7.

The Economic Environment of Polish Agriculture in the Period Following the Transformation of the Socio-Economic System

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Introduction

The development of agriculture is conditioned by the state of the socio-economic environment. Contemporary agriculture evolves in the same manner, being influenced both by external impacts stemming from the environment and by internally generated impulses of a sectoral nature. A significant factor in its development becomes the international context, resulting from the processes of advancing economic integration and globalisation. Agriculture is intricately interwoven within the realms of the global agricultural market, international competition, and endeavours pertaining to global food security, environmental and biodiversity protection, as well as climate change mitigation. Henceforth, novel challenges emerge for agriculture and farming establishments, necessitating cogent responses. This endeavour is not facile, given the volatility of markets, shifts in geopolitical landscapes, and the dwindling of resources. Therefore, when addressing the matter of property

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transformations within Polish agriculture, it is prudent to delineate past experiences in this domain, ascertain the trajectories of change, and trace the evolution and condition of the external (international) and internal (domestic) contexts of Polish agriculture.

7.1. Challenges Stemming from the External Environment of Polish Agriculture

The fundamental goal of agriculture is to provide sustenance for the population. Thus, for centuries, the challenge has been to ensure, through expanding agricultural land and increasing its productivity, the supply of food for a growing populace. The first considerations regarding the potential emergence of a global natural growth boundary are associated with Malthusian population theory, from which evolutionary economic theory also draws (Bartkowiak, 2010). In the 19th century, serious concerns arose that population numbers would outpace food production capabilities. While these apprehensions proved unfounded, the persistently rising global population prompts a re-evaluation of the question of sufficient agricultural production.

By the 1950s, the world's population had reached 2.5 billion. Since then, a continuous increase at a rate of approximately 80 million per year has been observed. In 2021, the estimated global population stood at 7.9 billion, surpassing 8 billion in 2022. Further growth is projected, at least to 10 billion individuals by the year 2050.

A significant trend in population evolution is the shift in demographic structure between urban and rural areas. In the 1950s, the rural population accounted for 70%, decreasing to only 43% in 2021. This situation demands not only increased agricultural production efficiency but also the prevention of losses in the supply chain: processing, transportation, storage, and distribution of prepared food. Due to inevitable, inherent levels of loss, the quantity of food produced must grow even more rapidly than the population.

Another issue concerns changes in living standards. As prosperity increases, there is a tendency to incorporate a greater proportion of animal products into diets. The demand for meat in developing countries could rise by as much as 100% by 2050 compared to current levels (Runowski, Wicki, 2017). Some protein sources of the future are seen in the cultivation of edible

insects and aquatic organisms (Bueschke et al., 2017), which could mitigate emissions from agriculture. Agriculture's contribution to global greenhouse gas emissions is around 18%, and in 2018, this amounted to 9.3 gigatons in CO_2 equivalent (FAO, 2020). Emissions related to animal production were increasing three times faster than those from plant production. A positive trend is that greenhouse gas emissions per unit of agricultural output have been decreasing, for example, in EU countries, there was a reduction of about 0.7% annually (Wicki, Wicka, 2022).

From 1961 to 2020, the global agricultural land area increased by 7.5% to 4.8 billion hectares, and the arable land area increased by 9% to 1.4 billion hectares, indicating much lower dynamics compared to population growth. This was possible due to progress leading to increased land resource productivity and enhanced production intensity in agriculture.

One general indicator of land productivity is the agricultural land area per capita. From 1960 to 2020, the agricultural land area per capita globally decreased at a rapid pace, even at 1.4% annually, and the arable land area decreased at a rate of 1.5% annually. In the 1960s, per capita agricultural land was 1.4 hectares, and arable land was 0.41 hectares. By 2020, these figures had decreased to only 0.6 hectares of agricultural land and a mere 0.18 hectares of arable land per capita. This signifies that production from a single hectare of arable land has more than doubled.

Table 7.1. Indicators of Changes in Selected Metrics Associated with Global Food Production and Demand

Itemisation	Quantity in years			State in 2020 in relation to:		Average general change in the years 1990-2020
	1961	1990	2020	1961=100	1990=100	
Total population (millions)	2499	5316	7909	258	149	1.30%
Rural population (millions)	1785	3041	3417	168	112	0.30%
Urban population (millions)	751	2290	4458	422	195	2.20%
Agricultural land (millions of hectares)	4441	4786	4772	108	100	-0.04%
Arable land (millions of hectares)	1272	1370	1387	109	101	0.06%
Area of agricultural land per person in hectares	1.45	0.90	0.61	42.1	67.6	-1.33%
Area of arable land per person in hectares	0.41	0.26	0.18	42.7	68.6	-1.23%

Source: own elaboration based on data from FAOSTAT.

To the most significant inputs for crop yield enhancement belong those of chemical origin – mineral fertilisers and pesticides. They play an important

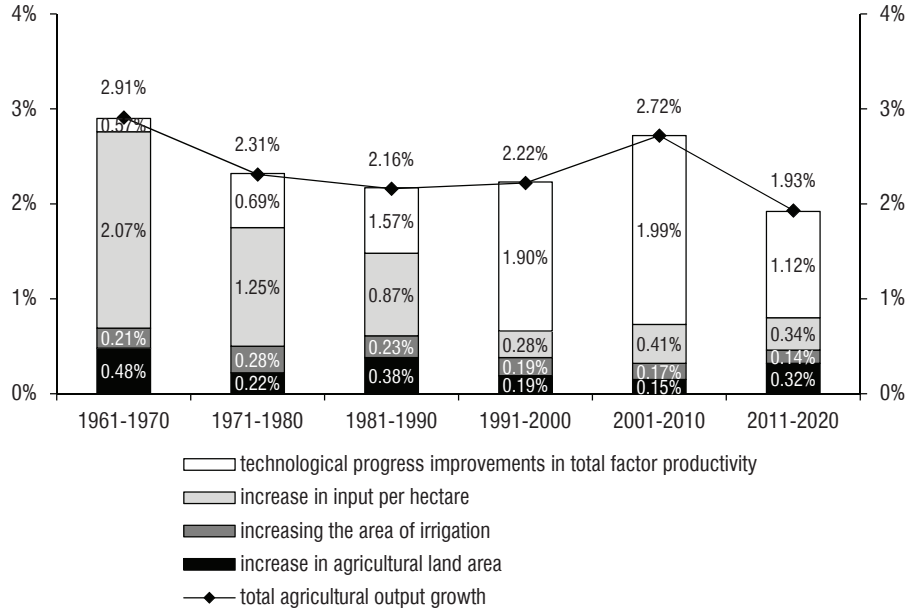
role in production growth, ranking second only to the quantity and quality of cultivated land. The extent of agricultural land is limited, yet inputs of chemically derived production agents can be significantly augmented. From 1960 to 2020, global consumption of synthetic fertilisers increased from approximately 40 million tons of NPK to over 190 million tons of NPK, representing a fivefold escalation.

The utilisation of synthetic fertilisers in agriculture exhibited the most rapid surge in Asia. From 1960 to 2020, it expanded 21-fold, escalating from around 5 to 110 million tons annually. In the Americas, fertiliser consumption increased by 360% during this period, while in Africa, it rose by 670%, and in Europe, a modest 20%. In 2020, approximately 56% of global synthetic fertiliser consumption was attributed to Asia, 26% to the Americas, 8% to Europe, and a mere 4% to Africa.

Complete data for pesticide consumption are available only from 1990 onwards. From 1990 to 2020, global pesticide usage surged from 1.7 to 2.7 million tons annually, signifying a 58% increase. This trend should be considered in conjunction with the development of new active substances and the reduction in pesticide application per treatment. The most notable upswing in pesticide consumption was observed in the Americas, soaring by a remarkable 111%. This was partly attributable to the proliferation of genetically modified soy and maize crops. Asia experienced a growth of 37%, while Africa's increase stood at 82%. Solely the European Union recorded a decline in pesticide consumption, decreasing by 4% from 1990 to 2020. In the early 1990s, the majority of pesticides were utilised in the Americas (36%), followed by Europe and Asia (both 30%), while Africa accounted for a significantly smaller share (4%). By 2020, pesticide consumption in the Americas had surged to 51% of the total, with Asia accounting for 25%, and Europe's share diminishing to 18%.

Agricultural production growth is achieved through both input augmentation and technological advancement (i.e., improved resource utilisation). During the 1970s and 1980s, agricultural production growth was derived 75% from input augmentation, primarily fertilisers and cultivated area, and 25% from technological progress. After 2000, agricultural production increased at an annual rate of 2.45%, with 75% attributed to technological advancement (Fuglie, 2018; Wicki, 2021). Following 2010, the momentum of agricultural production growth abated, with technological progress retaining its foremost significance (Figure 7.1).

Figure 7.1. Sources of Growth in Global Agricultural Production (average annual change in the indicated periods)



Source: own elaboration based on data from USDA (USDA 2022).

Research and development activities in agriculture are often underappreciated, as immediate investment outcomes are typically expected. However, several years are required before investments in agricultural research begin to influence its productivity, given that after the creation of new technology and its market introduction, numerous years are necessary for practical dissemination (Alston et al., 2022).

Another aspect, presently less frequently addressed, pertains to the emergence of competition for land resources to produce agricultural raw materials, allocating them for food production or energy generation. Up to 5% of these resources might be allocated for energy production, yet it remains unclear whether this leads to reduced food availability and price escalation (Bentivoglio, Rasetti, 2015; Wicki, 2017; Zilberman et al., 2013). In Poland, as much as 5.6% of arable land has been allocated for cultivating energy crops (Wicki, 2017).

The primary challenges for agriculture stem from escalating food demand, driven by the world's growing population. Another demand-related factor is

the dietary structure shift accompanying rising incomes, favouring a greater proportion of animal-derived products, primarily meat. Historically, agricultural production growth was predominantly achieved through intensification, yet technological progress has increasingly played a pivotal role, accounting for up to 75% of agricultural production growth in recent decades. Environmental conservation now presents a new challenge, encompassing both local and global greenhouse gas emissions. The unavoidable link between production growth and heightened emissions from agriculture becomes more pronounced with greater reliance on animal production.

In highly developed countries, neither strong demographic pressure nor food scarcity prevail. A trend towards reducing production intensity and volume is observed, leading to diminished environmental strain from agriculture. Such actions, however, may not be tenable in regions with rapidly growing populations and food scarcity. Consequently, the future calls for further augmentation of global food production. Polish agriculture should endeavour to play a significant role in this process.

7.2. Challenges Arising from the Domestic Environment of Polish Agriculture

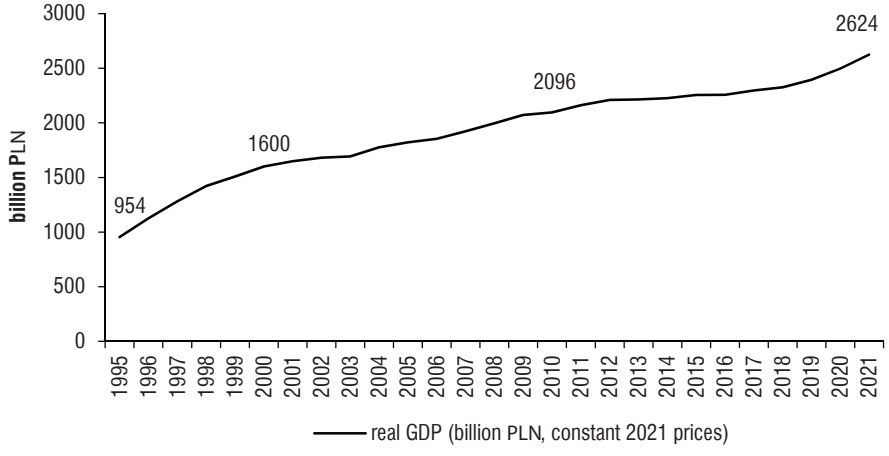
The changes observed in Polish agriculture result from certain developmental processes, the causal factors of which emanate from both within and outside the sector. Therefore, it is worthwhile to commence by presenting significant external factors and illustrating the directions and dynamics of changes in agricultural production, its efficiency, and structure.

One of the pivotal factors influencing food demand is the number of consumers. Poland is home to 38 million individuals. Since 1990, the population count has remained nearly constant, notwithstanding minor fluctuations. However, there has been a shift in the labour force participation rate. In 1990, there were 16.5 million individuals employed, which diminished to 14.8 million in 2020. The lowest number of employed individuals was observed post-2000, when only 12.6 million people were engaged in work.

Unemployment declined from over 15% between 2000 and 2006 to below 5% after 2018. The growth in economic activity and income contributes to a certain increase in consumption, including food consumption.

The period under consideration was marked by consistent real growth of the Polish economy. Gross Domestic Product (GDP) increased by over two and a half times from 1995 to 2021, reaching over 2.5 trillion PLN in 2021 (Figure 7.2). The average annual growth rate of real GDP amounted to a remarkable 2.93%. Economic growth led to an augmentation in labour demand, migration of a portion of the population from agriculture, and an elevation in the standard of living as measured by GDP per capita. In real terms (at 2021 prices), GDP per capita during the described period increased from 25,000 to 69,000 PLN, signifying an almost threefold rise. The growth rate stood at 2.91% annually in real terms. This facilitated an upswing in food demand, including animal-derived and highly processed products. Indirectly, farmers also benefited from this growth, although such impacts were more discernible in a distinct agribusiness subsector – food processing (Grontkowska, Wicki, 2015).

Figure 7.2. Gross Domestic Product in Poland from 1995 to 2021 (constant prices of 2021)

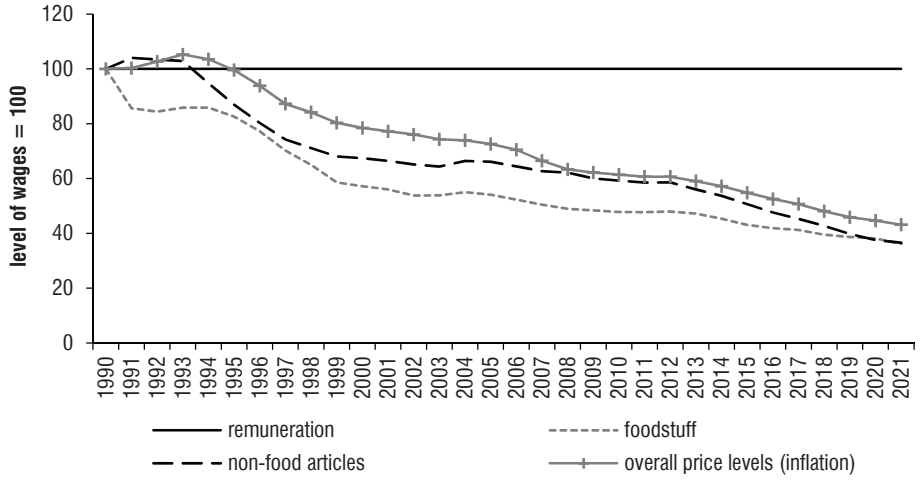


Source: own elaboration based on data from the Central Statistical Office (GUS).

In Figure 7.3, the dynamics of prices for major product groups are presented in comparison to wage dynamics. The purchasing power of wages relative to the basket of products increased by almost 2.4 times from 1990 to 2021, with the purchasing power growth in relation to food exceeding 2.5 times (Runowski, 2014). This signifies that agriculture, as a producer of food, benefited to a lesser extent from the citizens' enrichment compared to other sectors of the economy (Kisielińska, 2018). Agriculture, being a traditional

and resource-based economic sector, has historically reaped a lesser share of prosperity growth compared to other sectors.

Figure 7.3. Price Dynamics in Poland in Relation to Wage Dynamics, with the Level of Wages set at 100



Source: own elaboration based on data from the Central Statistical Office (GUS).

Against the backdrop of changes in the Gross Domestic Product level and wage relations, it is worthwhile to discuss the most significant trends in food consumption. Table 7.2 illustrates alterations in the consumption of major food product groups in Poland from 1990 to 2021. During the years 1990 to 2021, the consumption of cereal grains in grain products decreased from approximately 120 kg per capita to 101 kg per capita (by about 13%). A far greater decline was observed in potato consumption, which reduced from 140 kg to approximately 95 kg per capita (a decrease of 34%). A different scenario unfolded concerning animal products and sugar. Meat consumption per capita increased by 8% during the analysed period, reaching 75-80 kg annually. Similarly, milk consumption rose by over 4% to 250 litres per capita. Yearly sugar consumption escalated by nearly 10% to 42 kg per capita.

The proportion of processed and ready-to-eat products in consumption increased, those with higher consumable suitability (Seremak-Bulge, 2016). This pertained to both grain products, those derived from potatoes, as well

Table 7.2. Annual consumption of selected food products in Poland from 1990 to 2021 per capita

Year	Annual consumption of selected agricultural products per capita:				
	crops	potatoes	total meat	milk	sugar
	kg/per person	kg/per person	kg/per person	litre/per person	kg/per person
1990	115	144	68.6	241	44.1
1991	116	140	73.2	231	35.4
1992	119	144	70.3	217	36.3
1993	122	147	67.5	209	41.3
1994	120	136	62.6	202	39.4
1995	120	135	63.4	195	41.9
1996	120	135	64.7	196	39.7
1997	120	134	61.7	194	43.7
1998	119	135	64.7	205	41.7
1999	119	131	66.8	196	42.5
2000	120	134	66.1	193	41.6
2001	121	131	66.6	187	41.2
2002	120	131	69.5	182	43.6
2003	120	130	72.1	181	40.5
2004	120	129	71.5	174	37.0
2005	119	126	71.2	173	40.1
2006	117	121	74.3	176	35.2
2007	114	121	77.6	179	39.3
2008	112	118	75.3	182	38.4
2009	111	116	75.0	187	38.8
2010	108	110	73.7	189	39.9
2011	108	111	73.4	194	39.4
2012	108	111	71.0	193	42.5
2013	108	102	67.5	206	41.9
2014	106	101	73.6	205	44.3
2015	103	100	75.0	213	40.5
2016	103	97	77.6	222	42.3
2017	102	96	74.6	218	44.5
2018	101	95	80.2	221	47.0
2019	101	92	75.9	225	42.1
2020	102	94.3	78.1	246	42.9
2021	101	94.8	75.1	251	41.8
Dynamics					
2021 (1990=100)	86.9	65.7	108.0	104.8	109.5
2021 (2000=100)	84.2	70.7	113.6	130.1	100.5
2021 (2010=100)	93.5	86.2	101.9	132.8	104.8
Average yearly dynamics					
1990-2021	-0.64%	-1.55%	0.54%	0.23%	0.24%
2000-2021	-1.02%	-1.96%	0.53%	1.49%	0.47%
2010-2021	-0.76%	-1.73%	0.76%	2.42%	0.64%

Source: own elaboration based on data from the Central Statistical Office (GUS).

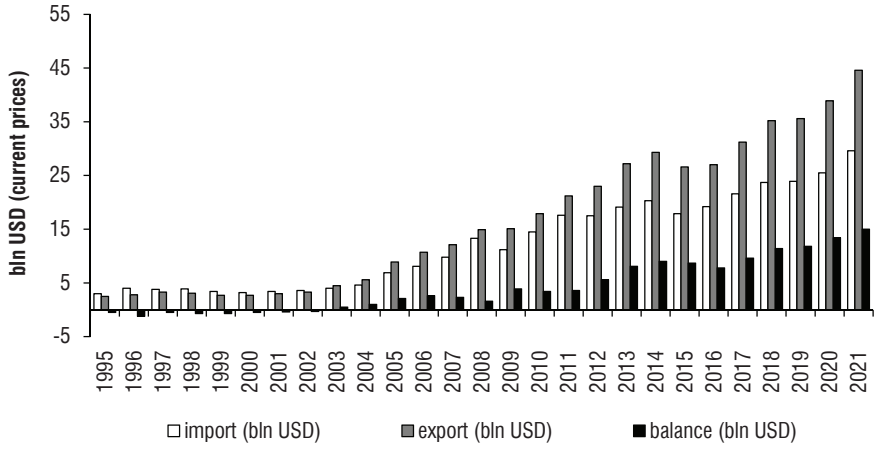
as dairy and meat products. For instance, the direct consumption of sugar remained relatively stable. However, Poles consumed more sugar through processed food products and beverages. Consumers declare their intent to limit processed food consumption (Staniewska et al., 2016), although these intentions have not translated into macro-level outcomes.

Agriculture primarily benefited from the growth in food demand due to the possibility of selling a larger volume of production, and only subsequently from changes in prices of sold agricultural products, which arose from the increased share of processing in the value chain of the food sector (Grontkowska, Wicki, 2015).

Another factor influencing the agricultural situation during the described period is the foreign trade of agri-food products, its volume, and balance. Until 2002, negative trade balances were observed, mainly due to restrictions in market access, including those of European Union countries. From 2003 onwards, the trade balance became positive and increased significantly. Export turnover grew from around USD 5 billion in 2005 to nearly USD 45 billion in 2021. The share of agri-food product trade in Poland's exports was approximately 8% from 2000 to 2004, and it increased to about 13% from 2013 onwards, maintaining this level. The positive trade balance in agri-food product trade reached USD 15 billion annually (Figure 7.4). The surplus in foreign trade proved to be enduring. Its foundation lay in market access and the competitiveness of Polish agribusiness in supplying mainly processed products (Cieślik, 2021; Kraciński, Wicki, 2020; Stańko, Mikuła, 2021; Strojny, 2018). Agriculture could increase production volume not only due to domestic demand growth but also due to export growth. Among the major domestic products, there were no advantages or surpluses in pork trade (Stańko, Mikuła, 2019).

The changes observed in the agricultural environment have contributed to its development. This encompassed both the rise in societal prosperity stemming from economic growth and the reduction of unemployment rates. Positive influences were also exerted by shifts in the dietary habits of Poles, who increasingly favoured more processed and animal-derived products. The dismantling of trade barriers, both tariff and non-tariff, following integration with the European Union, also played a significant role.

Figure 7.4. Poland's Foreign Trade in Agri-Food Products from 1995 to 2021



Source: own elaboration based on data from the Central Statistical Office (GUS).

Conclusion

Alterations in the agricultural environment are an inherent phenomenon. Their impact on agriculture is currently far more pronounced than it was several decades ago. Local-scale competition has evolved into a global-scale rivalry. Simultaneously, the scale of challenges emanating from both external and internal environments is expanding. The turbulence of observed environmental changes is on the rise, characterized by their dynamism and, at times, unpredictability. Non-renewable resources are being depleted, arable land and cropland per capita are diminishing, and unfavourable climate changes are progressing. Concurrently, the global population is rapidly increasing, incomes are growing, and interest in animal-derived products is on the rise, albeit with substantial spatial variations. Demand for agricultural and food products is on an upward trajectory.

In the perspective of forthcoming decades, ensuring an adequate level of food security is expected to become increasingly difficult, particularly in the presence of conspicuous continental disparities. Oversupply of food production is evident on some continents, while others grapple with glaring shortages, often resulting in malnutrition or even famine. Food losses and wastage prevail across the board, though at different stages of production

and distribution. Water scarcity is also palpable, acting as a barrier to agricultural growth.

Efforts to curtail production intensity are anticipated, with the aim of reducing the ecological burden imposed by agriculture. Strategies are being sought to diminish carbon dioxide emissions from agriculture, thereby safeguarding against climate change. There are calls for a reassessment of consumers' dietary compositions, with a view to limiting the role of animal-derived and animal-sourced products. However, this will prove challenging, given the growing interest in these products, especially in regions where their consumption remains low and where income levels are concurrently increasing.

In these circumstances, Polish and European agriculture will be subject to the pressures of the aforementioned megatrends. This will give rise to both opportunities for further growth and developmental barriers for Polish agriculture, which, as evidenced by the past two decades, has demonstrated its capacity to capitalize on existing opportunities. It is reasonable to expect that this trend will persist in the future. However, to achieve this, it must remain receptive to the challenges posed by evolving environmental changes.

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