

POLAND'S FOOD SECURITY IN 2007–2016

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Abstract. This paper covers the issues of one of the basic physiological needs, namely the need for food. The purpose of this paper is to assess the level of food security in Poland in 2007–2016 based on a dynamic approach. Key terms of relevance to food security were defined. The analysis covered 4 major conditions of food security: (i) physical availability of food; (ii) stability and reliability of food supplies; (iii) economic availability of food; (iv) health suitability of a product. The research also covered the level of self-sufficiency in selected food products which is another important aspect of food security. The research was based on statistical data from the Central Statistical Office and academic publications. The study found that Poland was self-sufficient in all basic food products, and confirmed that four conditions of food security were met simultaneously. Minor problems were only discovered in health suitability of a product, namely the fact that fat accounts for an excessive amount of energy in the Polish households' diet.

Keywords: food security, food self-sufficiency, physical availability of food, stability and reliability of food supplies, economic access to food, health suitability of a product

INTRODUCTION

Since the dawn of mankind, humans have made efforts to meet their basic physiological needs. A. Maslow believed that all human needs can be arranged hierarchically. First come the physiological needs such as supply of oxygen, food and water to satisfy hunger and thirst. Only after those needs are met, four subsequent levels

of psychological needs arise, including safety, love, esteem and self-actualization (Maslow, 2009). Nutrition needs are the most urgent ones and can be addressed by supplying food in adequate quantities and of adequate quality to the human body. Food should meet individual demand for energy and include essential nutrients such as carbohydrates, proteins, fats, vitamins and minerals (Kapusta, 2016).

Meeting food needs has always been a major challenge for the entire world. This problem has been discussed ever since antiquity (Kołodziejczak and Andrzejewska, 2016). In modern history, it was presented by T. Malthus who claimed that food is necessary for human existence and that, to his knowledge, no one believed an individual could survive without food (Malthus, 1798). Today, addressing the global food needs is an important problem, primarily because hunger and malnutrition are common in certain regions of the world, but also due to forecasted growth of the world population. According to UN forecasts, the global population may increase by as much as 3.5 billion (UN, 2017) by the end of the 21st century. This is a situation the world has never seen before. Mainly because of these reasons, it is justified to investigate the food situation both at global and country (or region) level.

The purpose of this study was to assess the dynamics of food security (the basic term related to addressing food needs) in Poland. The study period is 2007–2016. The authors provide various definitions, vectors and dimensions of food security and of the term 'food self-sufficiency'. The following was calculated: physical

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availability of food; stability and reliability of supplies; economic availability of food; and health suitability of a food product. Measures used to assess the national food security level include: consumption of food products (in weight units); volume of international trade in agri-food products; amount of disposable income by socioeconomic group; nutrient content of diet and energy value of nutrients (Kapusta, 2016).

LITERATURE REVIEW

Several definitions of food security have emerged over the years. Formally, the first was created in mid-1970s (Mikuła, 2012). They are interpreted in different ways depending on national- and international-level food policies. The evolution of the definition of food security is presented in Table 1. There are three dimensions of food security: the international, national and household level (note also that individual household members can be considered separately) (Kapusta, 2017). The international dimension represents the global commitment to eliminate regional disparities in satisfying hunger. It has two meanings; in a narrower sense, it means maintaining food stocks. In a broader sense, it includes all

elements of the international food system. The national dimension refers to three time intervals: the short term where food security means physical access to food; the middle term where food security means continuous supply of foods; and the long term where food security can be ensured only by using natural resources in a way that guarantees a proportional development of agriculture.

Food security at household level depends on many factors, including household activity (consumption only or production and consumption), place of residence, age and education of household members. All of the above affect the decisions made by households (Małysz, 1998). In 1974, the Food and Agriculture Organization of the United Nations provided their definition of food security; in years that followed, that term was progressively broadened. The definitions provided by FAO in 1974 and 1983 referred to the physical dimension (physical availability of food) and economic dimension (economic availability of food) at national and global level. The definition of food security presented at the 1996 FAO World Food Summit also includes the health dimension (pertaining to food quality and safety). Emphasis was also placed on food security at individual level (both physical and economic access to food of

Table 1. Definitions of food security

Definition	Author
“Availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices”	FAO, 1974
“Ensuring that all people at all times have both physical and economic access to the basic food that they need”	FAO, 1983
“Access of all people at all times to enough food for an active, healthy life”	World Bank, 1986
[Food security is] “when all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life”	USAID, 1992
“Food security, at the individual, household, national, regional and global levels [is achieved] when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”	FAO, 1996
“A person, household or community, region or nation is food secure when all members at all times have physical and economic access to buy, produce, obtain or consume sufficient, safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life”	IFRC, 2006
“Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life”	FAO, 2009
“Food security is defined as a state in which people at all times have physical, social and economic access to sufficient and nutritious food that meets their dietary needs for a healthy and active life”	Global Food Security Index, 2014

Source: FAO, 2003; USAID, 1992; FAO, 2009; IFRCRCS, 2006; EIU, 2014.

adequate quality) and at household level, measured as the quantity of food per household member. The definition of food security presented at the 2009 FAO World Food Summit extends the dimensions and levels proposed thirteen years earlier with the social dimension related to food preferences and socio-cultural conditions (Marzęda-Młynarska, 2014).

F. Kapusta (2003) presents four conditions that must be met jointly in order to guarantee food security at national level, namely:

1. Physical availability of food. This condition is met if the national economy guarantees that at least the minimum food supply requirements of the population are satisfied, while imported food is the margin over the minimum requirements.
2. Stability and reliability of supply: continuity of supply over time.
3. Economic availability of food to all households irrespective of their financial standing, also thanks to various forms of food aid.
4. Health suitability of a product and food ration, defined as a way to guarantee an appropriate energy value and an adequate mix of nutrients and minerals.

In addition to guaranteeing food security at national level, another major problem is posed by unequal access to sufficient quantities of food which results from the economic situation and cultural factors, including: hunger and malnutrition affecting the population, food losses and wastage (Kołodziejczak and Andrzejewska, 2016).

Food security is also linked to food self-sufficiency, a term which can be defined in different ways because, just like food security, it evolves in line with changes in the national economy. However, generally, it means a situation where the quantity of food produced domestically is enough to meet the total demand for food (Mikuła, 2012).

The definitions of self-sufficiency vary from one another depending on whether an open or a closed economy is considered. In a closed economy, food self-sufficiency is defined as the population's total demand for food produced domestically. In an open economy, food self-sufficiency means that food is available in line with the physical and economic dimensions, irrespective of its origin (produced domestically or imported). R. Sobiecki believes food self-sufficiency to be "the equality between domestic demand for foreign agricultural products and foreign demand for domestic agricultural products." He also defines the

yardstick for food self-sufficiency as "the ability of food production sectors to meet the domestic demand for food" (Sobiecki, 2007). In turn, according to Kołodziejczak (2018), food self-sufficiency depends on the volume of agricultural production and, as a consequence, on the area of land allocated to agricultural production, on the intensity of land use and on land productivity. The demand for food depends on the country's population as well as on their dietary preferences and the amount of food waste they generate. The self-sufficiency index presents the production level of a specific food product or product group in relation to the amount consumed over the analysis period. Domestic consumption includes food consumption, industrial processing volume, losses and – in the case of plant production – food for sowing and grazing. A balance or surplus of domestic production is an indication that enough food is produced domestically. The calculation of the self-sufficiency index cannot provide any information on whether the population's food requirements are actually satisfied. Instead, it only indicates whether this is feasible or not (Baer-Nawrocka, 2014).

The findings of a study by A. Sadowski and A. Baer-Nawrocka, based on a unique approach, allowed to determine the coefficient of energetic self-sufficiency in food for Poland in 1990–2009. The coefficient compares the amount of energy produced by the agriculture sector (in kcal on a countrywide basis) against the amount of energy consumed which also originates from the agriculture sector (in kcal on a countrywide basis). If the coefficient exceeds (or falls below) 100, the country considered is a net exporter (or an importer, respectively) of energy contained in agricultural products. In Poland, in 1990–1999, the coefficient of energetic self-sufficiency in food was 100; the average level for 2000–2009 was 101 but reached 104 in the 2004–2009 period. Also, according to the aforesaid study, Poland is one of four European Union countries who are at a level above 100 and experienced an increase in the coefficient of energetic self-sufficiency in food in 2000–2009 compared to 1990–1999 (Sadowski and Baer-Nawrocka, 2016).

MATERIAL AND METHODS

This study relied on reports available as part of the relevant literature on food security or included in legal acts issued in Poland and around the world. The calculations were based on available secondary data provided

by the Central Statistical Office. The study period was 2007–2016.

National food security was assessed using selected indices, as presented in the relevant literature, including by F. Kapusta (2016). As regards physical availability, the authors presented the per capita consumption level of basic food products, and then the domestic production volume and domestic consumption (which includes consumption by humans). This was the basis for calculating the food self-sufficiency level with the use of a widely adopted yardstick (Baer-Nawrocka, 2014; Kapusta, 2016) expressed as the degree to which the demand for agri-food products is met with domestic products. The surplus of production over consumption of selected agri-food products at country level informs of the capacity to feed a country's population. A positive net trade balance has an effect on the stability and reliability of supply; it reflects the country's strong position in foreign markets and means there is demand for that country's products in other countries. Economic availability of food was assessed based on the amount of disposable income (in PLN) and expenditure on food and soft drinks (in PLN), as delivered by the Central Statistical Office. This was the procedure for calculating the share of expenditure on food and soft drinks in total incomes across socio-economic groups. The results calculated for the last year covered by this study (2016) were compared against the base year (2007). Health suitability of a product (and of the diet as a whole) also has an impact on food security.

What matters in this context is the energy value of a diet and of particular nutrients, and the mutual relationships between nutrients. The reported values were compared against dietary standards for the Polish population, as published by the Food and Nutrition Institute.

RESULTS AND DISCUSSION

Physical availability of food

Physical availability of food is one of the conditions for establishing and maintaining food security. If food remains physically available in a country, one of the objectives of its food policy should be to maintain that situation for as long as possible. This is because the countries face a threat of becoming dependent upon imports of basic food products which supplant and reduce domestic production. Breaking out of that trap is very challenging because of the reluctance from both the consumers and food importers (Małysz, 2009).

Data in Table 2 shows the annual per capita consumption levels of basic food products in Poland in 2007–2016. It suggests that consumption of cereals and potatoes decreased throughout the analysis period while the consumption of milk grew steadily except for 2012 where it was one liter lower than the previous year. The fluctuations in the consumption level of other product groups are combined with either a downward trend (vegetables, meat, offal, animal fats, eggs) or an upward trend (fruits, sugar).

Table 2. Per capita consumption levels of basic food products in Poland in 2007–2016

Specification	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Cereal grains (preparations) (kg)	144	112	111	110	108	108	108	106	103	103
Potatoes (kg)	121	118	116	110	111	111	102	101	100	97
Vegetables (kg)	115	115	116	106	104	103	102	104	105	106
Fruits (kg)	41	55	56	44	42	46	46	47	53	54
Sugar (kg)	40	38	39	40	39	43	42	44	41	42
Meat, offal and animal fats (kg)	84	82	81	81	80	77	73	79	81	84
Cow's milk*(l)	179	182	187	189	194	193	206	205	213	222
Eggs (unit)	207	205	206	202	172	140	148	155	144	145

*Including milk for processing, excluding milk processed into butter.

Source: own calculations based on GUS, 2010b, p. 314; GUS, 2012b, p. 316; GUS, 2014b, p. 334; GUS, 2016b, p. 340; GUS, 2018b, p. 366.

The consumption of selected products may depend on both the domestic production volume and purchase prices. The decline in potato consumption in 2013 could result from a considerable change in price levels (an increase by PLN 0.62 per kg from the previous year) (GUS, 2015a). Lower volumes of domestic vegetable production in 2010 resulted in a decrease in vegetable consumption. Conversely, in 2014, the growth in production volumes caused another increase in consumption levels. In 2008, the increase in domestic fruit production largely contributed to consumption levels, resulting in a growth rate of 14 kg per capita per year. In turn, the decline which followed two years later entailed a reduction in the annual consumption volume (by 11.5 kg per capita). The largest increase in sugar consumption was recorded in 2014, the year where domestic sugar production reached the highest level recorded over the analysis period. As a consequence, the price dropped by PLN 1.1 per kg (GUS, 2015a). Changes in meat, offal and animal fat consumption also depend on domestic production volumes. In 2009–2011, the decline in milk prices contributed to an increase in milk consumption levels (GUS, 2011a; 2013a). In 2012, domestic production decreased from the previous year, translating into an increase in milk prices and lower consumption levels (GUS, 2015a). The drop in milk purchase prices recorded in 2015–2016 was also reflected in increased milk consumption (GUS, 2017a). The smallest volume of domestic egg production was recorded in 2012 where a PLN 0.15 increase in the price of chickens' eggs resulted in the largest drop in egg consumption levels (GUS, 2015a). Obviously, note that the consumption level may be affected by various other factors. This is especially true for food products which have a low income and price elasticity of demand.

The consumption level of basic food products, as presented in Table 2, does not directly reflect the level of food self-sufficiency (Table 3). This is because a part of agricultural production is not intended for consumption. This includes processing for non-food uses, losses, and a part of plant production which is intended either for sowing or for animal feed. Combined together, these uses constitute the domestic consumption category (Baer-Nawrocka, 2014). The importance of non-food uses is evident in the case of cereals: the domestic production in the analysis period did not once fall below 24 million tons; however, self-sufficiency was not maintained in 2011, and the consumption of cereals

subsequently declined year after year. Plant (cereal, potato, vegetable) production volumes are also subject to fluctuations which do not coincide with changes in consumption levels. If there is not enough food products, the country must either hold adequate stocks or maintain continuous supply of food from abroad (Kapusta, 2016).

When it comes to the first condition for food security at country level (i.e. physical availability of food in Poland in 2007–2016), it was satisfied for most product groups. In five of the groups analyzed, the condition was met each year; in two groups (sugar and cereals), the food self-sufficiency index was not in excess of 100% only once. In the other three product groups (fruits, pulses and vegetable fats and oils), the coefficient, considered on an annual basis, fell below 100% ($SS < 100\%$) several times. For fruits and pulses, it exceeds the threshold of food self-sufficiency from 2011 onwards and 2014 onwards, respectively. In some food product groups where food self-sufficiency was considerably higher than 100%, an opportunity emerges to export surplus product quantities (Kapusta, 2016).

Stability and reliability of food supplies

International trade in agri-food products is a proxy for assessing the stability and reliability of food supplies. Therefore, the necessary calculations of exports and imports of (and trade in) these products were made (Kapusta, 2016). A factor which encourages trade in agri-food products is the location of agricultural facilities which cannot be relocated without resulting in production changes. Moreover, natural conditions cannot be reproduced. This is what makes agriculture different from other sectors and has a favorable impact on international trade (Marks-Bielska et al., 2015). In Poland, international trade is primarily guided by agreements and measures implemented throughout the European Union. The accession to the EU had several advantageous effects, including efficiency improvements and modernization in the agri-food processing business (Lizińska, 2009). However, the first signs of changes in international trade were observed even before the accession, in 2003, where Poland recorded a trade surplus of EUR 447 million for the first time in 10 years. The inclusion of Poland in the single European market clearly had a stimulating effect on international trade in subsequent years (Pawlak and Poczta, 2011). After the accession to the customs union, the growing demand (from Europe and beyond) for Polish products resulted in a positive net trade being double

Table 3. Levels of food self-sufficiency in Poland illustrated by the example of selected product groups in 2007–2016

Specification		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1. Cereals	DP	25,318	25,738	28,020	25,088	24,255	24,413	24,262	27,325	24,741	25,344
	DC	24,382	24,781	25,318	24,945	24,982	23,621	22,707	21,952	21,306	21,194
	SS	103.8	103.9	110.7	100.6	97.1	103.4	106.9	124.5	116.1	119.6
2. Potatoes	DP	11,791	10,462	9,703	8,448	9,362	9,041	7,290	7,690	6,314	8,872
	DC	11,612	10,260	9,605	8,313	9,062	8,535	6,908	7,364	5,994	8,504
	SS	101.5	102.0	101.0	101.6	103.3	105.9	105.5	104.4	105.3	104.3
3. Vegetables	DP	5,710	5,203	5,601	4,878	5,575	5,430	4,986	5,607	4,795	5,610
	DC	5,091	4,745	5,183	4,574	5,092	5,057	4,809	5,144	4,728	5,446
	SS	112.2	109.7	108.1	106.7	109.5	107.4	103.7	109.0	101.4	103.0
4. Fruits	DP	1,684	3,826	3,646	2,744	3,415	3,843	4,128	4,189	4,100	4,654
	DC	2,282	3,870	3,707	3,245	3,406	3,341	3,696	3,953	4,049	4,465
	SS	73.8	98.9	98.4	84.6	100.3	115.0	111.7	106.0	101.3	104.2
5. Pulses	DP	288	231	222	192	308	324	357	430	665	599
	DC	303	249	244	202	314	328	364	429	632	573
	SS	95.1	92.8	91.0	95.1	98.1	98.8	98.1	100.2	105.2	104.5
6. Sugar	DP	1,934	1,351	1,674	1,629	1,963	1,996	1,952	2,070	1,867	2,214
	DC	1,485	1,315	1,272	1,647	1,325	1,366	1,357	1,599	1,345	1,275
	SS	130.2	102.7	131.6	98.9	148.2	146.1	143.9	129.5	138.8	173.6
7. Vegetable fats and oils	DP	570	653	816	790	623	650	918	1,100	1,081	1,094
	DC	893	879	997	1,098	1,048	953	1,063	1,110	1,165	1,486
	SS	63.8	74.3	81.9	72.0	59.5	68.2	86.4	100.0	92.8	73.6
8. Meat, offal and animal fats	DP	3,847	3,670	3,577	3,881	3,979	4,049	4,087	4,464	4,763	5,085
	DC	3,374	3,256	3,220	3,206	3,236	3,115	2,961	3,216	3,301	3,413
	SS	114.0	112.7	111.1	121.1	123.0	130.0	138.0	138.8	144.3	149.0
9. Milk	DP	11,744	12,063	12,085	11,921	12,052	12,299	12,348	12,607	12,859	12,867
	DC	9,623	9,808	10,198	10,133	10,166	10,198	10,941	10,746	11,045	10,694
	SS	122.0	123.0	118.5	117.7	118.6	120.6	112.9	117.3	116.4	120.3
10. Eggs	DP	556	590	614	637	587	538	564	577	590	598
	DC	448	467	481	492	428	350	339	372	349	350
	SS	124.1	126.3	127.7	129.5	137.2	153.7	166.4	155.1	169.1	170.9

DP – domestic production (thousand tons, except for milk: million liters); DC – domestic consumption (thousand tons, except for milk: million liters); SS – self-sufficiency degree (%).

Data for plant products is as recorded in 2007/2008, 2008/2009, 2009/2010, 2010/2011, 2011/2012/, 2012/2013, 2013/2014, 2014/2015, 2015/2016.

Source: own calculations based on: GUS, 2010b, pp. 299–305, 310; GUS, 2012b, pp. 301–307, 312; GUS, 2014b, pp. 319–325, 330; GUS, 2016b, pp. 325–331, 336; GUS, 2018b, pp. 351–357, 362.

Table 4. Poland's international trade in agri-food products in 2007–2016 (EUR million)

Specification	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Exports	10,089	11,692	11,500	13,507	15,228	17,893	20,427	21,877	23,887	24,332
Imports	8,071	10,277	9,299	10,921	12,628	13,557	14,313	15,134	16,068	17,292
Net trade	2,019	1,415	2,200	2,586	2,599	4,336	6,115	6,742	7,818	7,040

Source: own calculations based on: SWAID (n.d.).

that recorded the previous year. This great performance was possible because the entire agri-food industry was better prepared than expected for being part of the single European market (Pawlak, 2014).

Export and import figures for agri-food products, as published by the Central Statistical Office through the Analytic Platform of the Analysis and Decision-Aiding System (Knowledge Databases), imply that Poland experienced steady growth in international trade in agri-food products over the 2007–2016 period, except for a decline in 2009 (Table 4).

The decline was caused by the global economic crisis which contributed to a drop in demand in European countries. Compared to 2008, exports and imports declined by 1.65% and 9.52%, respectively. However, the slowdown in international trade in agri-food products did not last long; growth in exports and imports was re-established just one year later. Note also that from 2003 until the end of the study period (2016), Poland had a positive net trade (Pawlak, 2014). In the years covered by this study, exports grew by more than EUR 14 billion, translating into a growth rate of as much as 141% for the 2007–2016 period.

In turn, imports grew by more than 114%. In relation to total international trade, trade in agri-food products slightly declined in 2010–2011 because of the increase in prices of food and agricultural raw materials in the global market (Marks-Bielska et al., 2015). In the remaining years (2007–2009, 2012–2016), the respective shares of agri-food exports and imports in total exports and imports grew more or less rapidly. In 2007–2016, Polish agri-food exports and imports were observed to grow by 135.86% and 139.91%, respectively.

As shown by the analysis, the second condition for food security was satisfied. Agri-food imports and exports grew considerably over the study period. With a persistently positive net trade, Poland is positioned as a net exporter of agri-food products.

Economic access to food

The yardstick for the third condition of food security is the amount of disposable income. This means that consumers must have enough purchasing power to buy the essential foods. The purchasing power is determined by consumer incomes and prices of food and other goods and services available in the market (Małysz, 2009). Household income is the economic basis for the household's survival, and is determinant for the standards of living of household members and for the degree to which their food needs are addressed (Kwasek, 2012). In poor households, food may be considerably less economically available than in other ones, making it challenging to access food (Mikuła, 2012). At low or extremely low levels of income, focus is placed on meeting the basic needs. As the household income increases, household members start to address higher-order needs which can be satisfied only after the basic needs are met. The higher the disposable income, the smaller is the share of food expenditure. The following pattern can be observed: as the household income increases, the share of food expenditure declines; the share of residential charges remains relatively stable; and the share of expenditure on higher-order needs increases (Chmielewska, 2015).

Addressing new needs involves changes in food consumption. Household members decide to buy more southern fruits, fruit and vegetable juice and potato products. Also noticeable is the considerable increase in the consumption of fish and fish products, butter and semi-cured cheeses. The consumption of meat and meat products, eggs and vegetable oils also increases. Also, there is a slight increase in the consumption of pasta, sugar or preserved meat. Conversely, as the incomes grow, the consumption of animal fats, bread, flour, potatoes and margarine decreases in favor of products listed above. The diet of poor household members often includes the cheapest, poor-quality foods. Also, they eat smaller rations of these products. As the income increases, food

rations grow and improve in quality; as a consequence, the meals have more nutritional value (Gulbicka and Kwasek, 2006). In 2007, the average disposable household income per capita was PLN 928.87, and increased to PLN 1,474.56 in 2016 (Table 5). Throughout the study period, below-average incomes were recorded in farmer households where the disposable income per capita was, on average, 17.22% lower than the total disposable income. Above-average incomes were reported in self-employed households (a per capita income 24.38% above the average). Since 2008, employee households

have also demonstrated an increase in disposable income per capita, exceeding the average level for all household groups in the years studied.

In 2007–2016, the average monthly expenditure on food and soft drinks was PLN 251.46 per capita. Below-average expenditure was reported in farmer households whereas self-employed households and pensioner households incurred above-average expenditure. Note that as regards pensioner households, the monthly disposable income per capita did not exceed the average level for all Polish households in some years, whereas

Table 5. Average disposable incomes and expenditure on food and soft drinks in Polish households in 2007–2016

Specification	Year	Households				
		Total	Employee households	Farmer households	Self-employed households	Pensioner households
Disposable income (PLN)	2007	928.87	915.17	846.76	1,251.07	937.63
	2008	1,045.52	1,049.84	887.35	1,338.51	1,031.94
	2009	1,114.49	1,123.30	884.01	1,396.47	1,116.30
	2010	1,192.82	1,199.22	1,024.53	1,468.38	1,180.82
	2011	1,226.95	1,243.84	983.88	1,497.43	1,233.08
	2012	1,278.43	1,289.16	1,091.55	1,536.68	1,297.90
	2013	1,299.07	1,305.88	1,156.13	1,581.05	1,328.65
	2014	1,340.44	1,349.12	1,050.85	1,631.64	1,382.32
	2015	1,386.16	1,386.87	1,046.17	1,739.48	1,509.50
	2016	1,474.56	1,494.79	1,151.28	1,792.33	1,498.78
Expenditure on food and soft drinks (PLN)	2007	215.77	201.31	213.78	230.20	250.50
	2008	231.14	216.03	226.91	242.73	270.64
	2009	240.08	223.84	236.10	250.61	283.13
	2010	246.14	229.96	238.85	253.56	292.70
	2011	254.13	238.69	243.22	258.89	301.62
	2012	263.85	247.44	249.87	273.14	312.98
	2013	264.36	248.81	246.99	273.40	314.88
	2014	263.34	246.80	247.73	271.70	314.54
	2015	262.32	246.27	243.84	268.91	314.60
	2016	273.49	257.92	256.81	274.29	327.26

Source: GUS, 2008a, p. 62, 86; GUS, 2009a, p. 76, 104; GUS, 2010a, p. 72, 100; GUS, 2011a, p. 80, 112; GUS, 2012a, p. 83, 115; GUS, 2013a, p. 76, 108; GUS, 2014a, p. 100, 132; GUS, 2015a, p. 100, 132; GUS, 2016a, p. 100, 116; GUS, 2017a, p. 112, 144.

their expenditure on food and soft drinks did exceed the countrywide average level every year. Interestingly, that group did not consume much more food. The reason for the higher costs of food may be the place where the elderly do their shopping. Usually, they opt for small shops and neighborhood stores where prices are only slightly higher. But when compared to food prices in supermarkets, this explains the difference in the monthly expenditure on food and soft drinks. The smaller the disposable income of a household, the greater the share of food expenditure. In self-employed households—who recorded the highest monthly disposable incomes—the average expenditure on food and soft drinks was 16.95% of incomes in 2007–2016. In farmer households—who recorded the lowest monthly disposable incomes—the average monthly expenditure on food in the years studied was 23.28%. In turn, pensioner households had the greatest share of food expenditure in disposable incomes (23.86%).

In each group, a decrease could be observed in the share of expenditure on food and soft drinks in household disposable income. Over the 2007–2016 period, the largest relative decrease in the share of food expenditure in disposable incomes was recorded in farmer households (from 25.25% to 17.08%), followed by employee households (from 21.99% to 16.88%). A slightly smaller relative drop was observed in pensioner households (from 26.72% to 21.65%); a decrease by less than 4 percentage points was reported by self-employed households (from 18.40% to 14.91%). Note also that disposable incomes and expenditure on food and soft drinks differ not only between but also within household groups, and the figures above are average amounts. It is also worth mentioning that absolute poverty still exists in Poland. On top of that, this study found that ca. 5% of households are unable to afford a meal consisting of meat or fish every second day¹.

Health suitability of a single product

Health suitability of a single product affects food safety which, in turn, has an effect on food security at household level. Pursuant to the Food and Nutrition Safety Act, “food safety is determined by a complete set of conditions to be complied with, especially with respect to: additives and flavors, pollutant levels, pesticide residue, food irradiation conditions, organoleptic characteristics

and measures that must be taken at all stages of food production and marketing” (Journal of Laws [Dz.U.] of 2006, No. 171, item 1225, as amended). In turn, FAO defines food safety as “assurance that food will not cause harm to the consumer when it is prepared and/or consumed according to its intended use” (FAO Codex). In order for all food safety requirements to be complied with, health suitability must be assured in respect of a single product (to make it contaminant-free) and of the food ration consumed, so that it supplies the energy and essential nutrients in adequate quantities to avoid under- or overconsumption (Małysz, 2009).

A related term, the daily energy requirement of a human body is the amount of energy supplied in food within a day. That amount is necessary to balance the daily energy expenditure of a healthy, well-nourished individual. When maintained at a level appropriate for his/her age, it enables preserving good health and adequate body weight and composition. It also enables carrying out daily tasks and promotes optimum growth and development for children (Jarosz, 2017).

Human energy requirements are an individual thing. The optimum amount of energy depends on various factors. Therefore, the existing energy intake standards are average figures for people grouped by age or other criteria. Factors affecting the energy expenditure and the required energy intake include (Jarosz, 2017): body weight and composition, gender, age, growth (in children), pregnancy, ethnic factors, environmental factors, physical activity, endocrine factors and medications.

Based on the analysis of the energy value of diets in Poland (Table 6), no clear conclusions can be made as to whether the energy value decreased. Slight variations can be observed over the years. However, the values differ across socioeconomic groups considered. The highest levels were reported in pensioner households (an energy value above 2,400 kcal per day), followed by farmer households and self-employed households. The lowest energy value of diets was observed in employee households. These are average figures not disaggregated by age, daily physical activity, gender or body weight. Therefore, the available data does not provide grounds for concluding clearly whether the diets have sufficient energy value. Dietary standards for the Polish population take more factors into consideration, and hence specify more precisely the daily energy requirement which varies in the range of 550 kcal

¹ See: EUROSTAT, 2019.

Table 6. Average daily consumption converted into energy value. Nutrient consumption per capita across socioeconomic groups in Poland in 2007–2016

Specification	Households*	Year									
		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Energy value (kcal)	1	2,208	2,373	2,365	2,340	2,279	2,287	2,187	2,280	2,217	2,153
	2	2,063	2,210	2,206	2,191	2,140	2,146	2,061	2,149	2,092	2,032
	3	2,364	2,607	2,554	2,512	2,372	2,373	2,245	2,303	2,176	2,151
	4	2,080	2,236	2,224	2,210	2,134	2,172	2,087	2,177	2,117	1,998
	5	2,498	2,721	2,711	2,681	2,604	2,594	2,481	2,564	2,518	2,471
Nutrients (g)											
Total proteins	1	66	74	75	74	73	73	71	74	74	76
	2	62	69	70	70	68	68	68	71	69	71
	3	71	80	79	78	74	73	72	73	72	72
	4	66	72	72	73	71	71	70	73	71	72
	5	75	84	84	85	82	81	82	84	84	86
Fats	1	98	99	99	99	97	97	90	94	92	92
	2	91	92	91	92	91	91	84	88	87	87
	3	103	105	103	102	97	97	88	89	86	87
	4	93	94	93	93	91	92	85	88	87	86
	5	112	114	115	115	113	113	104	107	108	108
Carbohydrates	1	265	291	288	283	272	273	259	269	260	256
	2	248	270	269	265	255	256	244	254	246	242
	3	288	330	321	315	296	296	278	287	271	269
	4	246	267	266	262	251	256	242	253	246	236
	5	297	334	329	321	310	307	290	299	291	288

*1 – total; 2 – employee households; 3 – farmer households; 4 – of the self-employed households; 5 – pensioner households. Source: own calculations based on: GUS, 2009c, p. 300; GUS, 2011c, p. 335; GUS, 2013c, p. 291; 2014c, p. 308; GUS, 2017c, p. 310, GUS, 2019c, p. 312.

to 2850 kcal per day for infants, children and adolescents. For women and men, the respective intervals are 1450 kcal to 3850 kcal per day and 1600 kcal to 4750 kcal per day, depending on age and daily physical activity (Jarosz, 2017).

Total proteins mean vegetable proteins and animal proteins. As shown by data published by the Central Statistical Office, the population consumed more animal protein than vegetable protein in the study period. The highest total consumption of proteins in 2007–2016

was reported by pensioner households and the lowest by employee households (who never exceeded the general protein consumption level recorded for all socioeconomic groups combined). When it comes to fat and carbohydrate consumption, the lowest and the highest levels were recorded in exactly the same household groups, i.e. employee households and pensioner households, respectively. Note the decreasing consumption of fats and carbohydrates and the increase in total protein consumption over the 2007–2016 period.

Table 7. Share of different nutrients in the general diet in Poland in 2007–2016

Nutrients	Energy mix (%)									
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total proteins	11.97	12.59	12.80	12.76	12.96	12.94	13.33	13.35	13.68	14.10
Fats	39.98	37.90	38.03	38.42	38.75	38.68	38.03	38.14	38.26	38.40
Carbohydrates	48.05	49.51	49.17	48.81	48.29	48.38	48.64	48.51	48.06	47.50

Source: own calculations based on: GUS, 2009c, p. 300; GUS, 2011c, p. 335; GUS, 2013c, p. 291; GUS, 2015c, p. 308; GUS, 2017c, p. 310; GUS, 2019, p. 312.

The dietary standard for the Polish population also specifies the composition of the daily diet which should include from 10% to 20% of proteins, 20% to 35% of fats and 40% to 80% of carbohydrates (Jarosz, 2017). In 2007–2016, the energy mix consumed by the whole Polish population was not always well balanced and failed to meet the consumption standards (Table 7). In each year covered by the analysis, the share of energy from fats in the daily diet exceeded the recommended level of 35%. In turn, the consumption of proteins and carbohydrates was at the lower limit of recommended consumption levels. From a quantitative perspective, the consumption of different nutrients does not reflect the energy consumption mix inside particular groups. Just as in the case of the energy value of diets, average figures are presented for nutrient consumption. This means that members of the same socioeconomic group may considerably differ in consumption levels. This is because the composition of an individual's daily diet depends not only on his/her financial standing but also on informed dietary choices he/she makes every day.

Throughout the analysis period, the largest share of energy from total proteins (14.36% in 2016) was recorded in self-employed households. Conversely, the lowest shares were observed in farmer households. The share of energy from fats, as provided for in dietary standards, was exceeded in each socioeconomic group, mostly in pensioner households (39.38% in 2016) and to the smallest extent (this time, too) in farmer households. The largest share of energy from carbohydrates was observed in farmer households (over 50% in 2008–2016). In other socioeconomic groups, it varied in the range of 46.68% to 49.52%, with the lowest rate being recorded in pensioner households.

CONCLUSIONS

The purpose of this study was to assess the dynamics of food security in Poland. The analysis period was 2007–2016. As shown by the calculations, Poland is self-sufficient in basic agri-food products. Shortages can only be identified in such product groups as vegetable fats and oils. Four conditions need to be met jointly to make the country food secure. The indices calculated for each condition allow for concluding that in the study period, Poland had a surplus of production over consumption which provides new export opportunities; had positive net trade in agri-food products; witnessed a declining share of agri-food expenditure in total expenditure which suggests an improvement in the households' economic standing; and recorded a decrease in the energy value of the population's diet, accompanied by an excessive share of energy from fats. In summary, while Poland remains generally food secure, it does not mean this situation is equally beneficial to all Polish residents. Furthermore, the health suitability of the diet consumed by households poses some minor problems because of an excessive part of energy from fats. Note that the data presented in this paper are average figures. Therefore, potential threats and the need to take preventive measures should be kept in mind. It should be also considered that food security of Poland or any other country depends on many environmental factors affecting climate change.

SOURCE OF FINANCING

This paper was financed with funds of the Student's Scientific Club of Economic Thought, Department of Economics and Social Sciences at the Poznań University of Life Sciences.

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