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FOOD PROSUMPTION IN HOUSEHOLDS IN THE CONTEXT OF THE COVID-19 PANDEMIC IN POLAND

Abstract

During the pandemic crisis we have been observing a lot of new phenomena, and one of the areas that has changed significantly is consumer behavior. One interesting field of research is prosumer behavior related to household management during the COVID-19 pandemic period. Pandemic is the time of limited mobility, availability of products and services, time of paying attention to health and spending more leisure time at home. Prosumption is the most effective way to satisfy the needs of household members, minimizing costs and fostering the protection of the level of need fulfilment. The aim of this article is to assess consumer behavior in terms of subsistence food production before and during the COVID-19 pandemic. Food prosumption comes in line with new consumer trends, which constitute elements of sustainable development and food security. To explore investigate the subject, a direct survey was conducted using a diagnostic survey method with the application of Computer Assisted Web Interview (CAWI) survey technique. The survey was conducted in July 2022 among 1112 respondents[I]. Based on the results obtained, two indexes were

built to describe two categories of food self-supply: food production index and food processing index. The obtained indexes were juxtaposed with variables describing socio-economic characteristics of households, determinants of consumer behavior. Statistical, descriptive and comparative methods were used. The research shows that consumers are very active in the field of food prosumption during the COVID-19 pandemics. Analyzing the variables describing households, we obtain information that income does not correlate with the level of food self-supply in households. In turn, the number of people in the household and the place of residence have a significant impact on the level of food self-supply in the surveyed households.

Keywords: *Food self-supply, food prosumption, sustainable consumption, covid-19, Poland*

Introduction

Consumption plays a vital role in the life of humans, societies and in economy (Attanasio, 1999; Bocock, 2008). In recent years, it has become the subject of research and analysis by scientists from such fields and disciplines as economics, management, sociology, psychology or marketing (Zukin & Maguire, 2004; Friedman, 2018). In Poland, changes in consumption trends are a particularly graceful object of observation, as consumers have come a long way from the scarcity to excess of products in the stores to the current trends related to sustainable consumption or the ecologicalization of consumption (Wiśniewska, 2002). Consumption needs might be satisfied either by means of goods and services purchased on the market or through food self-supply (Zalega, 2013). Food self-supply (food prosumption) means independent production of food bypassing the market (self-supply of food), so most often from one's own allotments, self-grown (farm), or the independent processing (preparation) of food from self-grown or previously purchased products (Trębska, 2020).

Food constitutes a special group among consumer goods as a basic commodity that does not only satisfy human physiological needs, but also the needs related to security, sense of belonging and respect (Parraga, 1990; Komor et al., 2020). Changes in the level and structure of food consumption are related to the increased interest in the principles of rational nutrition and

the importance of food safety needs. Recently, some people have even been returning to nature, by consuming self-produced food products because of the nutritional value of such food, their concern for the health of their family members and concern for the environment and food security (Zalega, 2016).

According to recent scientific research, the coronavirus pandemic is a completely random event that has changed our reality in unpredictable ways, which has also led to changes in consumer behavior around the world (Gorzelany-Dziadkowiec, 2020; Fanelli, 2021; Aydınlıoğlu & Gencer 2020).

COVID-19 pandemic and resulting from it restrictions concerning mobility, meetings, and the ability to engage in activities outside the home have significantly affected people's daily lives (Zajadacz, 2021). A big number of consumers have been forced to change their habits, and thus to spend their leisure time in their own homes. Due to the restrictions introduced as a result of the spreading COVID – 19 pandemic the way of spending one's leisure has acquired a special significance. The pandemic has contributed locally but also globally to changes in the amount of free time of an individual (Kugiejko & Kociszewski, 2021). Leisure time ceases to be associated only with rest and entertainment, but constitutes an important sphere of human self-expression and self-realization. However, it should be noted that an increase in the amount of leisure time does not always lead to an increase in consumption. Often, such time happens be mismanaged due to a lack of skills to take advantage of the opportunities it provides, or the lack of financial resources (Makówka, 2006).

The multidimensional meaning of the sphere of free time in individual human life and in a broad social context leads to extensive research analyzing it as an important element of socio-cultural and economic life (Bittman & Wajcman, 2000; Müller & Wyss, 2007; Codina & Pestana, 2019).

Food prosumption has both advantages and disadvantages. Some of the biggest advantages include the freshness of food items grown on one's own farm or in one's own garden, and thus their rich nutritional value and flavor without any preservatives or chemical substances (Biernat-Jarka & Trębska, 2020). Moreover, such bypassing of processing and marketing shortens the time between production and consumption and cuts transportation costs. This means that the food supply chain is the shortest possible, we say "from farm to plate". The cost of self-production is much lower than buying the same food

products on the market, hence it is more characteristic of farmers' families and less affluent families. Natural consumption can make the producer feel a certain economic independence when it comes to meeting the family's food needs (food security), but also enables them to take care of the health and well-being of family members, and indirectly – of the environment (Sawicka & Tuka, 2016). An asset of food prosumption is the fact that the production reduces environmental pollution, which fits into the theory of sustainable development. It is a result of increasing environmental awareness of consumers, who declare the need for promoting information on the importance of conscious use of natural resources on a daily basis (Grzybowska-Brzezińska & Grzywińska-Rąpca, 2018; Grzybowska-Brzezińska & Rudzewicz, 2015)

Self-supply of food on a large scale can have its own negative implications in the sense that the level of consumption of food items is dependent on the farm's own production, which in turn contributes to less diversified consumption and the occurrence of seasonal fluctuations in the consumption of certain products. Seasonality concerning mainly fruits and vegetables means that these products are the only ones consumed or are consumed only during the harvest season. On the other hand, this is not necessarily bad, since out of season goods are less nutritious, less flavored and usually more expensive. Eating goods only at season also allow to vary food intake throughout the year. It can be a good practice and also more sustainable. This form of consumption is considered by some to be a relic of the past, and by others it is regarded as a fashionable trend of returning to nature and consuming healthy self-produced food (Biernat-Jarka & Tuka, 2015).

The purpose of this article is to assess consumer behavior in relation to subsistence food production during the COVID-19 pandemic in Poland. The issues raised in this article are important for several reasons. First, the problem of food prosumption is important both in terms of economics, sustainability, food security, or even environmental and health issues. On the other hand, it is a niche topic, a particular one to investigate during the COVID-19 pandemic when certain consumer behaviors and views haver been changing. Another important issue addressed in the article is how to fit the trend of food prosumption into the theory of sustainable consumption and food security.

Materials and methods

In order to identify selected elements of prosumer behavior, direct surveys were conducted. The surveys were carried out from July 26 to 29, 2022 using a diagnostic survey method with the application of Computer Assisted Web Interview (CAWI) survey technique as part of a scientific activity no 2021/05/X/HS4/00643 entitled "Prosumer behavior related to household management during the pandemic COVID-19 period" as part of the competition MINIATURA 5 organized by the National Science Center. The survey was conducted among 1112 adult respondents selected in a non-random manner – quota sampling (according to age, gender, place of residence and education criteria).

The collected data was analyzed employing descriptive statistics measures with the aid of the program Statistica 13.3. The Alpha level was adopted for the obtained results equal to 0.05. In response to the research questions posed, Spearman coefficient correlation analysis and Friedman difference test were chosen. The difference analysis was expanded to include effect size assessment with Kendall's W coefficient. The Mann-Whitney U test supported by an effect size assessment with the Glass rank correlation coefficient (rg) was used to evaluate the differences between the two groups. The choice of non-parametric methods was due to the non-normality of the distribution of quantitative variables and the ordinal measurement of variables related to household management.

Results and discussion

Table 1 presents the structure of the researched population . 52% of women and 48% of men participated in the survey. Two-person households predominate in the surveyed population (30%). In about 32% of the surveyed households there were children 14 [years of age]. 39% of the respondents lived in the countryside. The largest group among respondents were those whose monthly net income per capita was in the range of EUR 441.00-1100.00 (50%). During the COVID-19 pandemic, 34% of respondents declared that they had been in quarantine at least once.

Table 1. *Structure of respondents and their families*

Features of the Respondents	%
In all	**100.0**
Sex	
Female	52.3
Male	47.7
Place of residence	
Village	39.4
< 99 999 inhabitants	32.7
City from 100,000 to 499,999 inhabitants	16.4
> 500 000 inhabitants	11.7
Monthly net income per person in the household	
Up to EUR 220	11.3
From EUR 221 to EUR 440	31.2
From 441 to EUR 1 100	50.1
From EUR 1101 to EUR 1770	5.9
Above EUR 1771	1.6
Number of children under 14 in the household	
0	68.4
1	19.1
2	9.6
3	2.2
4	0.8
Number of people in the household	
1	13.5
2	30.2
3	23.9
4	20.6
5 and more	11.9
Being in quarantine	
Yes	34.3
No	65.8

Source: own calculations

On the basis of the definition of food self-supply (food production or food processing on one's own), two indexes were built to describe the phenomenon of food prosumption: food production index and food processing index. The indexes were built based on respondents' declaration concerning activities, which were later grouped into two areas of presumption (Table 2). Creation of such groups was prompted by the author's previous research (Trebska et.al, 2021).

Table 2. *Activities within the areas of food prosumption*

components food production index	components food processing index
X1 – cultivation of a vegetable garden X2 – cultivation of a fruit orchard X3 – herbal crops X4 – breeding chickens / small livestock X5 – mushroom picking	X6 – preparation of fruit preserves (e.g. jams, juices) X7 – preparation of vegetable preserves (e.g. pickled cucumbers) X8 – drying of fruits, vegetables, mushrooms X9 – baking bread X10 – baking cakes, preparing desserts X11 – preparing cold cuts, sausages, offal X12 – making ready meals (e.g. dumplings, noodles)

Source: own calculations

The areas of food prosumption (the food production index and the food processing index) were analyzed for correlation with variables describing socioeconomic characteristics of the surveyed households, such as place of residence, income (monthly net income per capita), number of children under 14, the total number of household members, and being in quarantine during the COVID-19 pandemic in Poland.

Table 3. *Summary of descriptive statistics of food prosumer behavior before and during the COVID-19 pandemic*

Prosumer behavior		Min	Max	M	Me	SD	SKE	K	K-S
Before the pandemic	Food production index	0,00	5,00	1,38	1,00	1,41	0,77	-0,41	0,214*
	Food processing index	0,00	7,00	2,97	3,00	2,09	-0,01	-1,18	0,132*
During a pandemic	Food production index	0,00	5,00	1,29	1,00	1,38	0,84	-0,29	0,226*
	Food processing index	0,00	7,00	2,94	3,00	2,11	0,03	-1,19	0,129*

Note. Analysis were performed in group N = 1112. Min – minimum, Max – maximum, M – mean, Me – median, SD – standard deviation, SKE – skewness, K – kurtosis, K-S – Kołmogorow-Smirnow test result; * – $p < 0.01$

Source: own calculations

Descriptive statistics for the food production index and the food processing index are presented in the Table 3. The descriptive analysis showed that the examined areas of behavior concerning food prosumption during the pandemic do not meet the assumption of normality of distribution, which is confirmed by the essential results of the Kolmogorov-Smirnov test. All areas of prosumer behavior are characterized by negative kurtosis, which means low concentration of results and their higher variation. This is particularly visible for the food processing index.

The correlation analysis was conducted on variables characterizing the examined households, such as place of residence, income (monthly net income per capita), number of children under 14, and the total number of household members with the number of prosumer behaviors (the food production index and the food processing index) during the COVID-19 pandemic in Poland. The Spearman correlation coefficient was used in this assessment (Table 4).

Table 4. *Summary of Spearman coefficient correlation analysis between food prosumer behavior during the COVID-19 pandemic with household-related variables*

Prosumer behavior	Place of residence		Income		Number of 14 year old children		Number of house members	
	rs	p	rs	p	rs	p	rs	p
Food production index before the pandemic	-0.31	<0.001	0.03	0.331	0.10	<0.001	0.21	<0.001
Food processing index before the pandemic	-0.11	<0.001	0.03	0.278	0.02	0.549	0.13	<0.001
Food production index during a pandemic	-0.27	<0.001	0.03	0.269	0.11	<0.001	0.24	<0.001
Food processing index during a pandemic	-0.11	<0.001	0.05	0.090	0.03	0.392	0.15	<0.001

Note. Analysis were performed in group N = 1112. rs – Spearman's coefficient, p – significance

Source: own calculations

The analysis showed that the number of people in the household correlated significantly with both the food production index and the food processing index. The correlations were positive and weak. As the number of household members grew, the number of prosumption behaviors in the analyzed prosumption areas increased during the COVID-19 pandemic. The number of children under 14 correlated significantly with the food processing index. The correlation was positive and weak, which means that as the number of children in the household went up, the number prosumer behaviors increased during the COVID-19 pandemic. No correlation was noted between the income variable and the examined indexes. The size of the place of residence correlated significantly and negatively with the examined areas. The correlations were weak. As the size of the place of residence increases, the number of prosumer behaviors decreases in the areas of both food production and processing.

Table 5. *Summary of the analysis of differences in the Wilcoxon pairwise order test of prosumer behavior before and during the COVID-19 pandemic*

Prosumer behavior	Before the pandemic		During a pandemic		z	p	rc
	Mrang	Me	Mrang	Me			
Food production index	1.52	1.00	1.48	1.00	2.752	0.006	0.15
Food processing index	1.50	3.00	1.50	3.00	0.179	0.858	0.01

Note. Analysis were performed in group N = 1112. Mrang – rank mean, Me – median, z – Wilcoxon test value, p – – significance, rc – effect size

Source: own calculations

The analysis of differences using the Wilcoxon pairs order test in prosumer behaviors before the start of the pandemic and during the COVID-19 pandemic showed that the food processing index does not differ significantly between the period before the pandemic and during the pandemic. However, the food production index before the pandemic was significantly higher than during the pandemic (Table 5).

Differences in the number of prosumer actions taken during the COVID-19 pandemic were analyzed for individuals staying in and out of quarantine during the pandemic. The Mann-Whitney U test was used to assess these differences, a summary of which is shown in Table 6.

Table 6. *Summary of Mann-Whitney's test of difference food prosumer behavior during the COVID-19 in between on residing in quarantine and without quarantine*

Prosumer behavior during the COVID-19 pandemic	No Quarantine N = 353		Quarantine N = 759		U	p	rg
	Mrank	Me	Mrank	Me			
Food production index	516.99	1.00	574.88	1.00	120016.500	0.005	0.10
Food processing index	488.43	2.00	588.16	3.00	109936.000	<0.001	0.18

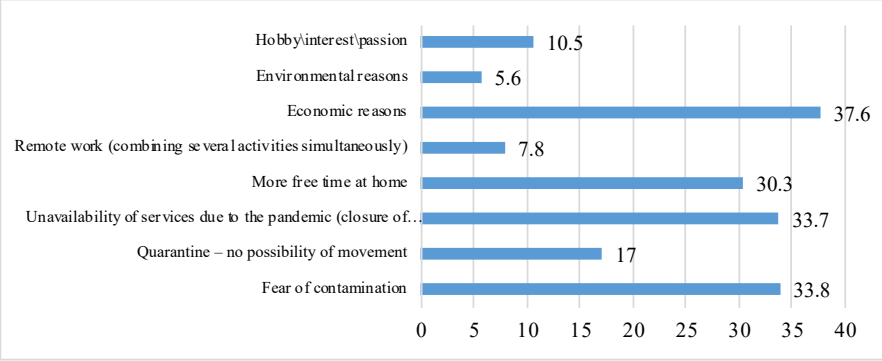
N – number of observations, Mrank – rank mean, Me – median, U – Mann-Whitney's test, p – significance, rg – size of the effect

Source: own calculations

Analysis of the results showed that individuals in quarantine during the COVID-19 pandemic achieved significantly higher prosumer behavior results in the analyzed areas of food prosumption. It can be observed that a stronger correlation was noted between the variable of staying in quarantine and the food processing index than between the food production index.

In the next step, the variables describing the respondents' declared reasons for withdrawing from using the services of external companies in favor of doing them themselves at home, as well as information on the sources of knowledge about doing housework, were subjected to the correlation analysis. In the analysis, due to the nominal nature of the variables, point-biserial correlation coefficients were used. Table 7 shows the summary of the analysis.

Figure 1. *Reasons to resign from the services of external companies (%)*



Source: own calculations

The respondents were also asked about the reasons for withdrawing from the services of external companies during the pandemic (Figure 1). This was a multiple-choice question. Most people indicated economic reasons (38% of respondents). When the consumer takes responsibility for doing most of the housework, it reduces the cost of running the household. One third of the respondents (34%) indicated the fear of infection and the unavailability of services due to the pandemic (closure of service establishments). Environmental reasons were indicated by only 6% of the respondents.

Table 7. *Summary of point-bipolar coefficient correlation analysis between food prosumer behavior during the COVID-19 pandemic with reasons for resignation from external companies and sources of knowledge on performing household chores*

Tested variables		Prosumer behavior during the COVID-19 pandemic			
		Food production index		Food processing index	
		rpbi	p	rpbi	p
Reasons for resignation from external companies	Fear of infection	0.02	0.540	0.09	0.002
	Staying on the quarantine	0.05	0.101	0.06	0.035
	Unavailability of services	0.02	0.618	0.09	0.002
	More free time	-0.11	<0.001	-0.09	0.004
	Remote working	0.11	<0.001	0.10	0.001
	Economic reasons	-0.01	0.696	0.00	0.888
	Environmental reasons	-0.10	0.001	-0.08	0.007
	Hobbies/interests	-0.03	0.258	-0.04	0.188
Sources of knowledge on performing household chores	Television	0.02	0.441	-0.01	0.735
	YouTube	0.10	0.001	0.08	0.006
	Internet forums	-0.05	0.101	-0.07	0.016
	Social media	0.06	0.050	0.04	0.178
	Specialized work	0.05	0.121	0.07	0.022
	Books and guides	0.04	0.165	0.07	0.018

Note. Analysis were performed in group N = 1112. rpbi – point-bipolar coefficient, p – significance

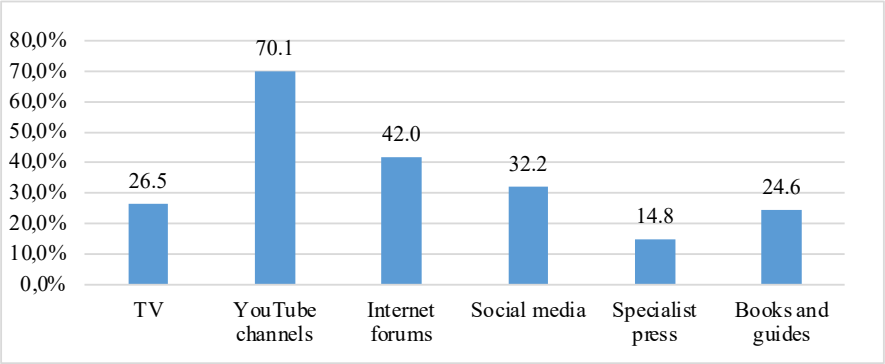
Source: own calculations

Correlation results showed that economic reasons did not correlate with the number of prosumer behaviors in the analyzed areas. Fear of infection correlated positively and weakly with the area of food processing. Indication of hobbies and interests as a reason for opting out was connected with a decrease in the number of behaviors in the indicated areas. Similarly negative and weak correlations can be seen for environmental reasons in the food processing area. Indication of the environmental factor as a reason for withdrawing from companies was connected with a decrease in the number of prosumer behaviors.

Staying in quarantine as well as the lack of availability of companies or services correlated positively and weakly with food processing areas. Indication of these reasons was connected with an increase in prosumer behaviors. More free time and working remotely were variables that proved significant in both of the analyzed cases. Remote work correlated weakly and positively with each area, meaning that the indication of remote work as the reason was connected with an increase in prosumer behavior. The variable of more free time correlated weakly and negatively with the areas of prosumer behavior, meaning that the occurrence of the free time reason was connected with a decrease in the number of prosumer behavior.

The respondents were asked in the survey what sources they used to support themselves with professional knowledge on a given topic when doing household activities related to their own food production and processing (Figure 2). The majority of indications, that is 70% of respondents use YouTube channels, 42% use online forums, and 32% use social media. The fewest respondents declare they use specialist press (15%).

Figure 2. *Respondents' indications regarding the use of sources knowledge of household activities (%)*



Source: own calculations

The analysis of variable correlations presented in Figure 2 showed that the number of prosumer behaviors was unrelated to the use of television as the source of knowledge about household activities. The use of books and guidebooks and the use of specialist literature correlated only with the area

of food processing. These correlations are weak and positive. The use of books, manuals and specialist literature was associated with an increase in prosumer behavior in the indicated areas. Respondents' use of social media correlates (positive and weak correlation) with the area of food production.

YouTube as the source of knowledge was found to be correlated with all areas of prosumer behavior. The correlations are weak and positive. The use of YouTube as the source of knowledge was connected with an increase in the number of prosumer behaviors. Interestingly, online forums correlated with food processing, in a weak and negative way. This means that the use of online forums was connected with a decrease in the number of prosumer behaviors during COVID-19 pandemic.

The number of prosumer behaviors was also assessed in terms of whether or not the helpful resources were used for household activities. The declaration of the use of resources such as the Internet, books or television was juxtaposed with a group of people who did not declare the use of such aids. The analysis used the Mann-Whitney U test, the summary of which is shown in the Table 8.

Table 8. *Summary of Mann-Whitney's test of difference food prosumer behavior during the COVID-19 in between on using any help to learn prosumer actions*

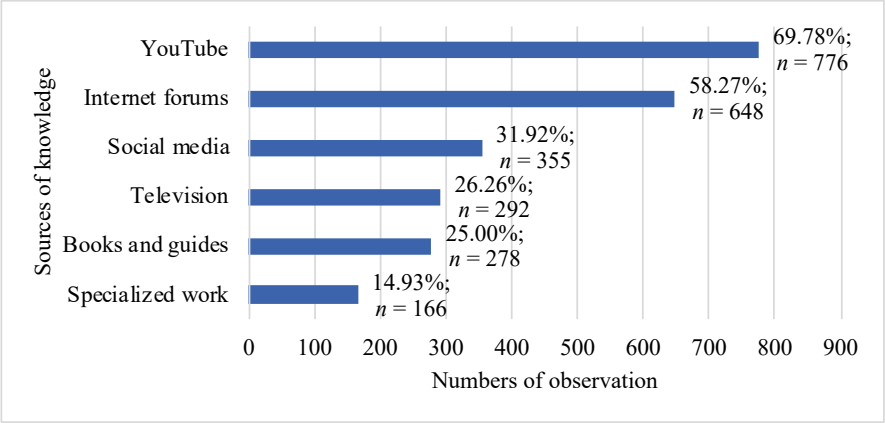
Prosumer behavior during the COVID-19 pandemic.	No using help n = 393		Using help n = 719		U	p	rg
	Mrank	Me	Mrank	Me			
Food production index	514.79	1.00	579.30	1.00	124892.000	0.001	0.12
Food processing index	520.38	3.00	576.24	3.00	127088.500	0.006	0.10

N – number of observations, Mrank – rank mean, Me – median, U – Mann-Whitney's test, p – significance, rg – size of the effect

Source: own calculations

The analysis showed that respondents who used the Internet (YT videos, tutorials, social media groups) to perform household chores on their own at home achieved significantly higher prosumer behavior results than those who did not use professional help on the Internet. The effect sizes were low. The obtained results are shown in Figure 3.

Figure 3. *Frequency analysis of using any help to learn prosumer actions*



Source: own calculations

The frequency of using resources as aid for doing housework was additionally assessed, as shown in the figure below. It can be noted that YouTube was the most frequently indicated source of knowledge. Apart from YouTube, more than half of the respondents marked online forums. Books and guidebooks, as well as specialist literature, were marked by only 25% and 15% respectively, which constitute the lowest number of indications.

The novelty of these studies is the characterization and evaluation of the phenomenon food prosumption during the COVID-19 pandemic in Poland, which has not been analyzed by researchers so far. The researchers addressed the subject of food consumption in general (Chenarides et al., 2021; Eftimov et al., 2021; Dumitras et al., 2021; Hirvonen et al., 2021; Profeta et al., 2021; Janssen et al., 2021; Sánchez-Sánchez et al., 2021), without specifically considering the problem of food self-supply.

The conducted research showed that food prosumption is of great interest among the surveyed population during the COVID-19 pandemic in Poland. On one hand, this is a topic that was of interest to researchers in Poland at the end of the previous century (Tracy, 1993), but nowadays in the era of increased consumer awareness, interest in healthy food, care for the environment – has again been brought to attention.

The pandemic caused consumers to pay more attention to prosumer behavior. The experience of previous crises shows that in a difficult economic situation, families introduce appropriate finance management, increase the number of income earners and look for savings in reducing consumption, giving up services or replacing them with prosumption (Olcoń-Kubicka et al., 2021).

Changes in consumer behavior during the COVID-19 pandemic also concerned the area of food consumption (Chenarides et al., 2021; Espinoza-Ortega et al., 2021). The study addressed both the form of food purchasing (Chen et al., 2021; Chmielarz et al., 2022) as well as other forms of consumer behavior, e.g . stock up shopping or panic buying (Chua et al., 2021; Keane & Neal, 2021; Kohli et al., 2020). The COVID-19 pandemic affects all aspects of human life including their food consumption. The changes in the food production and supply processes introduce changes to the global dietary patterns.

Food prosumption is a vital topic addressed in the political arena, especially in terms of food security, sustainability, environmental protection or agricultural policy. Subsistence production of quality food may play an essential role in ensuring food security in a region. Furthermore, by producing food, households are provided with the knowledge and skills to appropriately use (not waste) the food they produce (Wiggins et al., 2010). Limitations resulting from the conducted research is the fact that the respondents present their subjective assessment.

The intentions for further future research are to continue research in the field of food self-supply due to current consumer trends and trends in scientific research, including this topic in the following issues: Green Deal, sustainable development and sustainable consumption, sharing economy, prosumption, green behavioral intentions. This topic is gaining in importance among consumers.

Summary and concluding comments

The Coronavirus disease (COVID-19) rapidly expanded throughout the world affecting human life in the health, social, cultural, economic and environmental aspects. On an international scale, some works have addressed the importance of the agri-food topic during the pandemic, especially about food consumption. Based on the respondents' indications concerning production and processing of specific food items for their own purposes individual food products, the following indexes were built: the food production index and the food processing index, which in a synthetic way show the level of food prosumption for each surveyed household before pandemic and during the COVID-19 pandemic in Poland. The conducted research showed no significant differences between the level of food processing index and food production index before the COVID-19 pandemic and during the pandemic. Analyzing the variables describing households, we obtain information that income does not correlate with the level of food self-supply in households. Meanwhile, the number of people in the household and the place of residence have a significant impact on the level of food self-supply in the surveyed households. Analyzing the factor of having children, the level of food processing index is significantly higher in households where there are children. Due to the trends observed today in consumer behavior and choices, the issue of prosumption is becoming of increasing interest to both academic researchers and practitioners of economic life. The ongoing transformations in the structure and style of consumption imply the need to match the structure of supply to the reported demand for specific goods. The market of food products and subsistence food production show great development potential in this respect.

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Endnotes

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