

CHANGES IN THE IMPORTANCE OF AGRIBUSINESS IN THE POLISH ECONOMY AFTER 2000

Aleksandra Wicka, Dr.oec.; Ludwik Wicki¹, Dr hab., prof.

¹Warsaw University of Life Sciences

Abstract. Agribusiness is losing its significance in the economies with economic development. In agriculture, lower labour productivity is usually observed compared to the entire economy. Agribusiness also undergoes internal changes. With the lengthening of supply chains and the increasing demand for highly processed food, the economic importance of agriculture within agribusiness decreases while food processing grows. This study aims to determine how the significance of agribusiness changed in the Polish economy, what direction these changes are taking, and what their dynamics are. The analysis covers 2000-2022, and data from national statistics were used. The significance of agribusiness in the economy was assessed by considering its share in gross output, gross value added, net fixed assets, employment, and foreign trade turnover. Exponential function was used to evaluate the dynamics of changes. The importance of the agribusiness sector in the Polish economy decreased. The employment share declined from 20 to 17%, and considering the primary source of livelihood, it was 11%. The share in gross output was 9%, and in GVA, only 5%. Oppositely, agribusiness had a much higher share in foreign trade, generating 14% of exports and 9% of imports to Poland. Over the analyzed period, the gross output share of agribusiness in the whole economy decreased by 38% and GVA creation by 47%. The export share increased by 30% and imports by 17%. The structure of the agribusiness sector has modernized. From 2000 to 2005, agriculture accounted for about 60% of the sector's GVA, while from 2018 to 2022, it was only 45%. Most of the agribusiness's GVA is currently generated in industrial food processing. It can be concluded that agribusiness in the Polish economy is becoming less and less significant. It only maintains a high share in foreign trade. Further reduction in employment and increased labour productivity, primarily in agriculture, is expected.

Key words: agribusiness, bioeconomy, gross value added, GVA, agriculture, labour productivity.

JEL code: J43, Q13, Q17

Introduction

Agribusiness is the sum of all operations involved in farming, fishing, forestry, manufacturing, and distribution of inputs and outputs of agriculture, fishery, forestry, and fibres. (Davis & Goldberg, 1957) These are activities related to agricultural production. The role of non-food production, i.e., biofuels, fibres etc., is emphasized, but the most important agribusiness element is still the production and supply of food. The concept of agroindustry also often appears, which is defined more narrowly and includes food acquisition, processing and distribution. The agroindustry can be identified as part of the food supply chain (Chobanian, 1999). Currently, the food industry is becoming more and more independent from domestic agriculture due to the possibility of global sourcing of raw materials.

Agribusiness undergoes continuous changes stemming from the increased availability of agricultural production resources, continual emergence of process and product innovations, changes in production scale, the emergence of international and even global supply chains, and efforts to limit environmental impact and reduce GHG emissions. It is essential not to forget that the primary goal remains providing sufficient food for the growing population. In a situation where production and consumption occur in other parts of the world, a significant task for agribusiness is to organize efficient logistics for raw materials and processed products.

The development of agribusiness in a given country results from local production and consumption conditions. However, several main trends relating to agribusiness can be observed on a global scale. Globalization and liberalization of food trade, as well as the increasing role of transnational corporations, lead to a situation where regulations regarding agribusiness increasingly strongly consider the interests of states and corporations expressed in specific interventions and directions of support for development.

¹ E-mail: ludwik_wicki@sggw.edu.pl

The increasing dominance of food processing and distribution in food supply is also an important trend (Ziggers, 1999). This results from the increased distance in time and space between producers and consumers. There is a greater distance domestically, as urbanization levels rise, and internationally, as some countries are net food exporters while others are importers. This leads to increased demand for processing agricultural raw materials into semi-finished or finished products. Consequently, the significance of the food processing industry in aggregating raw materials into larger streams, processing them, and further distributing them, also within global chains, increases. This requires innovative and environmentally friendly investments in processing and conservation methods, packaging, quality certification, and food traceability (Abashidze, 2023). Global players may find it easier to afford such actions (Ritambhara and Shukla Shiv Kant and Shukla, 2021). In countries with a high concentration of agribusiness and agricultural potential exceeding domestic demand, the growing importance of agribusiness with a focus on exporting surpluses is evident (Orlykovskiy & Wicki, 2019; Shainidze et al., 2023), as is the case in countries exporting soybean or palm oil, for example (Milazzo et al., 2013). Overall, most researchers predict the development of agribusiness, or more broadly, the bioeconomy, including the emergence of innovations in production inputs, new processing technologies, as well as new products utilizing agricultural products, whether for food production or other biobased products (Frisvold et al., 2021; Muska et al., 2022; Raimjanova & Popluga, 2023). This requires both tangible investments and investments in workforce education for agribusiness (Muska et al., 2022).

Intense concentration and commercialization of agriculture also lead to land concentration and the disappearance of small-scale farmers and traditional land users. The specialization of plant production, including the creation of monocultures and industrialization of animal production, i.e., animal production separated from feed production (Burkard, 2018), is a sample of consequences connected to agribusiness development. Small-scale farmers are often excluded from participation in the supply chain in the modern agrifood industry (Reardon et al., 2009). Another effect is agriculture-related land and commons grabbing (Dell'Angelo et al., 2021; Zawajska, 2014).

There are also increasingly more vital pressures to limit the impact of agribusiness, primarily agricultural production, but also transportation, on the environment. This mainly concerns emissions reduction and preserving environmentally valuable areas beyond agricultural use (de Azevedo Denise Barros and Pedrozo, 2010; Lokko et al., 2018). Short supply chains, for example, are promoted, but these are ineffective beyond small local markets and may encompass a negligible percentage of production and only selected products (Dragicevic, 2021). Such short chains are often not low-emission either (Bogone Toth & Zs. Lakner, 2014; Malak-Rawlikowska et al., 2019). Allegations are made against large-scale and monoculture-based agriculture for not respecting environmental protection requirements and the rights of local communities (Milazzo et al., 2013), but other studies have found that emissions per unit of food production are decreasing in countries with intensive such output (Bajan & Mrówczyńska-Kamińska, 2020; Wicka & Wicki, 2023). Furthermore, large farms or agribusinesses are already becoming the subject of investments in financial markets, so agribusiness, and even agriculture in some regions, ceases to be an element belonging to local communities (Langford et al., 2020). For various reasons, stronger legal regulation of agribusiness is necessary, for example, regarding the use of multiple chemicals, GMOs, and food safety measures (Burkard, 2018).

In some countries, opening up to international competition can significantly weaken agribusiness. Agriculture is shifting towards extensive plant production; as a possible solution to move away from such a limited role, intensification in agriculture is advocated, including the development of animal production, biofuel production, and short supply chains. There is also a negative perception of agricultural work in the

surrounding environment and among successors on (Bilewicz & Bukraba-Rylska, 2021), which can lead to farm closing. Conversely, in least-developed countries, efforts are still being made to develop agribusiness to ensure at least food security. The introduction of modern solutions promoting efficiency growth and increased food sustainability while reducing environmental impact is advocated (Lokko et al., 2018). Both modernization and increased integration require support for sustainable development (Lema et al., 2021).

In Poland, as in other European Union countries, the role of agriculture and agribusiness in the economy is diminishing. Since the political transformation until 2000, the significance of agribusiness in the Polish economy has markedly declined, a consequence of both the development of non-agricultural sectors and the worsening economic conditions and the relation of input-product in agriculture production (Grontkowska & Wicki, 2015). A beneficial phenomenon for agriculture was the maintenance of the real price level of agricultural raw materials (D. Kusz et al., 2022). It was also observed that the dominance of agriculture in the entire agribusiness decreased and the importance of the food industry increased.

Aim and method

The study aims to assess how the significance of agribusiness in the Polish economy is changing, as well as the direction and dynamics of these changes. The analysis covers the period from 2000 to 2022. Data from national statistical resources, which are presented annually, were utilized. Three research tasks were adopted: 1) determining changes in the significance of agribusiness in the Polish economy; 2) identifying changes in the internal structure of agribusiness in terms of generating value-added; 3) evaluating differences in labour productivity levels in agribusiness relative to the entire economy.

Agribusiness was considered as the sum of agricultural activity and the food processing industry (food, beverages, and tobacco), as separate data on the shares of sectors supplying agriculture and the processing industry with means of production, as well as data on the share of agribusiness in trade and distribution, are not available. Estimating these quantities goes beyond the assumed scope of this study due to the specified research period. These two sectors constitute 64% of the bioeconomy in Poland.

The data used in the study originated from the database and publications of Statistics Poland (the authority responsible for public statistics in Poland). Data concerning the agricultural sector, food processing industry, beverage production, and tobacco processing were collected each year. The data included gross output, gross value added, net fixed asset values, and employment. Additionally, data on foreign trade turnover in agri-food products were collected. The data were collected in nominal values. To ensure comparability over time, nominal values were converted to real values using deflators calculated separately for the studied sectors for global production values, gross value added, and foreign trade prices.

The significance of agribusiness in the economy was assessed by its share in gross output, gross value added, fixed asset utilization, employment, and foreign trade turnover. In evaluating changes in the internal structure of agribusiness, the share of agriculture and food processing in generating gross value added within agribusiness was utilized. Labour productivity was determined using gross value added in the respective sector per one person employed.

Basic statistical methods, including those for assessing the pace of changes and average annual growth rates, were used in the calculations. The average annual growth rate was calculated based on the course of the exponential function for the time series. The function given below (formula 1) was used. Beta (β) is the average annual growth rate.

$$y = \alpha \cdot e^{\beta x_i} \quad (1)$$

where: x_i – means annual data for individual criterion.

The share of agribusiness in the Polish economy

The Polish economy grew at an average rate of approximately 3.7% per year in 2000-2022, as measured by GVA dynamics. As a result, in 2022, the value of real GVA generated was more than twice as high as in 2000 (Table 1). Much lower dynamics were observed for the agribusiness sector. The average annual real growth in the gross output value in this sector was approximately 2.2%, and the real yearly dynamics of GVA reached 1.2%. It was three times less than for the entire economy. This means that the structure of the economy was modernized.

Table 1

The size and dynamics of selected economic values of agribusiness in Poland against the background of the country's economy in the years 2000-2022 (constant prices for 2022)

Year	Size of agribusiness in Poland					GVA - Poland
	gross output	gross value added	import	export	employed persons [#]	billion 2022 zloty
	billion 2022 zloty*					
2000	365.9	95.6	29.0	25.5	2.57	1216.4
2001	370.0	100.3	28.8	27.1	2.54	1234.0
2002	380.0	107.9	28.6	27.8	2.57	1259.0
2003	393.6	112.1	28.7	34.5	2.54	1301.0
2004	420.6	111.2	29.8	37.1	2.55	1370.0
2005	419.5	113.2	40.3	53.7	2.54	1416.2
2006	447.8	118.7	45.0	61.0	2.54	1502.5
2007	470.3	117.0	53.8	67.8	2.54	1609.6
2008	469.8	117.9	62.7	72.8	2.53	1674.5
2009	492.9	129.2	64.8	79.8	2.51	1726.9
2010	471.7	129.3	69.1	86.3	2.78	1786.2
2011	484.6	122.5	75.4	93.4	2.76	1876.6
2012	472.0	112.7	79.1	108.4	2.77	1902.2
2013	483.8	119.5	83.9	123.2	2.76	1917.8
2014	500.2	118.6	90.5	132.0	2.78	1989.1
2015	502.8	116.2	97.5	142.2	2.78	2078.8
2016	528.4	122.4	109.3	150.5	2.79	2136.6
2017	556.8	126.7	118.1	166.1	2.79	2243.5
2018	537.3	135.0	115.1	173.8	2.79	2376.5
2019	580.6	139.1	125.2	182.0	2.79	2480.0
2020	561.1	130.9	137.6	196.8	2.79	2429.7
2021	604.4	120.9	140.2	204.3	2.79	2589.6
2022	653.5	146.0	150.8	223.9	2.79	2732.9
Real average annual dynamics [percent]	2.23	1.17	8.34	10.17	0.57	3.71

[#]—In 2010, the data was corrected based on the General Agricultural Census. Data for 2000-2001 and 2020-2022 were recalculated for comparability.

*-Exchange rates in 2022: 1 zloty = 0,223 USD; 1 zloty = 0,213 EUR.

Source: author's calculations based on Statistics Poland data

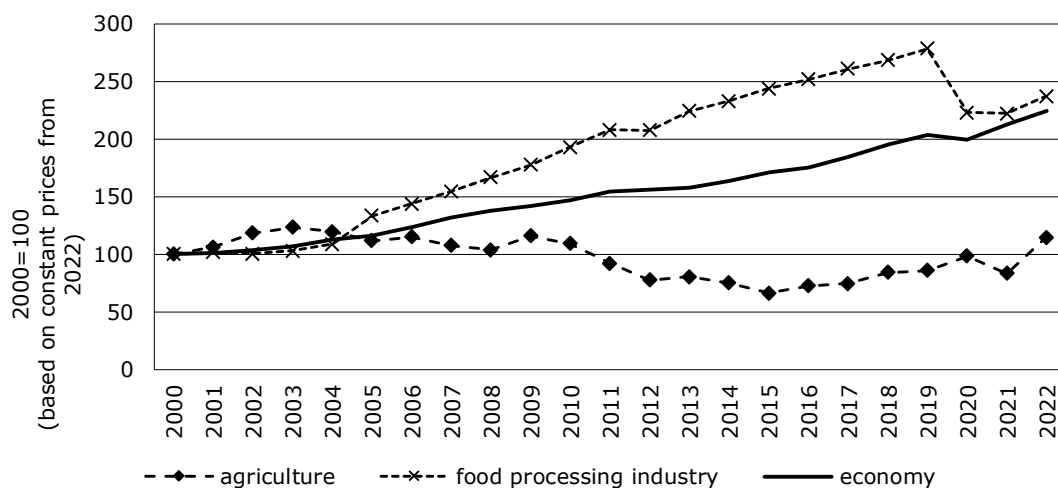
The value of gross agribusiness output (in real terms) in Poland increased from around 380 billion Polish złoty to 600 billion złoty between 2000 and 2022, representing approximately a 1.6-fold increase. The gross value added (GVA) of agribusiness also increased in real terms by about 30% during the same

period. This means that the ratio of value added to production decreased by approximately five percentage points from 27% to 22%. Profitability in agribusiness declined.

Employment in the agribusiness sector in Poland did not undergo significant changes. This is due to the high fragmentation of farms and the large number of people working in agriculture on a full—or part-time basis. After adjusting for the 2010 correction, after the National Agricultural Census, there was a slight increase in the number of people employed in agriculture, followed by a stabilization of employment.

In foreign trade, the share of turnover in agricultural and food products increased dynamically, both in imports and exports. Imports increased fivefold in real terms, while exports almost octupled. The average annual dynamics of real turnover value were 8.3% and 10.2%, respectively. Such high dynamics indicate that the sector's participation in international supply chains is increasingly significant and that the Polish agribusiness offering was competitive in foreign markets. Notably, exports increased from around 10% of the gross production value before 2005 to over 30% after 2015. Agribusiness in Poland currently has a strong export orientation.

Figure 1 shows the differences in the GVA dynamics of agriculture, the food industry and the entire economy. The lowest dynamics characterized GVA of agriculture; in 2011-2021, it was even lower than that observed at the beginning of the analyzed period. For the food processing sector, the GVA dynamics were higher than the average for the entire economy. During the SARS-CoV-2 pandemic, there was a significant slowdown in the growth dynamics in this sector. It is worth noting that food processing is responsible for all the growth in agribusiness, while agriculture only maintains a constant level of added value. Higher added value is created by expanding the offer of processed food and process and product innovations.



Source: author's calculations based on Statistics Poland data

Fig. 1. Real dynamics of GVA in agriculture and food industry against the background of the entire economy in Poland in 2000-2022 (2000 = 100)

The share of agribusiness in the Polish economy and its changes

In the years 2000-2022, agribusiness in Poland was characterized by lower growth dynamics than the entire economy. As a result, its share in the Polish economy has changed. Table 2 shows the importance of agribusiness in the economy, which is measured using several main criteria.

Table 2

Changes in the importance of agribusiness in Poland in the years 2000-2022 according to selected criteria (the shares were determined at nominal values)

Year	Share of agribusiness in the economy in Poland in 2000-2022 in [in percent]					
	gross output	gross value added	net fixed assets	employed persons	import	export
2000	11.9	8.3	8.0	19.9	6.5	8.4
2001	11.7	8.2	7.4	20.3	6.8	8.4
2002	11.4	7.5	7.2	20.1	6.5	8.0
2003	11.4	7.3	7.0	20.1	5.9	9.4
2004	11.6	8.0	7.0	20.1	5.2	7.5
2005	10.8	7.5	6.8	19.7	6.8	10.0
2006	10.6	7.4	6.5	19.2	6.4	9.8
2007	11.1	7.3	6.1	18.5	6.7	9.9
2008	10.0	6.3	5.8	18.0	7.2	10.1
2009	10.2	6.3	5.5	18.2	8.7	11.8
2010	9.6	6.5	5.3	19.7	8.1	11.2
2011	10.0	6.8	4.9	19.4	8.3	11.2
2012	9.8	6.0	4.8	19.5	8.8	12.5
2013	9.9	6.2	4.7	19.4	9.1	13.2
2014	9.6	5.9	4.7	19.1	9.0	13.2
2015	9.1	5.5	4.6	18.8	9.1	13.3
2016	9.2	5.8	5.0	18.2	9.6	13.2
2017	9.5	6.1	4.7	17.8	9.4	13.5
2018	8.4	5.4	4.7	17.5	8.5	13.3
2019	8.8	5.3	4.6	17.3	9.0	13.3
2020	8.7	5.1	4.6	17.3	9.9	14.3
2021	8.7	5.0	4.5	17.0	8.6	13.1
2022	9.7	5.3	4.6	16.8	8.8	13.8
Total change, %	76.4	66.7	62.7	85.5	145.2	162.5
CAGR in 2000-2022 in percent	-1.42	-2.22	-2.68	-0.67	2.21	2.72

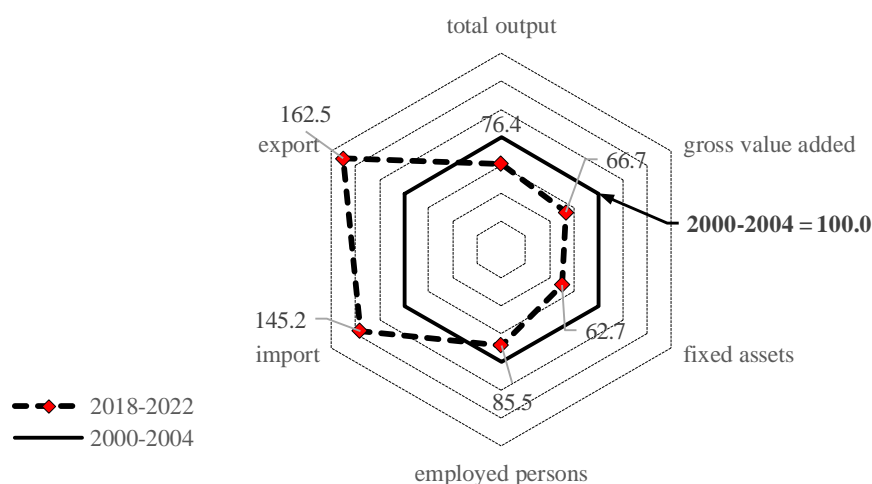
Source: author's calculations based on Statistics Poland data

The share of agribusiness in the Polish economy decreased. The primary indicator of the sector's significance in the economy, the share in gross value added, decreased by 2.6 percentage points between the beginning of the period (2000-2004) and the end of the period (2018-2022), from 7.8% to 5.2%. In relative terms, the decrease was as much as 33.3%. The share in gross output decreased by 2.7 percentage points to 8.9% in 2018-2022. The decrease was approximately 24%. To a lesser extent, by only 14.5%, the share of those employed in agribusiness decreased, and for the share of utilized fixed assets, the decline was 37%. It should be emphasized that the importance of agribusiness has reduced in terms of resource utilization, gross production, and value-added generation.

In contrast, an increase in importance was observed regarding the share of agribusiness in Poland's foreign trade. Trade in unprocessed agricultural products and processed food was considered. The share of agribusiness production in total exports increased from about 8 to 13.5%, with an overall increase of 5.2 percentage points during the entire period. In relative terms, this was a 62% increase. Concurrently, the import of agri-food products increased, but in this case, the dynamics were lower. In 2018-2022, the share of agri-food product imports in total imports was 9.0%. Since 2003, positive trade balances have

been observed in foreign trade in agribusiness products. In 2018-2022, this amounted to around 50 billion Polish złoty annually, representing approximately 12% of the value of total agribusiness production. The value of total agribusiness product exports in the last years accounted for about 35% of its total agribusiness output. It must be emphasized that the increase in output value in agribusiness was possible due to the export of surplus agricultural production and processed food.

Figure 2 shows the direction of changes in the significance of agribusiness in the Polish economy. In four out of six categories, the significance decreased. It is evident, among other things, that gross output and GVA decreased more than employment, leading to a relative decrease in labour efficiency in agribusiness.



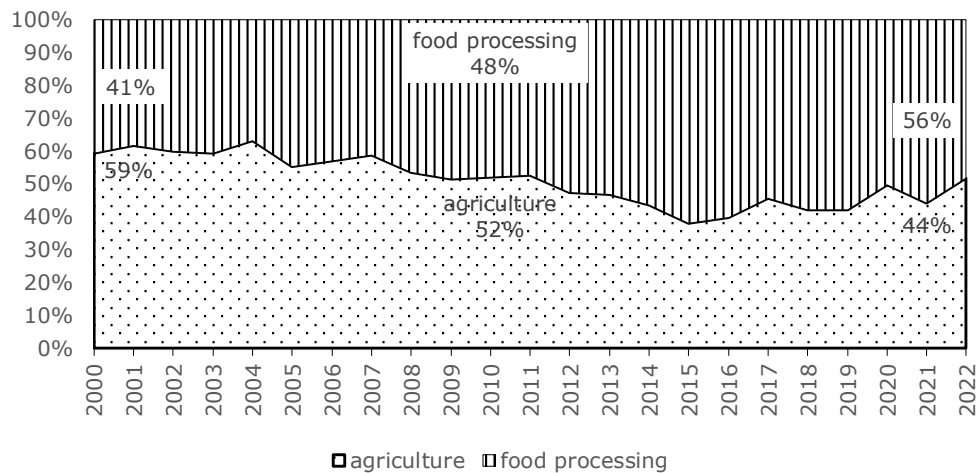
Source: author's calculations

Fig. 2. Changes in the importance of agribusiness in the economy according to various criteria in the years 2000-2022 (2000-2004=100)

Changes in the internal structure of agribusiness and differences in labor efficiency

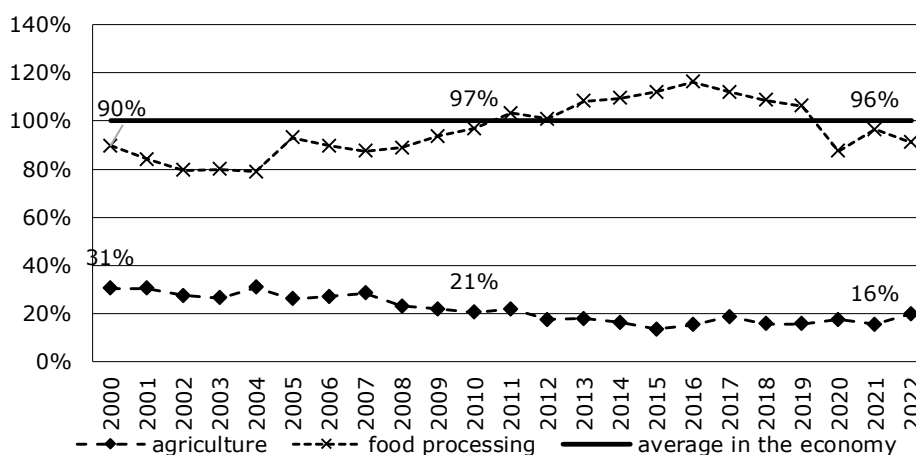
The results presented in the study concern agribusiness as a whole. Two main components included in this sector are agriculture and agri-food processing. There are persistent differences between these subsectors, primarily stemming from the level of production concentration and technological advancement. Another issue is that consumers expect food with an increasing degree of readiness for consumption, which means a lesser share of agricultural raw material costs in final products (Becvarova, 2002; D. Kusz et al., 2022). Similarly, processed food accounts for a growing share of exports, while agricultural raw materials account for a smaller share. Such a trend is observed alongside the economic development of countries. In more developed countries, the contribution of agriculture to value-added in agribusiness is smaller than the significance of food processing (Van Arendonk, 2015; World Bank Data, 2024). An exception is made for countries with high potential for plant production focused on the mass export of plant materials, such as grains (Zaburanna et al., 2017).

Figure 3 shows changes in agriculture and food processing share in creating gross added value within agribusiness. From 2000 to 2011, the share of agriculture decreased from 60 to 50%. After 2011, the majority of agribusiness GVA came from the processing subsector. The share of agriculture decreased to 40-45%. This means that a relatively modern structure currently characterizes agribusiness in Poland.



Source: author's calculations

Fig. 3. Changes in the share of agriculture and food processing in creating gross value added within agribusiness in Poland in 2000-2022



Source: author's calculations

Fig. 4. Labour productivity in agriculture and food processing compared to labour productivity in the entire economy (based on GVA per employed person)

An evident weakness of agribusiness is lower labour productivity compared to the average productivity in the economy. This is because agriculture in Poland is still fragmented. There are 1.3 million farms, and the average area of agricultural land per farm is only 11 ha. Figure 4 shows the level of labour productivity in agriculture and food processing relative to labour productivity in the economy.

The observed average labour productivity in agriculture, measured by the GVA per employed person, was low, reaching approximately 20% of the national average. A downward trend was observed, at around 3% annually compared to the average labour productivity in the economy. Agriculture fails to achieve the same pace of labour productivity growth as other sectors; it is a prolonged process because of its farm structure, which is dominated by small farms, which slows down modernisation processes (B. Kusz et al., 2022). Similar situations exist in other EU countries with fragmented agriculture (Ronzon et al., 2020). In contrast, the food processing sector experienced a different development path. Labour productivity in this subsector, initially lower than the country average, increased along with industry modernization and has been at a similar level to the average since 2010. The average annual growth rate was 1.18% relative to the average. On average, labour productivity in the agribusiness sector (agriculture and food processing) reached about 30% of the national average. Such disproportion will persist until there is a consolidation and, consequently, an increase in labour productivity in agriculture.

Conclusions

Agribusiness can be a significant sector of the national economy, particularly in countries with favourable natural and economic conditions for agricultural development and in less developed countries. With economic and social progress, the importance of the food processing and distribution sectors within agribusiness increases while the importance of agriculture itself decreases. Food processing and distribution may become increasingly independent of domestic agriculture and rely on importing raw materials.

In Poland, between 2000 and 2022, the gross output of agribusiness increased by over 60% in real terms, and the real gross value added in agribusiness increased by 30%. However, the significance of agribusiness in the Polish economy decreased as the real GVA value increased by over 100%. Based on the analysis conducted, the following conclusions can be drawn.

- 1) The dynamics of gross output and value-added in agribusiness were lower than those observed in the economy. The share of this sector in the economy decreased. Between 2000 and 2004, it accounted for approximately 8% of the gross value added in Poland, whereas between 2018 and 2022, it dropped to only 5.2%. Similarly, the sector's share in the gross output structure decreased from 11.6% to 8.9%.
- 2) In the GVA creation structure within agribusiness, agriculture's importance decreased while food processing increased. The share of food processing increased from about 40% to 56%. This also means that processed food with higher consumer readiness is becoming increasingly important.
- 3) The development of food processing was the basis for the dynamic growth of foreign trade in agri-food products. Their share in Polish exports increased from 8% to even 14% between 2000 and 2022. The trade balance surplus of agri-food products increased from zero to a permanent surplus of approximately \$16 billion (approximately 75 billion zloty).
- 4) Labour productivity in agribusiness in Poland, measured by GVA per person employed, was low compared to the national average and decreased over time. At the beginning of the study period, it was around 40%; in the end, between 2018 and 2022, it was only 30% of the average. This was due to low labour productivity in agriculture, which was about 18% of the average. In the food industry, labour productivity was similar to the national average.
- 5) Poland's agribusiness developed slower than the entire economy. The driving force for growth in this sector was the link of food processing, while agriculture maintained a steady production level. The development of processing enabled the export expansion of agri-food products and ensured market opportunities for agricultural farms.
- 6) The most important barriers to agribusiness development in Poland stem from farm fragmentation, which leads to low resource productivity and low labour productivity. Concentrating production in agriculture will promote the growth of labour productivity and the competitiveness of Polish agribusiness. Still, innovative processes and food products are necessary for further agribusiness development.

Bibliography

1. Abashidze, G. (2023). Digital agriculture - technological means and possibilities of digital transformation of agriculture. In A. Auzina (Ed.), *Economic Science for Rural Development*, (57) (pp. 13–19). LBTU. <https://doi.org/10.22616/ESRD.2023.57.001>
2. Bajan, B., & Mrówczyńska-Kamińska, A. (2020). Carbon footprint and environmental performance of agribusiness production in selected countries around the world. *Journal of Cleaner Production*, 276, 123389. <https://doi.org/https://doi.org/10.1016/j.jclepro.2020.123389>
3. Becvarova, V. (2002). The changes of the agribusiness impact on the competitive environment of agricultural enterprises. *Agricultural Economics*, 48(10), 449–455. <https://doi.org/10.17221/5351-AGRICECON>

4. Bilewicz, A., & Bukraba-Rylska, I. (2021). Deagrarianization in the making: The decline of family farming in central Poland, its roots and social consequences. *Journal of Rural Studies*, 88, 368–376. <https://doi.org/https://doi.org/10.1016/j.jrurstud.2021.08.002>
5. Bogone-Toth, & Zs.-Lakner, Z. (2014). Strategic Problems of Agribusiness Development and Environmental Burden in Light of Life Cycle Analysis in Hungary. *Procedia - Social and Behavioral Sciences*, 143, 1025–1030. <https://doi.org/https://doi.org/10.1016/j.sbspro.2014.07.548>
6. Burkard, M. (2018). The Battle for Agriculture. In *Conflicting Philosophies and International Trade Law: Worldviews and the WTO* (pp. 209–262). Springer International Publishing. https://doi.org/10.1007/978-3-319-61067-2_6
7. Davis, J. H., & Goldberg, R. A. (1957). *A Concept of Agribusiness* (1st ed.). Division of Research, Graduate School of Business Administration, Harvard University.
8. de Azevedo Denise Barros and Pedrozo, E. A. and M. G. C. (2010). Participation of Agribusiness Stakeholders in Global Sustainability Questions: The Case of Climate Change and Bioenergy in Brazil. In C. Stoner James A. F. and Wankel (Ed.), *Global Sustainability as a Business Imperative* (pp. 255–268). Palgrave Macmillan US. https://doi.org/10.1007/978-0-230-11543-9_15
9. Dell'Angelo, J., Navas, G., Witteman, M., D'Alisa, G., Scheidel, A., & Temper, L. (2021). Commons grabbing and agribusiness: Violence, resistance and social mobilization. *Ecological Economics*, 184, 107004. <https://doi.org/https://doi.org/10.1016/j.ecolecon.2021.107004>
10. Dragicevic, A. Z. (2021). Emergence and Dynamics of Short Food Supply Chains. *Networks and Spatial Economics*, 21(1), 31–55. <https://doi.org/10.1007/s11067-020-09512-7>
11. Frisvold, G. B., Moss, S. M., Hodgson, A., & Maxon, M. E. (2021). Understanding the U.S. Bioeconomy: A New Definition and Landscape. *Sustainability*, 13(4), 1627. <https://doi.org/10.3390/su13041627>
12. Grontkowska, A., & Wicki, L. (2015). Zmiany znaczenia agrobiznesu w gospodarce i w jego wewnętrznej strukturze. *Roczniki Naukowe Ekonomii Rolnictwa i Rozwoju Obszarów Wiejskich*, 102(3), 20–32. <https://doi.org/10.22630/RNR.2015.102.3.24>
13. Kusz, B., Kusz, D., Bąk, I., Oesterreich, M., Wicki, L., & Zimon, G. (2022). Selected Economic Determinants of Labor Profitability in Family Farms in Poland in Relation to Economic Size. *Sustainability*, 14(21), 13819. <https://doi.org/10.3390/su142113819>
14. Kusz, D., Kusz, B., & Hydzik, P. (2022). Changes in the Price of Food and Agricultural Raw Materials in Poland in the Context of the European Union Accession. *Sustainability*, 14(8), 4582. <https://doi.org/10.3390/su14084582>
15. Langford, A., Smith, K., & Lawrence, G. (2020). Financialising governance? State actor engagement with private finance for rural development in the Northern Territory of Australia. *Research in Globalization*, 2, 100026. <https://doi.org/https://doi.org/10.1016/j.resglo.2020.100026>
16. Lema, Z., Lobry de Bruyn, L. A., Marshall, G. R., Roschinsky, R., & Duncan, A. J. (2021). Multilevel innovation platforms for development of smallholder livestock systems: How effective are they? *Agricultural Systems*, 189, 103047. <https://doi.org/https://doi.org/10.1016/j.agsy.2020.103047>
17. Lokko, Y., Heijde, M., Schebesta, K., Scholtès, P., Van Montagu, M., & Giacca, M. (2018). Biotechnology and the bioeconomy—Towards inclusive and sustainable industrial development. *New Biotechnology*, 40, 5–10. <https://doi.org/10.1016/j.nbt.2017.06.005>
18. Malak-Rawlikowska, A., Majewski, E., Waś, A., Borgen, S. O., Csillag, P., Donati, M., Freeman, R., Hoàng, V., Lecoœur, J.-L., Mancini, M. C., Nguyen, A., Saidi, M., Tocco, B., Török, A., Veneziani, M., Vittersø, G., & Wavresky, P. (2019). Measuring the Economic, Environmental, and Social Sustainability of Short Food Supply Chains. *Sustainability*, 11(15), 4004. <https://doi.org/10.3390/su11154004>
19. Milazzo, M. F., Spina, F., Cavallaro, S., & Bart, J. C. J. (2013). Sustainable soy biodiesel. *Renewable and Sustainable Energy Reviews*, 27, 806–852. <https://doi.org/https://doi.org/10.1016/j.rser.2013.07.031>
20. Muska, A., Popluga, D., & Pilvere, I. (2022). Assessment of the Concentration and Structure of the Bioeconomy: The Regional Approach. *Emerging Science Journal*, 7(1), 60–76. <https://doi.org/10.28991/ESJ-2023-07-01-05>
21. Orlykovskiy, M., & Wicki, L. (2019). Znaczenie sektora agrobiznesu w Polsce i na Ukrainie. *Zeszyty Naukowe SGGW w Warszawie - Problemy Rolnictwa Światowego*, 19(2), 210–223. <https://doi.org/10.22630/PRS.2019.19.2.36>
22. Raimjanova, M., & Popluga, D. (2023). Bioeconomy concept and possibilities of its implementation in Uzbekistan agriculture for making it more attractive for investments. In A. Auzina (Ed.), *Economic Science for Rural Development*, (57) (pp. 600–608). LBTU. <https://doi.org/10.22616/ESRD.2023.57.059>
23. Reardon, T., Barrett, C. B., Berdegue, J. A., & Swinnen, J. F. M. (2009). Agrifood Industry Transformation and Small Farmers in Developing Countries. *World Development*, 37(11), 1717–1727. <https://doi.org/10.1016/j.worlddev.2008.08.023>
24. Ritambhara, G., Shukla, S. K., & Shukla, S. (2021). Automation, Modern Tools and Technique for Sustainable Agriculture – An Important Parameter Toward Advance Plant Biotechnology. In C. Chakraborty (Ed.), *Green Technological Innovation for Sustainable Smart Societies: Post Pandemic Era* (pp. 281–300). Springer International Publishing. https://doi.org/10.1007/978-3-030-73295-0_13
25. Ronzon, T., Piotrowski, S., Tamosiunas, S., Dammer, L., Carus, M., & M'barek, R. (2020). Developments of Economic Growth and Employment in Bioeconomy Sectors across the EU. *Sustainability*, 12(11), 4507. <https://doi.org/10.3390/su12114507>
26. Shainidze, E., Verulidze, V., & Surmanidze, I. (2023). The role of cooperatives in the process of development of agriculture and integration into trade area of the European Union case of Georgia. In A. Auzina (Ed.), *Economic Science for Rural Development*, (57) (pp. 556–565). LBTU. <https://doi.org/10.22616/ESRD.2023.57.055>

27. Van Arendonk, A. (2015). The development of the share of agriculture in GDP and employment. *A Case Study of China, Indonesia, the Netherlands and the United States. Master's Thesis, Wageningen University, Wageningen, The Netherlands.*
28. Wicka, A., & Wicki, L. (2023). Energy productivity in agriculture in EU countries – directions and dynamics. In A. Auzina (Ed.), *Economic Science for Rural Development*, (57) (pp. 114–123). LULS&T.
<https://doi.org/10.22616/ESRD.2023.57.011>
29. World Bank Data. (2024, March 10). *World Bank national accounts data, and OECD National Accounts data files. World Bank National Accounts Data, and OECD National Accounts Data Files.*
<https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS>
30. Zaburanna, L., Wicki, L., & Orlykovskyi, M. (2017). Agriculture in Poland and Ukraine – Potential and Dynamics of Changes in Production. *Zeszyty Naukowe SGGW w Warszawie - Problemy Rolnictwa Światowego*, 17(4), 326–338.
<https://doi.org/10.22630/PRS.2017.17.4.108>
31. Zawojska, A. (2014). Globalna grabież ziemi rolniczej postrzegana przez pryzmat ekonomii politycznej. *Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu*, 16(4), 369–376.
<https://rnseria.com/resources/html/article/details?id=172780>
32. Ziggers, G. W. (1999). *Vertical Coordination in Agribusiness and Food Industry: The Challenge of Developing Successful Partnerships* (pp. 453–466). https://doi.org/10.1007/978-3-642-48765-1_26