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PRICE RELATIONS OF ORGANIC AND CONVENTIONAL FRUIT AND VEGETABLES[2]

Key words: organic food, conventional food, organic food market, prices, price relations, price premiums

ABSTRACT. The paper's objective is to identify the level of organic fruit and vegetables prices compared to their conventional substitutes' prices and determine the price premiums for organic products. In order to achieve this goal, prices of both types of food were quoted for 9 months (between October 2022 and June 2023) in various types of commercial outlets offering organic and conventional food located in the Poznań agglomeration. Each week, 60 price registers were created – 30 for organic food and 30 for conventional food. It allowed to calculate the average monthly prices of the investigated products and, based on that, the average price premiums for selected fruits and vegetables. The conducted study proved that generally, the prices of the investigated fruit and vegetables were relatively high and fluctuated similarly, in line with their seasonality and storage properties. The highest price premiums (over 100%) were noted for red beetroots, tomatoes, apples, and potatoes. The price premiums lower than 100% were observed for carrots, onions, bananas, and cucumbers. A decrease in price premiums compared to the former study has been observed, however the price premiums in the Polish market are still relatively high considering more mature organic food markets. This proves that there is a need for further research to improve the market infrastructure efficiency, which would lower the price of organic food.

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INTRODUCTION

Organic farming brings certain environmental, economic, and social benefits; therefore, it is one of the basic elements of sustainable development in rural areas. In Poland, favorable conditions exist for developing organic production methods due to the relatively low degree of agriculrutal chemicals use and fragmented agrarian structure of agriculture. Nevertheless, the significant demand for organic food is the rationale for further development and support for organic production methods. Consumer studies show that the price level is still the most crucial factor determining the size and structure of this demand and is perceived by Polish buyers as relatively high. Moreover, the vast majority of consumers are willing to pay up to 10% more for organic food [Łuczka 2019, Żakowska-Biemans et al. 2017, Wojciechowska-Solis, Śmiglak-Krajewska 2022, Smoluk-Sikorska 2021, Bryła 2016]. It is also the case in other countries like Germany or Sweden, however, these consumers are more willing to pay a premium for organic food [Aschemann-Witzel, Zielke 2017, Rödiger, Hamm 2020, Lindström 2022, Schäufele-Elbers, Janssen 2023]. On the other hand, price premiums (apart from public subsidies) may incentivize producers to convert conventional farms into organic farms and generate incomes for the existing organic farms.

The fact that in retail organic food is relatively expensive when compared to conventional food mainly results from market immaturity. One main market weakness is hardly developed vertical and horizontal relations between individual market actors. There also occur frequent shortages of certain types of fruit and vegetables, which justifies the necessity to import these products. Moreover, there are no sufficient solutions for building effective distribution systems. High costs of transportation resulting from long distances between producers and urban agglomerations where the demand for organic products is concentrated, are also factors influencing the price level.

In Poland, there are no regular registers of the level of prices of this food compared to conventional food prices (so-called price premiums), as is the case in Germany, Denmark, Italy, or the USA. Apart from a few works carried out over a short period in a relatively small number of retail outlets, no results have been published so far covering long-term research and various retail outlets [Łuczka-Bakuła, Smoluk-Sikorska 2010, Łuczka 2016, Pawlewicz 2020]. Therefore, in order to fill this research gap, it was necessary to undertake broader research on the level of prices of organic food. Therefore, the main objective of the study was to identify the level of organic food prices in relation to conventional food prices. The specific objectives were:

- identification of organic fruit and vegetable prices,
- identification of non-organic fruit and vegetable prices,
- comparison between prices of organic and non-organic food,
- recognising relations between prices of organic and non-organic food, so-called price premiums.

MATERIAL AND RESEARCH METHODOLOGY

In order to achieve the objectives, prices were quoted in various types of commercial outlets offering organic and conventional food located in the Poznań agglomeration in:

- 15 specialist stores with organic food,
- 15 general grocery stores offering conventional food,
- 15 outlets of retail chains with an assortment of both types of food).

Price quotations lasted 9 months (between October 2022 and June 2023) and covered 12 product groups, such as vegetables, fruit, bread, fruit preserves, vegetable preserves, cereals, dairy products, eggs, meat and its preserves, vegetable fats, coffee and tea, as well as sweets. Each week, 60 price registers were created – 30 for organic food and 30 for conventional food, with two registers covering both types of food in each chain outlet. The collected data was statistically analyzed using Excel and STATISTICA.

Based on the obtained registers, the average monthly prices of the investigated products were calculated. The average so-called price premium also called the relative price, is the percentage by which an organic product's selling price exceeds (or falls short of) a benchmark price – for a conventional product [Pawlewicz 2020]. It can determined using the following formula:

$$Price\ premium\ [\%] = \frac{organic\ product\ price - conventional\ product\ price}{conventional\ product\ price} \times 100\%$$

RESEARCH RESULTS

Throughout the investigated period, retail prices for organic fruit and vegetables were higher than for conventional products, compared to other countries, like Sweden [Lindström 2022], Germany [Bissinger, Herrmann 2021], the United States [Gayle et al. 2022] or Australia, where for certain products, even negative premiums are noted [Lee et al. 2021]. A similar conclusion for the Polish market was drawn by Adam Pawlewicz [2020] in the case of organic and conventional eggs.

Considering potatoes, at the beginning of the analyzed period, the organic potatoes cost 5.95 PLN per kilogram, and the conventional ones – 2.49 PLN (Figure 1). At the end of the period, it was 7.10 PLN and 3.50 PLN respectively. The price of the price of organic product fluctuated a bit more (the standard deviation for the price of organic product was 0.48 PLN and for the conventional one 0.34 PLN). On the other hand, the increase in price in this case was 20% and 40%, respectively. The reason for this may be that the initial price of organic potatoes was so high that its higher relative growth would result in a considerable demand reduction.

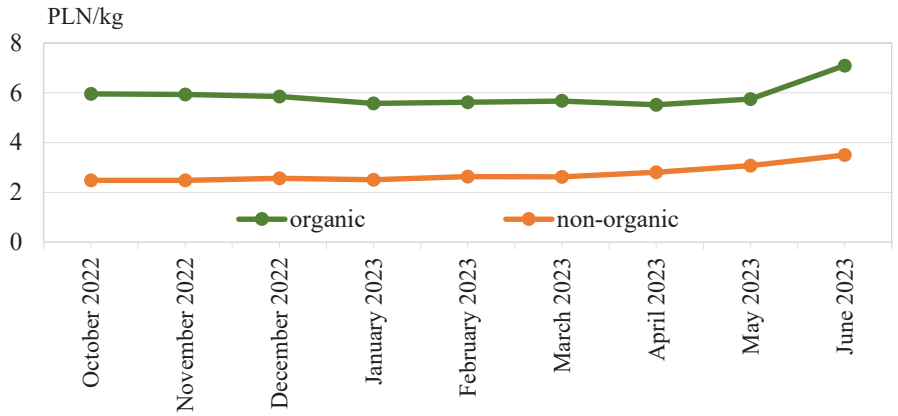

Figure 1. Average prices of organic and conventional potatoes between October 2022 and June 2023

Source: own research

For onions, at the beginning of the investigated period, the organic products cost 7.64 PLN per kilogram, and the conventional ones – 3.77 PLN. In June 2023, it was 11.02 PLN and 6.52 PLN, respectively (Figure 2). The price of the organic and conventional products changed similarly (standard deviation – 1.54 PLN and 1.27 PLN). The price increase was 44% for organic tomatoes and amounted to almost 76% for conventional ones. Again, the clarification might be that the initial price of the organic onions is so high that higher growth would result in a significant demand reduction.

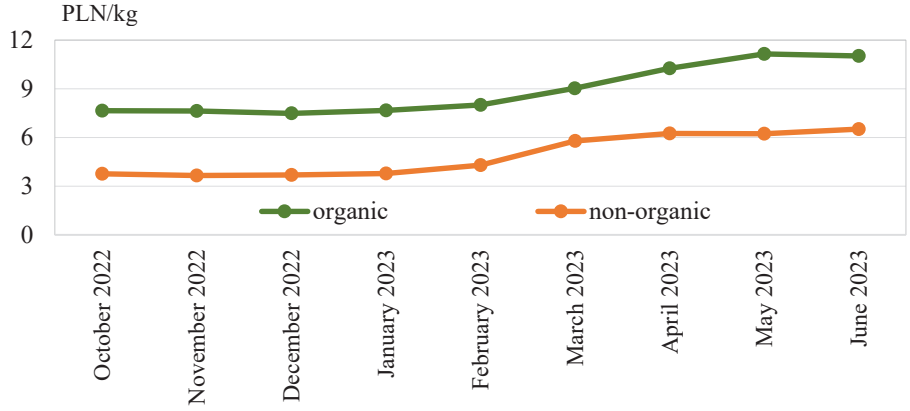

Figure 2. Average prices of organic and conventional onions between October 2022 and June 2023

Source: own research

For tomatoes, at the beginning of the investigated period, the organic products cost 24.91 PLN per kilogram, and the conventional ones – 10.27 PLN (Figure 3). At the end of the period, it was 29.04 PLN and 10.26 PLN, respectively. The price of the organic and conventional products changed similarly (standard deviation – 2.17 PLN and 2.51 PLN). Only at the end of the period, the fall in price for conventional products was more noticeable. The price increase was 16% for organic tomatoes, and there was almost no change in price for conventional products. It might be explained that there was still a shortage of Polish organic produce in tomatoes, which needed to be imported.

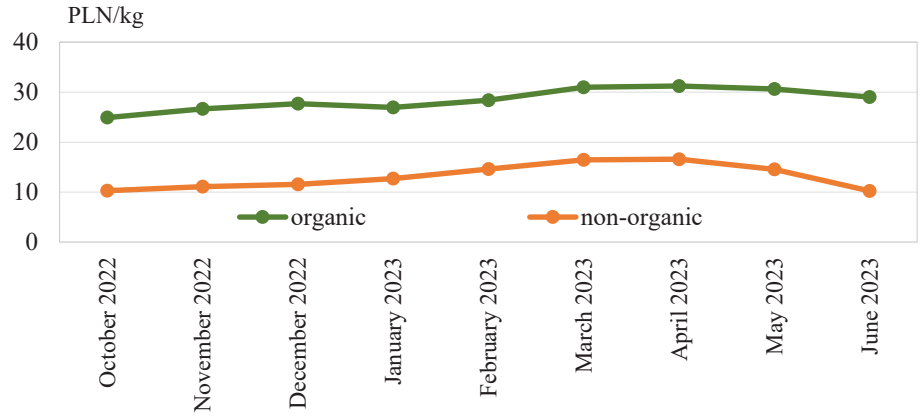

Figure 3. Average prices of organic and conventional tomatoes between October 2022 and June 2023

Source: own research

In the case of cucumbers, in October 2022, the organic products cost 17.71 PLN per kilogram, and the conventional ones – 10.87 PLN (Figure 4). At the end of the period, it was 16.22 PLN and 8.3 PLN, respectively. The price of organic and conventional products changed almost similarly, however, the price of conventional cucumbers (standard deviation 2.10 PLN and 2.60). Again, at the end of the period, the price fall for conventional products was more noticeable. The price decrease was 8.5% for organic cucumbers and 23% for conventional ones. Again, the explanation might be similar to the case of tomatoes – there was still a shortage of Polish produce in cucumbers and a necessity to import them.

For red beetroots, at the beginning of the investigated period, the organic products cost 7.61 PLN per kilogram, and the conventional ones – 3 PLN (Figure 5). At the end of the period, it was 8.58 PLN and 3.47 PLN, respectively. The price of the organic and conventional products changed similarly (standard deviation equal to 0.42 PLN and

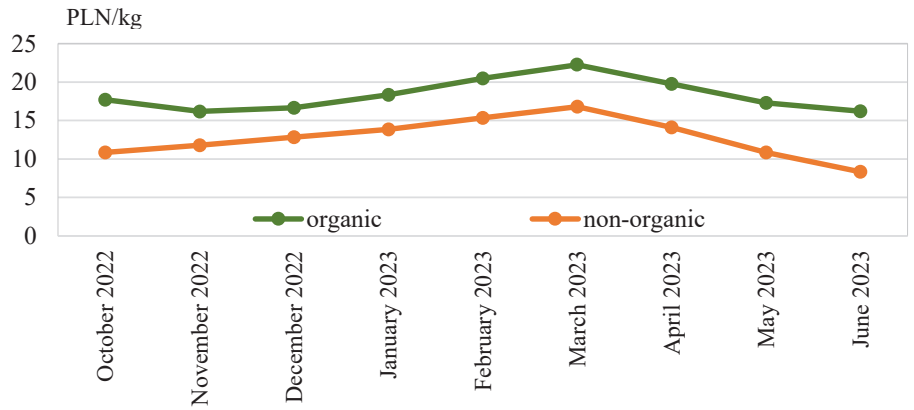

Figure 4. Average prices of organic and conventional cucumbers between October 2022 and June 2023

Source: own research

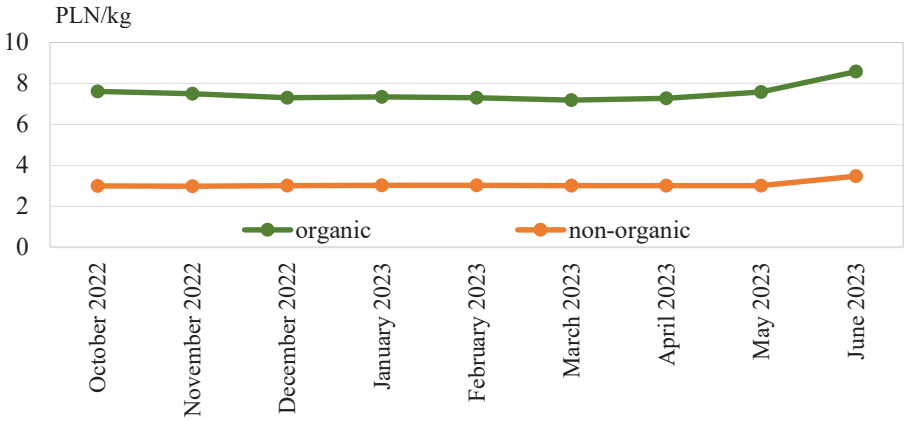

Figure 5. Average prices of organic and conventional red beetroots between October 2022 and June 2023

Source: own research

0.15 PLN), only at the end of the period was the price increase for organic products more noticeable. The price increase was 13% for organics and 16% for conventional products.

Considering carrots, the organic products cost 7.46 PLN per kilogram at the beginning of the investigated period, and the conventional ones cost 3.55 PLN (Figure 6). At the end of the period, it was 10.43 PLN and 7.34 PLN, respectively. The price of the conventional products changed to a greater extent than the organic ones (standard deviation 1.02 PLN and 1.42 PLN). However, the increase in price was 40% for organics and 107% for conventional

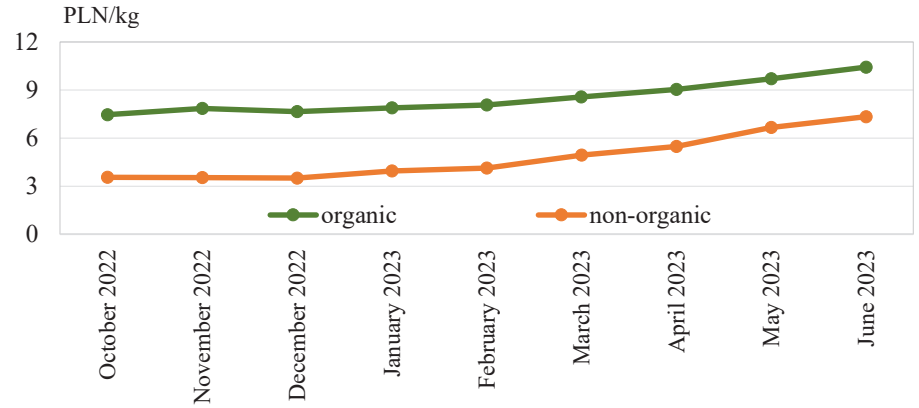

Figure 6. Average prices of organic and conventional carrots between October 2022 and June 2023

Source: own research

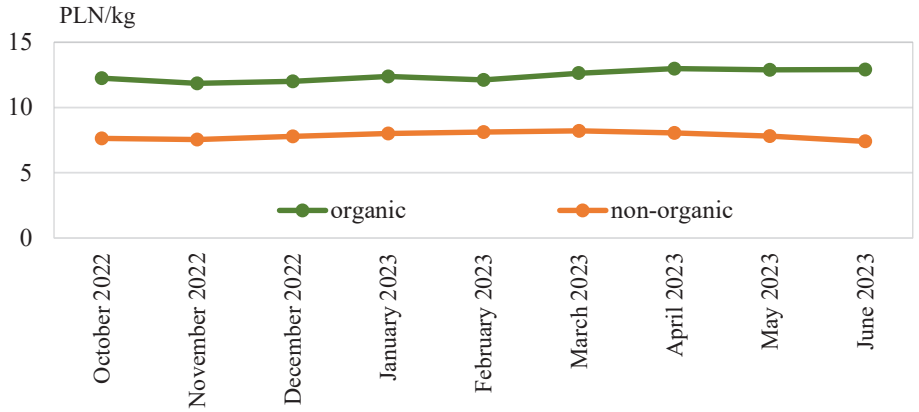

Figure 7. Average prices of organic and conventional apples between October 2022 and June 2023

Source: own research

products. Again, the possible reason is that the departure price for the organics was very high, and it is impossible to increase the price without significant demand reduction.

In the case of apples, the organic products cost 8.41 PLN per kilogram at the beginning of the investigated period, and the conventional ones cost 3.71 PLN (Figure 7). In June 2023, it was 8.58 PLN and 4.33 PLN, respectively. The prices of the organic and conventional products were relatively stable (the standard deviations amounted to 0.16 PLN and 0.22 PLN, respectively). The price increase was equal to 2% for organic products

and 17% for conventional ones. Slight price changes for both product types result from good storage properties of apple.

In bananas, at the beginning of the investigated period, the organic products cost 12.24 zloty per kilogram, and the conventional ones – cost 7.63 PLN (Figure 8). At the end of the period, it was 12.91 PLN and 7.41 PLN respectively. The prices of the organic and conventional products were relatively stable, only at the end of the period was the fall in price for conventional products more noticeable (standard deviation 0.42 PLN and 0.28 PLN, respectively). Interestingly, the price increase was 5% for organics, and there was a decrease in conventional products by 3%. The situation is related to organic and conventional bananas being imported from tropical countries throughout the year, and the price does not depend on the product seasonality.

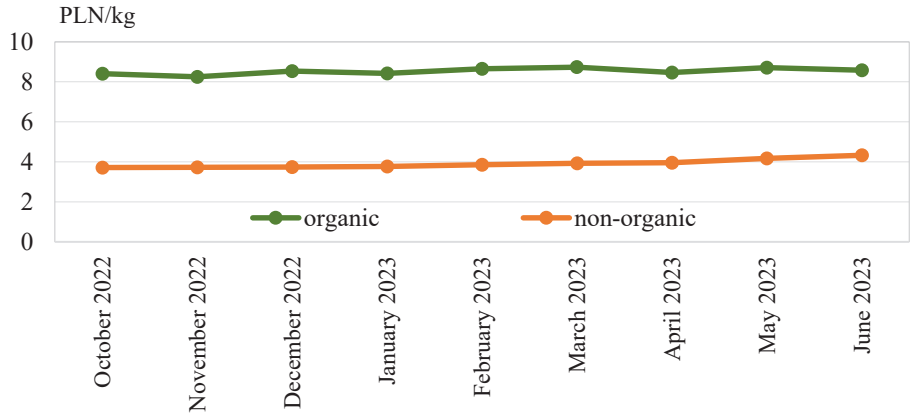

Figure 8. Average prices of organic and conventional bananas between October 2022 and June 2023

Source: own research

The analysis of the obtained data demonstrated differences in price premiums on various organic fruit and vegetables. The highest (over 100%) were for beetroots (145.9%), tomatoes (122.2%), apples (118.6%), and potatoes (115.9%), and lower ones (below 100%) for cucumbers (47.2%), bananas (58.9%), onions (85.6%) and carrots (85.8%) (Figure 9). Compared to previous research from 2009 also performed in the Poznan agglomeration [Łuczka-Bakuła, Smoluk-Sikorska 2010], the price premiums generally fell from 256% for beetroots, from 243% for tomatoes, from 160.3% for apples, from 223% for carrots, from 324% for onions, from 122% for bananas and from 90% for cucumbers. Only in the case of potatoes, a slight increase in price premium by almost 11 percentage points (p.p.).

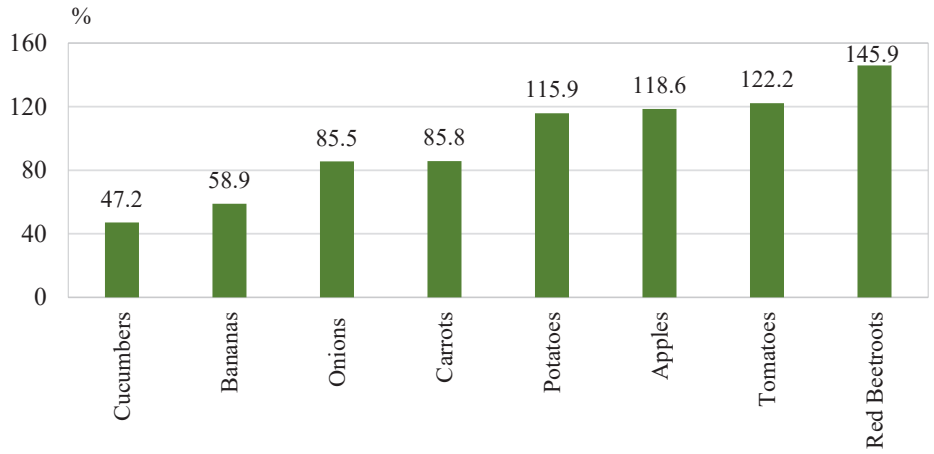

Figure 9. Average price premiums for organic fruit and vegetables between October 2022 and June 2023

Source: own research

Table 1. Price premiums for organic fruit and vegetables between October 2022 and June 2023 in particular months

Product	Price premiums [%]									
	October 2022	November 2022	December 2022	January 2023	February 2023	March 2023	April 2023	May 2023	June 2023	Standard deviation
Potatoes	139.87	139.20	128.26	121.95	113.16	116.07	96.52	86.91	102.77	139.87
Onion	103.10	108.69	102.55	103.14	86.37	56.39	64.33	78.82	69.13	108.69
Tomatoes	142.89	140.11	139.58	112.06	94.70	87.85	88.52	116.02	183.42	183.42
Cucumbers	63.26	37.37	29.75	32.22	33.39	34.27	40.18	60.75	96.00	96.00
Red beetroots	153.54	151.63	142.75	142.55	140.89	138.65	141.66	152.29	147.71	153.54
Carrots	110.58	122.68	119.13	100.02	95.05	74.04	65.31	46.54	42.28	122.68
Apples	126.59	121.95	127.88	123.89	124.18	122.16	114.13	108.84	98.34	127.88
Bananas	60.56	56.86	54.49	54.46	49.37	53.82	61.25	65.05	74.32	74.32

Source: own research

In most products, the price premium has been reduced, which resulted in higher availability of organic fruit and vegetables for consumers. With a high probability, the reduction is a result of the organic market development over the last 13 years and greater engagement of the retail chains – almost all supermarket chains started to offer organic food, including various types of fruit and vegetables. Due to economies of scale, retail chains can manage the supply chain more efficiently and offer relatively lower retail prices.

Considering changes in price premiums (Table 1), the highest were observed in tomatoes (in the range between 87.8% to 183.4% with a standard deviation of 31.6 p.p.) and carrots (range between 42.3% and 122.7%, standard deviation of 30.3 p.p.). The price premiums for red beetroots (price premium between 138.6% and 153.5% and standard deviation of 5.61 p.p.), bananas (price premium between 49.4% and 74.3% and standard deviation of 7.45 p.p.), and apples (price premium between 98.3% and 127,9%, standard deviation equal to 9.74 p.p.) fluctuated only slightly. Generally, the price premiums changed according to the seasonality of the fruit and vegetables.

CONCLUSIONS

Generally, the prices of the investigated fruit and vegetables were relatively high and fluctuated similarly, in line with their seasonality and storage properties. The highest price premiums (over 100%) were noted for red beetroots, tomatoes, apples, and potatoes. The price premiums lower than 100% were observed for carrots, onions, bananas, and cucumbers. The differences between organic and conventional food prices mostly remained stable or changed also with product seasonality throughout the researched period for all investigated products.

Nevertheless, a decrease in price premiums for most of the investigated fruit and vegetables has recently been observed. The reduction results from the latest development of the market and the growth in the importance of retail chains in the distribution sphere. On the other hand, the fall in price premiums proves that the undertaken activities supporting the organic market development, however slowly, bring some results and should be continued. They might result in a reduction of the price premiums, which would contribute to higher consumer interest and what follows that – demand for organic food. This can be observed in more mature markets, like in Western European countries, which are characterised by well-developed market infrastructure, efficient distribution channels, and dense networks of links, horizontal and vertical, between producers and distributors, which results in lower price premiums and lower relative price for the final consumer. Therefore, in Poland, to reduce the price premiums for organic food, the large market actors should be encouraged to engage more in the processing and distribution of organic food since economies of scale could contribute to the lowering of the margins and

what follows that – the price premiums. On the other hand, the creation of strengthening the existing relations between producers and distributors, launching producers' groups that might increase their market power should be supported by the public institutions responsible for the development of the organic food market.

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RELACJE CENOWE EKOLOGICZNYCH I KONWENCJONALNYCH OWOCÓW I WARZYW

Słowa kluczowe: żywność ekologiczna, żywność konwencjonalna, rynek żywności ekologicznej, relacje cenowe, premie cenowe

ABSTRAKT. Celem badań było określenie poziomu cen ekologicznych owoców i warzyw w stosunku do cen ich konwencjonalnych zamienników, a także określenie premii cenowych produktów ekologicznych. W związku z tym przez 9 miesięcy (od października 2022 roku do czerwca 2023 roku) notowano ceny obu rodzajów żywności w różnego rodzaju placówkach handlowych oferujących żywność ekologiczną i konwencjonalną, zlokalizowanych na terenie aglomeracji poznańskiej. Co tydzień tworzono 60 rejestrów cen – 30 dla żywności ekologicznej i 30 dla żywności konwencjonalnej. Pozwoliło to określić średnie miesięczne ceny badanych produktów i na tej podstawie średnie premie cenowe wybranych owoców i warzyw. Z przeprowadzonych badań wynika, że ceny produktów ekologicznych były wysokie i podlegały podobnym wahaniom jak produkty konwencjonalne, zgodnie z ich sezonowością i właściwościami przechowalniczymi. Największe premie cenowe (ponad 100%) odnotowano w przypadku buraków czerwonych, pomidorów, jabłek i ziemniaków. Premie cenowe niższe niż 100% zaobserwowano dla marchwi, cebuli, bananów i ogórków. W porównaniu do wcześniejszych badań stwierdzono spadek premii cenowych, niemniej jednak premie cenowe na polskim rynku są nadal relatywnie wysokie w porównaniu do innych, bardziej dojrzałych rynków. Świadczy to o konieczności podjęcia działań poprawiających efektywność infrastruktury rynkowej, co mogłoby przyczynić się do obniżenia cen żywności ekologicznej.

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