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FOOD MANAGEMENT IN THE EUROPEAN UNION COUNTRIES IN THE CONTEXT OF FOOD WASTE

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ABSTRACT: The aim was to analyse the relationship between the level of food waste in EU countries and to compare these countries in terms of development in terms of counteracting this phenomenon. Methodology/Approach: A multidimensional comparative analysis was carried out to assess the level of development of EU countries in reducing food losses. Findings: Some countries achieved the highest level of development in reducing food losses. The greatest waste occurs in households, highlighting the importance of educational and regulatory measures. Limitations/Implications of the study: The study was limited to two years (due to data availability). Practical implications: The results can support the development of food policy strategies in the EU aimed at reducing waste. Social implications: Reducing food waste can help improve food security. Originality/Value: The article makes an important contribution to the understanding of the determinants of food waste and proposes a benchmarking for EU countries in food management.

KEYWORDS: food waste management, sustainable development, food economy, food supply chain

Introduction

Food waste is one of the most serious problems of the modern food economy, generating negative economic, environmental and social consequences. According to the European Commission (2024, September 27), around 59 million tonnes of food are wasted each year in European Union countries, leading to significant financial losses and greenhouse gas emissions, as well as exacerbating inequalities in access to food. This problem affects all stages of the food supply chain – from primary production, through processing, trade and gastronomy, to households.

In the context of the challenges of sustainable development and the need to improve the efficiency of resource management, it is important to understand the factors affecting the level of waste in various sectors of the food economy. Food governance requires an integrated approach that takes into account both food policies and socio-economic conditions, such as income levels, urbanisation and the structure of food spending.

The aim of this article is to analyse the relationship between the level of food waste in EU countries and to compare these countries in terms of development in terms of counteracting this phenomenon. The study is based on 2020 and 2022 data and focuses on five key parts of the food supply chain: primary production, food processing, distribution, catering and households.

The following research hypotheses were put forward:

1. Hypothesis 1: Countries with a higher level of economic development (measured by GDP per capita) are less effective in reducing food waste compared to countries with a medium level of economic development.
2. Hypothesis 2: The highest levels of food waste are in the household sector, which indicates the need for more targeted education and regulation in this area in EU countries.
3. Hypothesis 3: It is possible to benchmark the measure of development of EU countries in the context of reducing food waste.

The article contributes to the understanding of the determinants of food waste in the European Union countries and is a kind of benchmarking of EU countries, allowing to intensify activities for sustainable food management.

An overview of the literature

Food waste is a major global problem throughout the food supply chain. Studies estimate that 13.1 million tonnes of food waste are generated in the UK alone every year (Jeswani et al., 2021). The main sources of food waste are overproduction, inefficient processing, logistical problems, and household behaviour (Zhao et al., 2019). The type of food is related to the amount of waste and the degree of impact on the environment. For example, cereals, vegetables, and spices spears contribute the most to waste, while meat and fish have the highest environmental impact, despite having less waste (Jeswani et al., 2021). The drivers and barriers to reducing food waste can be divided into social, personal, and behavioural factors (Stangherlin & de Barcellos, 2018). In Finnish households, the average annual food waste is 23 kg per person, with vegetables, homemade food and dairy products being the most frequently discarded products (Silvennoinen et al., 2014). To address food waste, a comprehensive approach is needed that includes policy solutions, improved packaging, date labelling, logistics, and changing consumer behaviour (Zhao et al., 2019).

The problem of food waste concerns several fundamental areas or, in fact, stages of the supply chain. In particular, these are: primary production of food in agriculture, fishing and aquaculture, manufacture of food products and beverages, retail and other distribution of food, restaurants and food services and total activities by households. Table 1 presents numerical data on scientific studies published in 2020-2024 for these five areas according to the ScienceDirect database.

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Table 1. Number of study published in 2020-2024 in the area of food waste

Food waste vs. year	primary food production	food manufacturing	food retail	food services	households
2024	1633	1156	394	731	776
2023	1105	878	305	616	612
2022	1015	764	330	578	672
2021	834	715	323	545	568
2020	588	459	200	399	430
2024/2020 change	278%	252%	197%	183%	180%

It is obvious that these topics are gaining importance, as can be seen from the analysis of the data in Table 1 – over the five-year period, there was a significant increase in the number of publications in each of these thematic areas.

A significant amount of food waste is generated in agriculture and fisheries, with primary production varying from country to country depending on the specificities of the region and climate. Many researchers take up this problem in their studies. For example, O'Connor et al. (2022) indicate that food waste in Ireland comes mainly from the vegetable, meat and crop sectors. In contrast, in the Nordics, food waste generated accounts for as much as 3.7% of total production (Hartikainen et al., 2018). Also, Zhang et al. (2019) state that agricultural and fish waste, occurring in various forms, accounts for a significant part of the world's harvest. At the same time, food losses and waste in primary production are estimated to be between 4 and 31% for vegetables, cereals and legumes (Franke et al., 2017). These are mainly due to quality problems, while fish side flows are mainly associated with diseases and predators. There are also works in which the authors propose specific solutions. For example, Kari et al. (2023) point out that reusing agricultural waste for aquaculture feed can reduce dependence on fishmeal and soybean meal while also addressing environmental and economic issues.

The analysis of available studies in this area also allowed us to conclude that food waste in primary agricultural production results primarily from technical problems, such as poor equipment, biological factors (pests and weather), as well as operational problems, including work organisation. The results of this analysis are presented in Table 2.

Table 2. Food waste in primary production of food – selected papers

Study	Factor Category	Impact Level
O'Connor et al. (2022)	Biological (pests, disease, stress); Operational (unharvestable/unsaleable)	High (vegetables largest source)
Łaba et al. (2022)	Sector/stagedependent (no further detail found)	Moderate (15% of national losses)
Dumitru et al. (2020)	Biological (pests, microorganisms); Operational (harvest, storage); Economic (infrastructure)	High in cereals
Gage et al. (2024)	Operational (quality, supply/demand); Biological (innate mechanisms); Economic/technical	High (apples, onions, carrots, potatoes)
Croad (2024)	Economic (quality, surplus); Operational (supply chain)	Potentially high (field losses underestimated)
Bartezzaghi et al. (2022)	Biological (perishability, pests); Operational/economic (practices)	High in fruit/veg
Alexander et al. (2017)	Operational (system inefficiency); Behavioral (overconsumption)	High (livestock, pre-harvest)

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Food waste is also a serious problem in the next stage of the supply chain – the food industry. In manufacturing, waste can result from processing operations, quality assurance, and products that do not meet quality requirements (Raak et al., 2017). Authors such as Mozos et al. (2020) also draw attention to process losses at this stage of the food supply chain and mention here: peeling, cutting, cooking, or spoilage.

Food waste in the manufacturing sector can result in significant economic costs (Colwill et al., 2016). There are studies that provide specific estimates of these costs. For example, Amicarelli et al. (2022), conducting quantitative estimates of the Italian potato chips and meat sectors, suggest that waste can account for up to 22% of the production value, with losses in the range of hundreds of millions of euros. Also noteworthy is the research using Material Flow Cost Accounting (MFCA), in which the authors (Bux & Amicarelli, 2022) identified not only direct product losses but also significant hidden costs related to the use and disposal of resources. According to the authors, in the Italian meat sector alone, this is greater than 242–268 million euros. It is worth noting that there is no standardised approach to measuring the economic costs of food waste. Methods are typically limited to Material Flow Costing at the sector level to company-level cost-benefit analysis and quality frameworks (Stone et al., 2019).

On the other hand, the issue of food waste at the sales stage is taken up by authors such as Quested et al. (2011). They identify actions to reduce food waste, such as engaging consumers, working with retailers and manufacturers to improve purchasing and warehousing practices, and developing strategies to minimise losses in the food processing sector. Other authors point out that improving elements such as packaging, storage, and clear directions can be beneficial in reducing food waste by consumers (Jellil et al., 2016).

By contrast, the highest levels of food waste are recorded at the level of consumers and restaurant services. Some authors estimate that it could be close to 50 % (Jellil et al., 2016). The reasons for this include exceeding the expiration date (Siedlecka et al., 2024), surplus cooked food, wasting food after preparation, leftovers from plates, hygiene rules, or poor management of the premises (Mozos et al., 2020). The authors, i.e. van Rooijen et al. (2025), indicate that the most common causes of food waste by consumers are uncertainty about the number of people at meals, irregular planning, and lack of flexibility in shopping and meals. In turn, Paroissien et al. (2024) indicate here the high opportunity cost of time, lack of planning, and limited willingness to take time-consuming actions to counteract waste. On the other hand, errors in food management in the household (shopping, storage, preparation), automatic behaviours, and lack of awareness are the reasons for food waste indicated by Bain et al. (2024). Food waste in urban retail and restaurant establishments has significant economic and environmental consequences. Studies suggest that up to 40% of food is wasted in restaurants, representing an annual loss of between $9 billion and $23 billion in the US out-of-home sector and costing between $40,000 and $100,000 per million US dollars spent (Parsa et al., 2024; Zheng & Ai, 2021). In the retail context, modelling suggests that food waste generates significant direct costs and that recovery programs can be cost-effective (for example, at transportation costs as low as $0.06 per pound), although such interventions can also reduce demand in supply sectors. Environmental assessments reveal that food waste on plates in restaurants has an associated carbon footprint of 128–324 grams of CO_2 equivalent per plate, while LCA methods in independent restaurants suggest that targeted measures could reduce overall environmental impacts by up to 17% (Matzembacher et al., 2020). Urban food recovery efforts have shown a 97% reduction in greenhouse gas emissions per tonne diverted, equivalent to savings of about 0.51 metric tonnes of CO_2 per tonne. Integrated approaches using system dynamics models across the consumer and supply sectors further highlight the potential for coordinated interventions to deliver economic, environmental, and social benefits.

Therefore, at individual stages of the food supply chain, the level of food waste may vary significantly, and in the research part, this problem was analysed in relation to individual European Union countries.

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Research methods

This study on food waste levels at different stages of the supply chain is based on publicly available data taken from the Eurostat database. The data, updated in March 2025, cover the years 2020-2022 and cover all Member States. Data for 2022 and 2020 were selected for analysis to compare the results and indicate a possible trend. The data was for food waste according to NACE Rev. 2, and the unit was a kilogram per person. In the first step, a preliminary analysis of the obtained data was carried out, and then a comparative multivariate analysis was carried out to examine the behaviour of individuals (selected EU countries) in relation to the amount of food waste at different stages of the supply chain. This type of analysis makes it possible to assess the differences of the studied units due to a complex phenomenon, and additionally, to rank the examined units according to the level of the studied phenomenon.

In the next step, the variables affecting the level of waste were determined:

- X1 – amount of food waste in kg/person in the primary production of food – agriculture, fishing and aquaculture area;
- X2 – amount of food waste in kg/person in the area of manufacture of food products and beverages;
- X3 – amount of food waste in kg/person in the area of retail and other distribution of food;
- X4 – amount of food waste in kg/person in the area of restaurants and food services;
- X5 – amount of food waste in kg/person in the area of activities by households.

All of these variables are destimulants, due to the fact that the increase in the value of each of these variables affects the decrease in the level of development of a given facility – country in the context of food waste.

When using multivariate comparative analysis methods, due to the condition of separating variables expressed in the same units of measurement with similar orders of magnitude, it is recommended to normalise the variables in order to unify both the units of measurement of the variables and the orders of magnitude of the variables. In this study, standardisation was used, carried out according to the scheme:

$$z_{ij} = \frac{x_{ij} - \bar{x}_j}{s_j} \quad (i = 1, 2, \ldots, n; j = 1, 2, \ldots, m), \tag{1}$$

where:
n – number of objects,
m – number of variables,
z_{ij} – standardised value of the variable X*j* for the i-th object,
$\bar{x}_j$ – arithmetic mean of the variable X*j*,
S_j – standard deviation of the variable X*j*.

Next, the similarity of the objects to the reference object was measured using Euclidean distances:

$$d_{i0} = \sqrt{\sum_{j=1}^{m} (z_{ij} - z_{0j})^2} \quad \text{(i=1, ..., n)}, \tag{2}$$

where:

$$z_{0j} = \begin{cases} \max_i z_{ij} \ \ for\ stimulants \\ \min_i z_{ij} \ \ for\ destimulants \end{cases} \tag{3}$$

The measure of development was estimated using:

$$m_i = 1 - \frac{d_{i0}}{d_0} \text{ (i=1, ..., n).} \tag{4}$$

where d_0 is the distance between the pattern and the antipattern of development.

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The values of the measure of the development of the studied phenomenon are in the range [0,1]. The higher its value, the higher the level of development of a given country in the area of reducing food waste. It should be noted that the same influence of all variables on the analysed phenomenon was assumed. Finally, on the basis of the results of the analysis, individual countries were ranked according to the level of development in the studied subject.

Results of the research

The analysis uses data obtained from Eurostat. However, the latest data (updated in March 2025) concerns 2022. Therefore, comparing them with data for 2020 (the oldest list), we can see some changes, but it is not yet possible to talk about a clear trend (Figure 1).

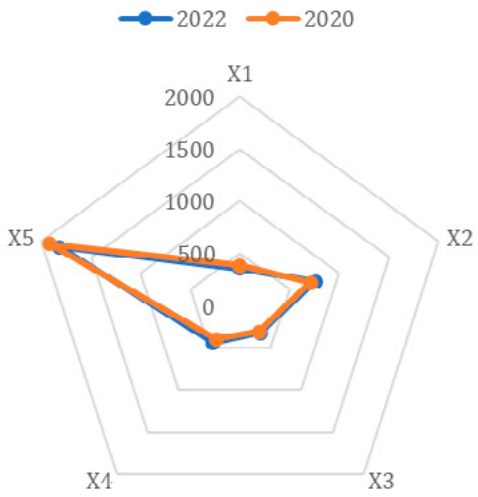

Figure 1. Comparison of food waste in selected stages of the supply chain in 2020 and 2022

The largest amounts of waste in both years were found in households (X5), which confirms that it is consumers who generate the most waste. However, a positive change can be seen in this area in the form of a reduction in the amount of food waste. Unfortunately, in 2022, the values in X2 (processing) and X3 (retail and distribution) are higher than in 2020, which suggests an increase in losses in these sectors. In general, it can be seen that between 2020 and 2022, the situation deteriorated primarily in processing and in the area of restaurants and food services.

The data was then analysed, taking into account the EU Member States, indicating a change in food losses that occurred in 2022 compared to 2020 (Table 3).

Preliminary analysis of the data in Table 3 indicates significant variation across countries and supply chain areas where waste occurs. Data analysis indicates complex changes that may be the result of legislative actions, consumption transformations or the impact of the economic and pandemic situation. In the area of primary food production (X1), which includes agriculture, fisheries and aquaculture, we observe a decreasing or stable trend in many countries. For example, Slovakia recorded a significant decrease, from 13 kg to 7 kg per person, which is a reduction of 46%. Similarly, in the Netherlands, the decrease was 33%. At the same time, some countries recorded increases, such as Denmark, where the amount of waste in this area increased from 11 to 20 kg/person, which may suggest intensification of production or inefficiency of primary processes. In most countries, however, the values in this sector are relatively low compared to other links in the chain.

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Table 3. Wasted food in kg per person in each EU country in 2020 and 2022

NACE_R2	Total			X1			X2			X3			X3			X5		
	2020	2022	Change [%]	2020	2022	Change [%]	2020	2022	Change [%]	2020	2022	Change [%]	2020	2022	Change [%]	2020	2022	Change [%]
BE	146	151	3	3	3	0	54	63	17	11	11	0	8	10	25	70	64	-9
BG	114	95	-17	10	10	0	20	23	15	7	6	-14	19	15	-21	58	41	-29
CZ	91	101	11	3	1	-67	9	15	67	6	6	0	4	17	325	69	61	-12
DK	221	254	15	11	20	82	102	118	16	17	17	0	11	13	18	79	86	9
DE	131	129	-2	2	2	0	19	19	0	9	9	0	23	24	4	78	75	-4
EE	125	134	7	18	16	-11	24	29	21	15	15	0	8	10	25	61	65	7
IE	152	144	-5	11	10	-9	44	44	0	14	17	21	35	30	-14	48	42	-13
GR	191	196	3	35	25	-29	35	44	26	14	18	29	21	23	10	87	86	-1
ES	69	65	-6	18	16	-11	11	11	0	6	7	17	4	6	50	30	26	-13
FR	129	139	8	18	17	-6	26	35	35	10	12	20	16	16	0	60	58	-3
HR	73	72	-1	10	10	0	3	2	-33	1	1	0	4	4	0	55	55	0
IT	136	139	2	12	11	-8	9	9	0	6	11	83	3	8	167	107	100	-7
CY	273	294	8	49	52	6	67	72	7	56	60	7	30	33	10	71	77	8
LV	145	124	-14	17	14	-18	19	16	-16	8	8	0	19	13	-32	82	71	-13
LT	136	140	3	29	29	0	10	14	40	10	11	10	2	1	-50	86	86	0
LU	147	122	-17	12	12	0	17	18	6	14	13	-7	14	15	7	91	65	-29
HU	94	84	-11	2	1	-50	19	14	-26	4	6	50	2	2	0	66	60	-9
MT	160	162	1	1	1	0	15	14	-7	8	9	13	45	51	13	92	88	-4
NL	161	129	-20	27	18	-33	59	50	-15	12	9	-25	5	5	0	59	48	-19
AT	136	131	-4	2	1	-50	19	23	21	9	9	0	23	28	22	83	70	-16
PL	120	123	3	18	20	11	21	15	-29	14	13	-7	7	7	0	61	69	13
PT	175	184	5	10	11	10	6	6	0	21	22	5	16	23	44	123	123	0
RO	166	181	9	36	32	-11	16	20	25	2	2	0	25	29	16	86	99	15
SI	74	71	-4	0	0	0	5	5	0	7	7	0	24	26	8	37	33	-11
SK	107	106	-1	13	7	-46	23	26	13	5	6	20	1	2	100	65	65	0
FI	113	109	-4	6	5	-17	29	25	-14	10	10	0	14	15	7	53	55	4
SE	121	117	-3	10	9	-10	29	29	0	11	10	-9	9	14	56	61	56	-8

Source: author's work based on https://ec.europa.eu/eurostat [28-06-2025].

In the case of food and beverage processing (X2), a greater variation was noted. Some countries, such as the Czech Republic (an increase from 9 to 15 kg/person) or France (from 26 to 35 kg/person), have shown a significant increase in waste, which may be due to the intensification of production or logistical problems. At the same time, countries such as Poland (a decrease from 21 to 15 kg/person) or Hungary (from 19 to 14 kg/person) have managed to reduce the amount of waste. This indicates the possible implementation of effective technological solutions or the optimisation of processing processes. The area of food retail and distribution (X3) is characterised by relative stability, although there are also exceptions here. Italy increased the amount of food waste from 6 to 11 kg/

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person, which is an increase of as much as 83%, while the Netherlands and Finland recorded decreases. It is worth emphasising that the levels in this sector are not the highest in the overall structure, but their increase may indicate problems in supply chain management, including: in terms of expiration dates, cold storage logistics or planning supply in relation to demand. When it comes to gastronomy (X4), i.e. restaurants and other food services, the changes are varied but noticeable. For example, Poland, the Czech Republic and Romania have recorded increases, which may be the result of the sector recovering from the pandemic and a renewed increase in out-of-home consumption. In turn, Ireland and Spain have reduced waste in this sector, which may indicate the growing awareness of restaurateurs or the effects of educational and optimisation activities. The largest amount of waste is still generated by households (X5). In many countries, this sector accounts for more than half of total losses. In Denmark, this level reached 86 kg/person in 2022, while in Romania – 99 kg/person. Although some countries, such as Bulgaria, the Netherlands and Luxembourg, have recorded significant decreases (by 29%, 19% and 29% respectively), in many countries this level remains high. In Poland, the amount of household waste has even increased, from 61 to 69 kg/person, which highlights the need for educational activities and policies to reduce waste at the consumer level. In summary, data for 2020 and 2022 indicate that although positive changes are noticeable in some countries, most food waste is still concentrated in households. Other sectors show some success in reducing losses, but their situation is strongly diversified depending on the country. Policy recommendations should therefore take into account national and sectoral specificities, with support for consumer education, technological solutions in processing and better logistics management in the retail and catering sectors remaining key. It can therefore be concluded that there is a need for a differentiated approach to waste reduction, adapted to the specific characteristics of each country and sector.

Then, a linear ordering was carried out, and its results were presented for a total of five variables (Table 4) along with a ranking of countries, which allows for a comparison of the development of individual countries in the context of shaping the levels of food waste in different areas of the supply chain.

Table 4. A measure of the development of EU countries in the context of the level of food waste

Cuntry	The distance from the pattern		Measure of the development		Ranking possition	
	2022	2020	2022	2020	2022	2020
AT	3.358	3.515	0.971	0.967	18	15
BE	3.332	3.326	0.971	0.969	17	13
BG	1.934	2.523	0.983	0.976	4	9
CY	8.604	8.257	0.925	0.923	27	27
CZ	2.288	2.079	0.980	0.981	7	4
DE	3.248	3.328	0.972	0.969	16	14
DK	6.099	5.582	0.947	0.948	26	26
EE	2.996	2.845	0.974	0.973	13	11
ES	1.612	1.663	0.986	0.984	1	2
FI	2.282	2.294	0.980	0.979	6	6
FR	3.025	2.898	0.974	0.973	15	12
GR	4.704	4.913	0.959	0.954	22	23
HR	1.647	1.538	0.986	0.986	2	1
HU	1.753	1.988	0.985	0.981	3	3
IE	3.619	4.071	0.969	0.962	19	21
IT	3.815	4.048	0.967	0.962	20	20
LT	3.949	3.853	0.966	0.964	21	18
LU	2.783	3.742	0.976	0.965	10	17

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Cuntry	The distance from the pattern		Measure of the development		Ranking possition	
	2022	2020	2022	2020	2022	2020
LV	2.812	3.553	0.976	0.967	11	16
MT	5.356	5.158	0.953	0.952	24	24
NL	2.851	3.914	0.975	0.963	12	19
PL	3.007	2.731	0.974	0.974	14	10
PT	5.454	5.349	0.953	0.950	25	25
RO	5.128	4.719	0.955	0.956	23	22
SE	2.428	2.477	0.979	0.977	9	8
SI	2.294	2.212	0.980	0.979	8	5
SK	2.232	2.304	0.981	0.978	5	7

The results of the multidimensional analysis show the different levels of development of the European Union countries in the area of reducing food waste. The development measure, which ranges from 0 to 1, assesses how effectively countries manage waste reduction in different sectors, such as primary production, processing, distribution, food service and households. In 2022, the highest level of development (i.e. the lowest distance from the model and the highest development measure) was characteristic of countries such as Spain (ES), Croatia (HR) and Hungary (HU). Their development measures exceeded the value of 0.985, and the distances were much lower than in the others. Therefore, their high compliance with the model is visible, which may indicate effective systemic actions in reducing food waste or, more broadly, in sustainable resource management. On the other hand, the weakest results in both years were recorded by Cyprus (CY), Denmark (DK), Portugal (PT) and Malta (MT). The development indicators of these countries remain below 0.955, and their distances from the model are the highest, for example, for Cyprus in 2022 it was as much as 8.6. This may indicate greater difficulties in effectively implementing strategies to reduce waste, weaker infrastructure or lack of appropriate regulations. An interesting case is Bulgaria (BG), which improved its position in the ranking from 9th place in 2020 to 4th in 2022 – significantly reducing the distance from the benchmark and improving the development measure. Similarly, the Czech Republic (CZ), Slovakia (SK) and Slovenia (SI) maintain high positions with relatively stable indicator values. It is also worth noting the declines in the ranking of countries such as Austria (AT), Belgium (BE) and France (FR), where, despite slight changes in development measures, the position has shifted downwards. This may suggest that despite the high economic level, there are areas in these countries that require further improvements in food management. To sum up, these data indicate significant differences in the level of development of EU countries in the analysed area and the dynamics of changes between 2020 and 2022.

Discussion/Limitation and future research

The results of the conducted analyses indicate a significant difference in the level of development in the area of reducing food waste among EU countries. According to the results obtained, Croatia, Spain and Hungary have achieved the highest measure of development, which may indicate effective waste management measures at all stages of the supply chain. Referring to the literature, such results may be due to relatively simpler supply chain structures and lower losses in processing and distribution (Franke et al., 2017; O'Connor et al., 2022). In contrast, Cyprus and Denmark were at the bottom of the ranking, confirming previous research pointing to the challenges of large losses in the household and catering sector (Mozos et al., 2020; Jellil et al., 2016). Food waste in households is complex and depends on both behavioural factors (such as poor planning, habits or lack of awareness) and economic factors, especially the opportunity cost of time. The dominant category of waste is fruit and vegetables. Quantitatively, waste reaches hundreds of kilograms per household per year, and costs, where estimated, can amount to several hundred euros per month. There is a clear need to design

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individualised interventions that take into account the profile of households and their habits. The importance of this topic is justified by, for example, Agenda 2030, adopted by the UN in 2015, which states that combating food waste is a key element of Sustainable Development Goal (SDG) 12: Responsible consumption and production, and specifically specific goal 12.3, which aims to halve global food waste per capita at the retail and consumption level by 2030 and reduce food losses along production and supply chains, including post-harvest losses.

One of the limitations of the study was study was data availability, limited to two years. In addition, the assumption of an equivalent effect of all variables on the analysed phenomenon may not have fully reflected reality. An additional difficulty was the limitation of the data to a narrow date range (2020-2022), which prevents dynamic analysis and actual assessment of trends over time.

In the context of future research, it would be advisable to extend the analysis to include data from subsequent years and to include more differentiated weights for individual variables to better reflect their importance in reducing waste. It is also worth examining the impact of national and regional policies on food losses in order to identify best practices.

Conclusions

The aim of this study was to analyse the level of food waste in EU countries and to assess their development in terms of reducing losses at different stages of the supply chain. The results of the survey made it possible to rank countries according to the measure of development and indicated a large variation between countries. The study concluded that Croatia, Hungary and Bulgaria were the most effective in reducing losses, while countries such as Cyprus, Denmark and Portugal require urgent corrective action.

The hypotheses have been verified. Hypothesis 1, assuming that countries with a higher GDP per capita are less effective in reducing waste, has been partially confirmed – the cases of Germany and France indicate the need for further analysis. Hypothesis 2, suggesting that the highest waste occurs in the household sector, has been confirmed in most cases, especially for countries such as Cyprus and Denmark. Hypothesis 3, concerning the possibility of benchmarking EU countries in terms of waste, has been fully verified – the measure of development allowed for an effective comparison of countries. The study makes a significant contribution to understanding the determinants of food waste and indicates the directions of activities aimed at sustainable food management. The results may provide the basis for further research and for the development of strategies to reduce food waste in the specific conditions of individual countries, taking into account their position in the ranking and distance from the pattern. Fortunately, the consumer model is also changing – as shown by the research by Gajdzik et al. (2023), the share of consumers who go to the store, have a prepared shopping list and buy carefully planned products is growing. Returning to the results of this study, countries with lower values of the development measure should focus on implementing comprehensive solutions that cover all sectors of the food economy.

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ZARZĄDZANIE GOSPODARKĄ ŻYWNOŚCIOWĄ W KRAJACH UNII EUROPEJSKIEJ W KONTEKŚCIE MARNOTRAWSTWA ŻYWNOŚCI

STRESZCZENIE: Celem była analiza zależności między poziomem marnotrawstwa żywności w krajach UE oraz porównanie tych krajów pod względem rozwoju w zakresie przeciwdziałania temu zjawisku. Metodologia/Podejście: Wykorzystano dane z Eurostatu z 2020 oraz 2022 roku. Przeprowadzono wielowymiarową analizę porównawczą w celu oceny poziomu rozwoju krajów UE w ograniczaniu strat żywności. Ustalenia: Najwyższy poziom rozwoju osiągnęły Hiszpania, Chorwacja i Węgry, natomiast Cypr, Dania i Portugalia wymagają pilnych działań naprawczych. Największe marnotrawstwo występuje w gospodarstwach domowych, co podkreśla znaczenie działań edukacyjnych i regulacyjnych. Ograniczenia/Implikacje badań: Badanie ograniczono do jednego roku ze względu na brak pełnych danych dla niektórych krajów. Równoważny wpływ wszystkich zmiennych mógł nie oddać pełnej złożoności zjawiska.

Implikacje praktyczne: Wyniki mogą wspierać tworzenie strategii polityki żywnościowej w UE, ukierunkowanych na redukcję marnotrawstwa w najbardziej problematycznych sektorach. Implikacje społeczne: Ograniczenie marnotrawstwa żywności może przyczynić się do poprawy bezpieczeństwa żywnościowego oraz zmniejszenia nierówności w dostępie do żywności. Oryginalność/Wartość: Artykuł wnosi istotny wkład w zrozumienie determinant marnotrawstwa żywności i proponuje benchmarking dla krajów UE w zarządzaniu gospodarką żywnościową.

SŁOWA KLUCZOWE: zarządzanie marnotrawstwem żywności, zrównoważony rozwój, gospodarka żywnościowa, łańcuch dostaw żywności