to generalize the conclusions for the entire sector. Hence, an in-depth analysis is needed.

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