

Protein Consumption and Dietary Transition Patterns in Central and Eastern Europe - Implications for Sustainable Consumption

Ramona Lile¹, Ioana Mihaela Balan², Cosmin Salasan³ and Adrian Daniel Gencia⁴

¹*Aurel Vlaicu University, Arad, Romania.*

²*University of Life Sciences "King Mihai I" from Timisoara, Timisoara, Romania.*

³*Romanian Academy, Branch of Timisoara, Timisoara, Romania.*

⁴*West University of Timisoara, Timisoara, Romania.*

E-mail: ramona.lile@uav.ro; E-mail: ioanabalan@usvt.ro; E-mail: cosminsalasan@usvt.ro;
E-mail: adrian.gencia@e-uvt.ro

Please cite this paper as:

Lile, R., Balan, I. M., Salasan, C. and Gencia, A.D., (2026). Protein Consumption and Dietary Transition Patterns in Central and Eastern Europe - Implications for Sustainable Consumption. In C. Vasiliu, D.-C. Dabija, A. Tziner, D. Pleșea, & V. Dinu (Eds.), *Proceedings of BASIQ International Conference on New Trends in Sustainable Business and Consumption, 12th Edition* (pp. 461-468). Editura ASE.

DOI 10.24818/BASIQ/2026/12/006

Abstract

The present study analyzes the long-term evolution of protein consumption patterns in Central and Eastern Europe, with a focus on structural changes between animal-based and plant-based proteins. It explores how these changes reflect transformations in food systems and dietary behavior amongst the general population. The analysis is based on secondary data derived from FAO food balance sheets, accessed through the *Our World in Data* platform, for the period 1961–2023. Three indicators are used: total protein consumption, animal-based protein consumption, and plant-based protein consumption (g/capita/day). The approach is descriptive and comparative, and it is complemented by statistical indicators (mean, standard deviation, coefficient of variation) and convergence/divergence analysis between countries. The results highlight a general increase in total protein consumption in all countries analyzed, accompanied by significant structural changes in protein sources. Most countries show a transition towards higher consumption of animal-based protein and a relative reduction of plant-based protein. However, the intensity and stability of these changes differ considerably. While some countries (Poland, Serbia) show sharp increases and structural transformations, others (Bulgaria, Slovakia) show more moderate developments. The analysis also indicates a trend of divergence between countries. The study provides a long-term comparative perspective on protein consumption in a region insufficiently explored in the literature. The results provide relevant information for decision-makers, highlighting the need to integrate nutritional and sustainability dimensions into food policies and future dietary transitions.

Keywords

Protein consumption; animal-based protein; plant-based protein; dietary transitions; Central and Eastern Europe; food systems.

DOI: 10.24818/BASIQ/2026/12/006

Introduction

Long-term changes in dietary patterns are an important topic in the literature on food systems and population nutrition. The structure of diets is influenced by economic, social and institutional factors, and the analysis of food consumption provides relevant information about the transformations of agri-food systems and eating behaviors. In this context, protein consumption is an essential indicator of the structure of diets, indirectly reflecting the diversity and accessibility of food resources at the national level (FAO, 2023; Roser et al., 2013).

The specialized literature shows that dietary changes are not only manifested by the variation in total protein consumption, but also by the modification of the share of animal and plant sources. The analysis of these changes allows the structural transformations of diets and food systems to be highlighted (Tilman & Clark, 2014; Willett et al., 2019). In this sense, the source of protein is a relevant element for the characterization of dietary patterns and their evolution in different populations. Central and Eastern Europe is a relevant framework for the analysis of these transformations, as the countries in the region have undergone major economic and institutional changes that have influenced both agri-food systems and food consumption. However, the region remains under-researched in longitudinal studies on diet structure and protein consumption.

Based on these aspects, the study analyzes the evolution of animal and vegetable protein consumption over the period 1961–2023, using harmonized data from the FAO food balance sheets available through the Our World in Data platform. The evolution of total protein consumption and structural changes in animal and vegetable proteins in Poland, the Czech Republic, Slovakia, Hungary, Romania, Bulgaria and Serbia are investigated. The article includes a presentation of the methodology and data sources, followed by an analysis and discussion of the results, and finally the main conclusions of the research are synthesized.

1. Review of scientific literature

The evolution of dietary patterns at population level has been widely analyzed in the literature on food systems and global nutrition. Long-term studies show that diets change not only in terms of total nutrient intake, but also in the composition of foods and the relative contribution of different nutrient sources. In this context, protein consumption is a key indicator for analyzing dietary transformations, as it reflects both the overall level of food consumption and the structure of food sources (FAO, 2023).

Numerous studies emphasize the importance of distinguishing between animal and plant proteins in population-level dietary analysis. Protein sources influence the nutritional characteristics of diets while also reflecting the structure of agri-food systems and agricultural dynamics (Chrisendo et al., 2026; Cramarencu et al., 2023; Diaconeasa et al., 2024). Thus, analyzing protein consumption structure enables the identification of key trends in dietary evolution and food system transformation (Tilman & Clark, 2014; Willett et al., 2019). Increased consumption of animal proteins has often been associated with dietary diversification and changes in consumption behavior across regions. The literature also highlights the need for long-term perspectives in analyzing dietary trends (Balan, 2025; Trasca et al., 2026). Studies based on extended data series allow the identification of structural trends that are not visible in short-term analyses. FAO food balance sheets are frequently used in comparative studies, as they provide consistent and comparable data across countries and time periods (Roser et al., 2013).

Despite the growing literature on global dietary changes, Central and Eastern Europe remain underexplored in longitudinal studies on protein consumption patterns. Most studies focus on national or global analyses, lacking a comparative regional approach. Therefore, a long-term comparative analysis of animal and plant protein consumption can improve understanding of dietary transformations in the context of recent economic and institutional changes.

2. Research methodology

2.1 Data sources

The study uses secondary data on national protein consumption, derived from FAO food balance sheets and accessed through the Our World in Data platform, which provides internationally harmonized and comparable datasets. The indicators analyzed reflect the average daily protein consumption at population level, expressed in g/capita/day, for the period 1961–2023. The use of food balance sheets allows for comparative and long-term analyses of the evolution of nutrient consumption within national food systems. However, these data represent estimates based on national food availability and not actual individual consumption.

The literature review included sources from Web of Science, Google Scholar, institutional reports and grey literature on food systems. Sources were identified using keywords such as protein consumption, dietary patterns, animal and plant proteins, dietary changes and Central and Eastern Europe. The selection was based on thematic relevance, scientific quality and contribution to the understanding of long-term dietary changes.

2.2 Study design and country selection

The study is descriptive, comparative and longitudinal, analyzing the evolution of protein consumption

during the period 1961–2023 in seven countries in Central and Eastern Europe: Poland, the Czech Republic, Slovakia, Hungary, Romania, Bulgaria and Serbia. Their selection is based on belonging to the same region and on the existence of similar historical and economic characteristics, most of the states being part of the former communist bloc and having centrally planned economies. These particularities are relevant because the transition to a market economy has significantly influenced the structure of diets and access to protein sources. For all the analyzed countries, there are comparable data series for the entire period studied. In the case of states with political and territorial changes, the historical names corresponding to the analyzed periods were used, to ensure the coherence of the data series. The comparative analysis allows highlighting both common regional trends and differences between national protein consumption trajectories in the context of economic and institutional transformations in recent decades.

2.3 Definition of indicators

The analysis is based on three main indicators of protein consumption: total protein consumption, which reflects the total amount of protein consumed at the entire population level; animal-based protein consumption, which includes proteins from animal products, such as meat, dairy products, eggs, and fish and plant-based protein consumption, which includes proteins from plant sources, such as grains, legumes, nuts, and other plant products.

The indicators are expressed in g/capita/day and are derived from the FAO food balance sheets, calculated on the basis of domestic production, imports, exports and non-food uses. Although these indicators do not reflect actual individual consumption and do not include food losses or waste at the consumer level, they are frequently used in the literature for comparative analyses between countries and for assessing long-term food trends.

2.4 Analytical approach

The data analysis was carried out through a descriptive and comparative approach, using univariate statistical indicators to highlight trends and structural changes in protein consumption at the population level. The study does not aim to identify causal relationships, but to analyze the evolution of consumption during the period 1961–2023.

Long-term trends and absolute variations in total protein consumption were analyzed for each country. In order to capture changes associated with economic and institutional transformations, the period was divided into two sub-periods: 1961–1989 and 1990–2023, with average values calculated for each interval.

The stability of protein consumption was assessed by the standard deviation and the coefficient of variation, calculated for total, animal and vegetable proteins. Since the analysis uses the entire available data series, the population standard deviation (σ) was applied, calculated according to the following relationship:

$$\sigma = \sqrt{\frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2}$$

where:

x_i - annual value of protein consumption,

$\bar{x}$ - the average value for the entire analyzed period,

n - total number of observations.

To allow comparability between countries with different levels of protein consumption, the coefficient of variation (CV) is also calculated, as a relative indicator of dispersion:

$$CV = \frac{\sigma}{\bar{x}} \times 100 \quad (2)$$

The coefficient of variation expresses the variability of consumption as a percentage of the mean value and allows for the comparison of the degree of volatility between countries.

Regional convergence or divergence was assessed by comparing the dispersion of protein consumption values between countries in 1961 and 2023. Reducing the dispersion indicates convergence, and increasing it suggests divergence between national trajectories.

The analyses were performed in Microsoft Excel, and the results are presented through comparative tables and graphs.

3. Results and discussion

3.1. Trends in total protein consumption

The evolution of total protein consumption in the period 1961–2023 highlights a generally upward trend in all countries analyzed, but with significant differences in levels, trajectories and stability of consumption.

In the period 1961–1989, the values were relatively close (≈ 85 – 105 g/capita/day), with Poland maintaining higher levels, and Romania and Bulgaria lower and more volatile levels. In the early 1990s, all countries recorded decreases in consumption, more pronounced in Romania, Bulgaria and Slovakia.

Subsequently, the trajectories become divergent. Poland and Serbia recorded significant increases, with Serbia exceeding 135 g/capita/day in 2023. Romania experienced a sharp decline in the 1990s, followed by a recovery after 2000, but remained below the levels of Poland and Serbia. In contrast, Bulgaria and Slovakia maintain lower values, with Slovakia having one of the lowest levels in 2023 (≈ 81 g/capita/day) (Table 1).

Table no. 1. Protein consumption in Central and Eastern Europe, 1961–2023 (g/capita/day) (FAO - OWID, 2025)

Year	Type of protein	Country						
		Bulgaria	Czechia	Hungary	Poland	Romania	Serbia	Slovakia
1961	Total	90.64	89.25	85.01	96.72	88.3	90.76	89.25
	Animal-based	23.39	41.43	37.11	42.57	24.03	22.61	41.43
	Plant-based	67.25	47.82	47.9	54.15	64.27	68.15	47.82
1971	Total	96.57	96.47	95.77	104.57	88.16	96.75	96.47
	Animal-based	30.82	52.17	44.92	54.44	29.4	29.3	52.17
	Plant-based	65.75	44.3	50.85	50.13	58.76	67.45	44.3
1981	Total	105.51	99.97	102.31	107.49	97.75	105.11	99.97
	Animal-based	45	58.81	55.53	58.67	43.08	39.72	58.81
	Plant-based	60.51	41.16	46.78	48.82	54.67	65.39	41.16
1991	Total	91.46	92.98	95.14	102.67	90.49	98.29	92.98
	Animal-based	39.1	49.42	56.1	55.33	45.29	37.45	49.42
	Plant-based	52.36	43.56	39.04	47.34	45.2	60.84	43.56
2001	Total	84.43	92.83	89.06	99.8	100.52	81.13	71.12
	Animal-based	39.49	54.42	51	49.54	44.25	46.67	33.35
	Plant-based	44.94	38.41	38.06	50.26	56.27	34.46	37.77
2011	Total	85.32	98.19	86.44	111.73	106.64	113.09	79.34
	Animal-based	44.64	58.62	49.28	61.93	56.92	51.91	41.95
	Plant-based	40.68	39.57	37.16	49.8	49.72	61.18	37.39
2023	Total	86.49	96.07	93.64	117.74	112.42	135.58	81.31
	Animal-based	52.78	61.75	53.79	72.47	63.05	62.4	48.76
	Plant-based	33.71	34.32	39.85	45.27	49.37	73.18	32.55

Comparing the values from 1961 to 2023 highlights a trend of divergence between countries. While at the beginning of the period the differences were relatively small, today they are much more pronounced, especially between countries such as Serbia and Poland, on the one hand, and Slovakia or Bulgaria, on the other. This development suggests that the economic and food transformations of recent decades have led to distinct national trajectories, rather than a convergence of protein consumption in the region. (Figure no. 1)

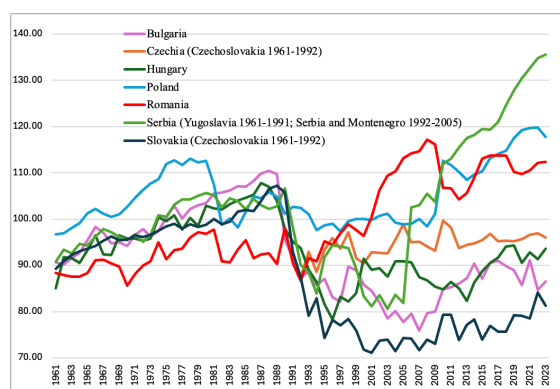


Figure no. 1. Evolution of total protein consumption (g/capita/day) in Central and Eastern Europe, 1961–2023

Overall, the results indicate that although protein consumption increased in all countries analyzed, this increase was not uniform, reflecting significant differences in the dynamics of food system transformations and dietary behavior at national levels.

3.2. Structural changes in protein consumption: animal-based vs plant-based protein

To highlight structural changes in the diet, the analysis differentiates between animal and plant proteins. The results indicate a significant transformation of dietary patterns in all countries analyzed, characterized by an increase in the consumption of animal proteins and a relative reduction in the share of plant proteins (Table 1).

During the period 1961–1989, plant proteins represented the dominant component of protein intake, while animal protein consumption was at lower levels, suggesting a predominantly plant-based dietary pattern.

After 1990, the structure of protein consumption changed considerably: animal protein consumption increased in most countries, while plant protein consumption stagnated or decreased. This trend reflects economic changes, dietary diversification, and greater access to animal products (Figure no. 2).

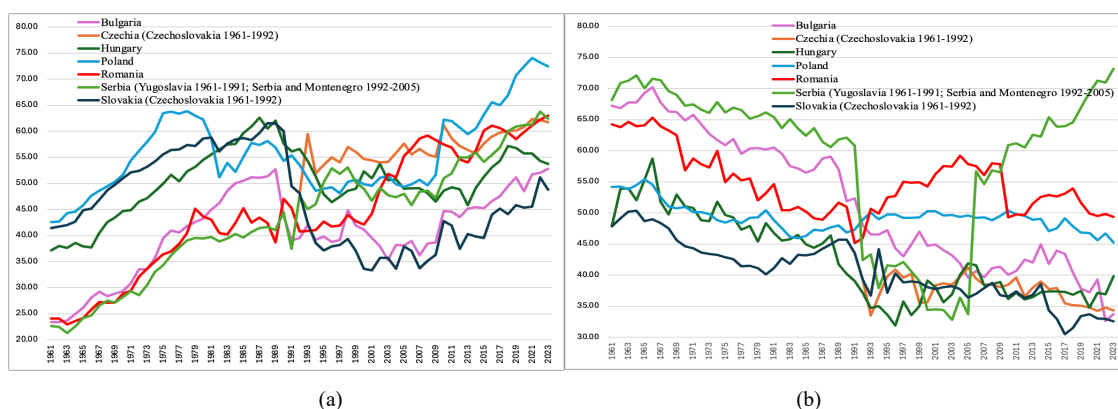


Figure no. 2. Evolution of animal-based protein consumption (a) and plant-based protein (b) consumption in Central and Eastern Europe, 1961–2023 (g/capita/day)

Poland and Serbia stand out for their high levels of animal protein consumption, recently exceeding 70 g/capita/day and 60 g/capita/day, respectively. Romania follows a similar trend, with a sharp increase after 2000, reaching around 63 g/capita/day in 2023, while plant proteins gradually decrease.

In contrast, Bulgaria and Slovakia show more moderate levels of animal protein consumption and a more pronounced reduction in plant proteins, suggesting a slower dietary transition.

The comparative analysis shows that all countries follow the same general direction of structural transformation, but with different intensities. Overall, the results highlight a clear dietary transition in Central and Eastern Europe, characterized by the shift from predominantly plant-based diets to dietary patterns with an increasing share of animal proteins.

3.3. Variance and stability of protein consumption

The variance and stability of protein consumption were analyzed using descriptive indicators such as the mean, standard deviation and coefficient of variation, calculated for each country and protein type over the period 1961–2023.

The results highlight important differences between countries in terms of the stability of total protein consumption. The Czech Republic (CV = 4.09%) and Poland (CV = 6.25%) show the most stable consumption trajectories, while Serbia (CV = 13.02%) and Slovakia (CV = 13.00%) record higher fluctuations. Romania and Bulgaria are at an intermediate level, with values of the coefficient of variation of approximately 9–10%, indicating a moderate stability of protein consumption. These differences reflect the particularities of economic evolution and national food systems (Table 2).

Table no. 2. Comparative variance and stability of protein consumption across countries: mean (g/capita/day), standard deviation, and coefficient of variation (1961–2023)

Country		Bulgaria	Czech	Hungary	Poland	Romania	Serbia	Slovakia
Mean	Total	92.42	96.16	93.11	105.15	98.98	102.41	87.11
	Animal-based	40.54	55.07	50.48	55.85	44.2	43.17	46.52
	Plant-based	51.89	41.09	42.63	49.3	54.78	59.24	40.59
Std. Dev.	Total	9.01	3.93	6.91	6.58	9.55	13.33	11.32
	Animal-based	7.99	5.25	6.26	7.8	11.68	11.38	8.55
	Plant-based	10.72	4.34	6.64	2.2	4.96	12.02	4.94
CV (%)	Total	9.75	4.09	7.42	6.25	9.65	13.02	13
	Animal-based	19.71	9.54	12.41	13.97	26.42	26.36	18.39
	Plant-based	20.66	10.56	15.57	4.46	9.05	20.29	12.16

Notes: Mean values represent the average daily protein consumption per capita (g/capita/day) over the period 1961–2023. Standard deviation (Std. Dev.) reflects the absolute variance of consumption over time, while the coefficient of variation (CV, %) expresses relative variance, allowing for comparison across countries with different consumption levels. Protein consumption is disaggregated into total, animal-based, and plant-based components. Higher CV values indicate greater temporal volatility, whereas lower values suggest more stable consumption patterns.

In the case of animal proteins, the analysis highlights a higher level of variance than in the case of total protein consumption. Romania (CV = 26.42%) and Serbia (CV = 26.36%) register the largest fluctuations, and Bulgaria and Slovakia also present high values of the coefficient of variation (CV > 18%), indicating a strong sensitivity to economic and institutional changes. In contrast, the Czech Republic (CV = 9.54%), Hungary (CV = 12.41%) and Poland (CV = 13.97%) present a more stable evolution of animal protein consumption. The results suggest that the dietary transition associated with the increase in the consumption of animal products has not been uniform in the region, with some countries being characterized by more volatile trajectories and stronger structural adjustments (Figure no. 3).

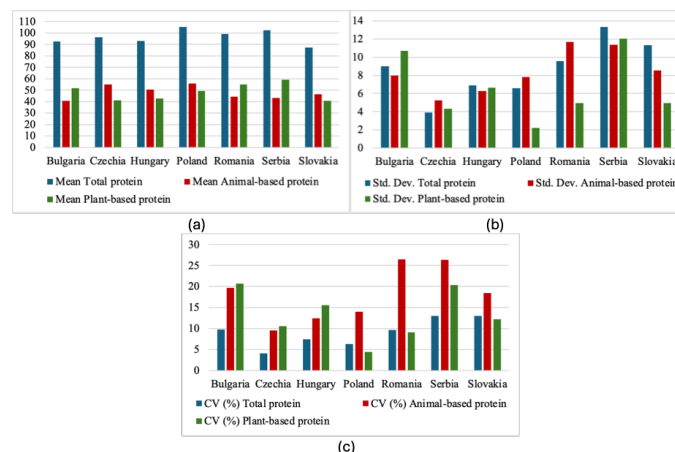


Figure no. 3. Levels and variance of protein consumption in Central and Eastern Europe: mean, standard deviation, and coefficient of variation (1961–2023)

Notes: (a) Mean protein consumption (g/capita/day); (b) standard deviation; (c) coefficient of variation (CV, %)

In the case of plant proteins, the results indicate important differences in stability between countries. Poland presents the most stable consumption (CV = 4.46%), followed by Romania (CV = 9.05%) and the Czech Republic (CV = 10.56%). In contrast, Bulgaria (CV = 20.66%) and Serbia (CV = 20.29%) register a high level of volatility, suggesting significant changes in the structure of plant consumption.

The comparison of protein types highlights the fact that total protein intake remains relatively stable, while its structural components, especially animal proteins, show more pronounced fluctuations. This suggests the existence of substitution processes between protein sources, which mask more complex internal dynamics of the diet. From a systemic perspective, the results show that the food transition in Central and Eastern Europe was a differentiated process between countries, influenced by economic changes, food accessibility and institutional transformations in the post-1990 period.

3.4. Convergence and divergence across countries

The analysis of the convergence or divergence of protein consumption between Central and Eastern European countries was carried out by comparing the dispersion of values in the initial year (1961) and in the final year of the period in question (2023). In this regard, both box-plot-type graphical representations and comparative country diagrams highlight the changes in consumption levels for each country.

The results indicate that, in 1961, total protein consumption levels were relatively close across the analyzed countries, with values concentrated in a narrow range, approximately between 85 and 97 g/capita/day. This relatively compact distribution reflects the existence of similar dietary patterns, specific to the economic and institutional context of the period. (Figure no. 4)

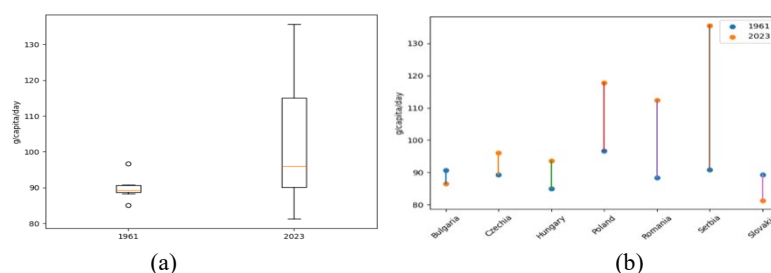


Figure no. 4. Convergence and divergence in total protein consumption across countries (1961 vs 2023)
(a) distribution of values; (b) comparative evolution of each country

Notes: The figures combine a boxplot representation of total protein consumption (g/capita/day) for 1961 and 2023 with a country-level comparison of changes between the two years. The increased dispersion and widening gap between minimum and maximum values indicate a divergence in protein consumption levels across countries over time.

In 2023, the dispersion of protein consumption values between countries increases significantly, ranging from around 81 g/capita/day in Slovakia to over 135 g/capita/day in Serbia. This development highlights the increasing differences between countries, confirmed both by the boxplot analysis and by the individual national trajectories. Serbia, Poland and Romania record significant increases in protein consumption, while Bulgaria and Slovakia show more moderate developments. These differences indicate a clear process of regional divergence, suggesting that Central and Eastern European countries did not follow a common convergence trajectory over the period 1961–2023. The development reflects differences in economic transformation, the structure of food systems and access to food resources.

3.5. Discussion - Implications for dietary transitions and food systems

The findings indicate that the evolution of protein consumption in Central and Eastern Europe reflects structural transformations of food systems, not just a quantitative increase in intake. The increase in total protein consumption and the shift towards animal protein are consistent with patterns described in the literature on nutritional transition and global dietary changes (Popkin, 2006; Tilman & Clark, 2014; Willett et al., 2019).

However, these changes do not follow a uniform regional trajectory. Differences between countries in consumption levels, protein composition and their stability suggest the existence of distinct dietary pathways, influenced by economic and institutional factors (FAO, 2023; Kearney, 2010). In this context, protein consumption can be interpreted as both a nutritional indicator and an indicator of agri-food systems transformation (Roser et al., 2013).

From a sustainability perspective, the increase in animal protein consumption raises issues related to resource use and environmental pressure (Tilman & Clark, 2014; Springmann et al., 2018). At the same time, differences between countries highlight the coexistence of distinct dietary patterns, with different implications for sustainability and access to nutritionally adequate diets (FAO, 2023; Willett et al., 2019). The results must also be interpreted in relation to certain methodological limitations, generated by the geopolitical changes associated with Czechoslovakia and the former Yugoslavia. Although these do not affect the overall trends identified, they should be taken into account in long-term historical comparisons between countries.

Conclusions

All in all, the study highlights important transformations in protein consumption in seven Central and Eastern European countries over the period 1961–2023. All countries analyzed register an increase in protein consumption, accompanied by an increasing orientation towards animal proteins.

However, these changes have not followed a uniform trajectory. Although the countries had similar starting points, different developments have led to a process of regional divergence, reflecting the influence of economic and institutional factors on national food systems. Differences in consumption stability indicate

varying levels of resilience and adaptability of these systems.

The results suggest that protein consumption patterns can be interpreted as indicators of food system transformation and changes in food production, availability and access. From a sustainability perspective, the increase in animal protein consumption raises issues related to environmental impacts and the development of balanced food systems adapted to the local context.

The study also opens up relevant directions for future research on the relationship between protein consumption, sustainability and resilience of food systems.

Generative Artificial Intelligence (GenAI) usage statement:

Grammarly for Mac was responsibly used for language improvement. After this process, the authors reviewed and edited the content as needed and take full responsibility for the content of the present article. Available at <https://app.grammarly.com/apps>.

References

- Balan, I. M. (2025). Addressing food waste and hunger together. *Nature Human Behaviour*, 9(11), 2217-2218. <https://doi.org/10.1038/s41562-025-02337-9>.
- Chrisendo, D., Heikonen, S., Piipponen, J., Banafa, T., Deryng, D., El Wali, M., Heino, M., Irz, X., Jalava, M., Lång-Ritter, J., Mazac, R., Niva, V., Pihlajamäki, M., Roitto, M., Tuomisto, H. L., & Kumm, M. (2026). A systematic review of sustainable food systems identifies socio-economic pathways driving food systems transformations. *Nature Food*, 7(3), 234-246. <https://doi.org/10.1038/s43016-026-01317-0>.
- Cramarencu, R. E., Istudor, N., & Petrescu, A. G. (2023). Organic food consumption during the covid-19 pandemic. A bibliometric analysis and systematic review. *Amfiteatru Economic*, 25(Special 17), 1042. <https://doi.org/10.24818/EA/2023/S17/1042>.
- Diaconeasa, M. C., Zaharia, A., Ladaru, G. R., & Mocanu, S. (2024). Bibliometric analysis of sustainable food systems. *Amfiteatru Economic*, 26(Special 18), 1224. <https://doi.org/10.24818/EA/2024/S18/1224>.
- FAO. (2023). *The state of food security and nutrition in the world 2023*. Retrieved January 20, 2026, from <https://openknowledge.fao.org/items/445c9d27-b396-4126-96c9-50b335364d01>.
- Our World in Data. (n.d). *Animal protein consumption, 2023*. Retrieved January 20, 2026, from <https://ourworldindata.org/grapher/animal-protein-consumption?time=2023>.
- Kearney, J. (2010). Food consumption trends and drivers. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 365(1554), 2793-2807. <https://doi.org/10.1098/rstb.2010.0149>.
- Popkin, B. M. (2006). Global nutrition dynamics: The world is shifting rapidly toward a diet linked with noncommunicable diseases. *The American Journal of Clinical Nutrition*, 84(2), 289-298. <https://doi.org/10.1093/ajcn/84.2.289>.
- Roser, M., Ritchie, H., & Rosado, P. (2013). Food supply. *Our World in Data*. Retrieved January 20, 2026, from <https://ourworldindata.org/food-supply>.
- Springmann, M., Clark, M., Mason-D'Croz, D., Wiebe, K., Bodirsky, B. L., Lassalle, L., De Vries, W., Vermeulen, S. J., Herrero, M., Carlson, K. M., Jonell, M., Troell, M., DeClerck, F., Gordon, L. J., Zurayk, R., Scarborough, P., Rayner, M., Loken, B., Fanzo, J. & Willett, W. (2018). Options for keeping the food system within environmental limits. *Nature*, 562(7728), 519-525. <https://doi.org/10.1038/s41586-018-0594-0>.
- Trasca, T. I., Balan, I. M., Fintineru, G., Tiu, J. V., Mateoc-Sirb, N., & Rujescu, C. I. (2025). Sustainable food security in Romania and neighboring countries—Trends, challenges, and solutions. *Foods*, 14(8), 1309. <https://doi.org/10.3390/foods14081309>.
- Tilman, D., & Clark, M. (2014). Global diets link environmental sustainability and human health. *Nature*, 515(7528), 518-522. <https://doi.org/10.1038/nature13959>.
- Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T., Tilman, D., DeClerck, F., Wood, A., Jonell, M., Clark, M., Gordon, L. J., Fanzo, J., Hawkes, C., Zurayk, R., Rivera, J. A., De Vries, W., Majele Sibanda, L. & Murray, C. J. L. (2019). Food in the Anthropocene: The EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, 393(10170), 447-492. [https://doi.org/10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4).