

HOUSEHOLD FOOD WASTE ESTIMATED IN EUROPE - INTERMEDIATE STUDY ON FOOD WASTE DURING THE COVID - 19 PANDEMIC

BALAN IOANA MIHAELA¹, POPESCU COSMIN ALIN¹, IANCU TIBERIU¹,
GENCIA ADRIAN DANIEL², DINCU ANA-MARIANA*¹

¹*Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Romania*

²*West University of Timisoara, Romania*

* Corresponding author's e-mail: anamariadincu@usab-tm.ro

Abstract: *The arithmetic average of food waste estimates in European Union countries is 2 kg/capita/year higher than the arithmetic average of food waste estimates in all European countries, from 74 kg/capita/year to 76 kg/capita/year. The difference is greater in the case of the weighted average (European Union - 73 kg/capita/year, all European countries 66 kg/capita/year), the one we consider more representative in terms of impact on the economy and the environment. However, the arithmetic average remains a key indicator in assessing individual consumer behavior with regard to food waste. Although there are European Union policies that can combat food waste, they are not exploited, and the opportunities offered have not been put into practice. There is a lack of assessments of the impact of different European Union policies on combating food waste.*

Key words: *food waste, household food waste, European Union, Europe*

INTRODUCTION

Food waste has become a major concern of each state, and of all states together. Measures to reduce food waste are becoming increasingly obvious, but nevertheless ineffective [5,6,7,12]. Food waste cannot be attributed to a certain social or demographic category. It is a widespread phenomenon, on all continents, in all regions, in all countries, in all socio-demographic categories [12].

In essence, food waste consists of 3 major components:

1. food waste from households;
2. food waste from food service;
3. food waste from retail.

This study presents food waste from households in the European Union and continent Europe, with its different regions, according to the methodology of the United Nations Statistics Division.

MATERIALS AND METHODS

The study presents an objective analysis based on external data published by the United Nations Environment Program - FOOD WASTE INDEXREPORT 2021.

The interpretation of this external data by the authors was performed in a more complex study, which is the subject of analysis of the impact of the COVID-19 pandemic on consumer behavior regarding food waste, research that is ongoing.

RESEARCH RESULTS

Combating food waste is a global, European and European Union opportunity to make more efficient use of resources in the food chain. Food waste is a global issue that has become increasingly important on the public and political agenda in recent times. The importance of reducing food waste will need to increase, due to the growing need to feed a growing world population. Food is a valuable asset, and food production requires considerable amounts of resources [1,12].

Estimates presented globally show that about 1/3 of food produced for human consumption is wasted or lost, involving enormous economic and environmental costs.

Although globally the estimates show that Food service and retail have a high contribution in terms of participation in food waste, household food waste has the largest contribution (Table 1.)

Table 1.

Global food waste in 2019		
	Global average food waste (kg/capita/year)*	2019 total (million tons)
Household	74	569
Food service	32	244
Retail	15	118
Total	121	931

* The global averages is population-weighted averages

Source: FOOD WASTE INDEXREPORT 2021 United Nations Environment Program

Contrary to the growing importance of the phenomenon of food waste on the political agenda of the European Union, interventions related to this issue have diminished considerably over time. The measures adopted so far have been uninterrupted, constantly fragmented and intermittent, and the coordination at European Union level is absent. The absence of a unitary definition of food waste, of a unitary reference level to which to refer the aim of reducing food waste, has stagnated and even reduced further progress [1,12].

Countries in different regions of Europe are experiencing an extremely high level of food waste, while others are at very low levels (Tables 2, 3, 4, 5, 6).

Table 2.

Household food waste estimate - Eastern Europe		
No.	Countries Eastern Europe	Household food waste estimate (kg/capita/year)
1.	Belarus	68
2.	Bulgaria	68
3.	Czech	70
4.	Hungary	94
5.	Poland	56
6.	Republic of Moldova	76
7.	Romania	70
8.	Russian Federation	33
9.	Slovakia	70
10.	Ukraine	76

Source: FOOD WASTE INDEXREPORT 2021 United Nations Environment Program

In Eastern Europe the lowest estimate is for the Russian Federation, with 33 kg/capita/year, while Hungary has almost three times more, respectively 94 kg/capita/year. Romania has an estimate of 70 kg/capita/year, which places it slightly below the average of the countries in this region of Europe.



Figure 1. Map of food waste in Eastern Europe

Source: Graphic interpretation of authors based on FOOD WASTE INDEXREPORT 2021 United Nations Environment Program

Table 3.

Household food waste estimate - Northern Europe

No.	Countries Northern Europe	Household food waste estimate (kg/capita/year)
1.	Denmark	81
2.	Estonia	78
3.	Faroe Islands	76
4.	Finland	65
5.	Iceland	76
6.	Ireland	55
7.	Isle of Man	76
8.	Latvia	76
9.	Lithuania	76
10.	Norway	79
11.	Sweden	81
12.	United Kingdom	77

Source: FOOD WASTE INDEXREPORT 2021 United Nations Environment Program

In Northern Europe, the average level of food waste is higher. However, the range is narrower, with values between 55 and 81 kg/capita/year. Sweden and Denmark are at the upper limit of food waste estimates in Northern Europe, and Ireland at the lower limit.



Figure 2. Map of food waste in Northern Europe

Source: Graphic interpretation of authors based on FOOD WASTE INDEXREPORT 2021 United Nations Environment Program

Table 4.

Household food waste estimate - Southern Europe		
No.	Countries Southern Europe	Household food waste estimate (kg/capita/year)
1.	Albania	83
2.	Andorra	84
3.	Bosnia and Herzegovina	83
4.	Croatia	84
5.	Gibraltar	84
6.	Greece	142
7.	Holy See (Vatican)	-
8.	Italy	67
9.	Malta	129
10.	Montenegro	83
11.	North Macedonia	83
12.	Portugal	84
13.	San Marino	84
14.	Serbia	83
15.	Slovenia	34
16.	Spain	77

Source: FOOD WASTE INDEXREPORT 2021 United Nations Environment Program

In Southern Europe, the range of food waste is the widest. While Slovenia has an estimate of 34 kg/capita/year, close to the lower limit of food waste across Europe, Greece has more than 4 times more, respectively 142 kg/capita/year, being the upper limit of Europe in terms of regarding food waste in households. At Holy See (Vatican) no estimates made.



Figure 3. Map of food waste in Southern Europe

Source: Graphic interpretation of authors based on FOOD WASTE INDEXREPORT 2021 United Nations Environment Program

Table 5.

Household food waste estimate - Western Europe

No.	Countries Western Europe	Household food waste estimate (kg/capita/year)
1.	Austria	39
2.	Belgium	50
3.	French	85
4.	Germany	75
5.	Liechtenstein	72
6.	Luxembourg	90
7.	Monaco	72
8.	Netherlands	50
9.	Switzerland	72

Source: *FOOD WASTE INDEXREPORT 2021 United Nations Environment Program*

In Western Europe, the range of food waste estimates is between 39 kg/capita/year in Austria, at the lower limit, and 90 kg/capita/year at the upper limit, in Luxembourg. The arithmetic mean of food waste estimates in Western European countries (67 kg/capita/year) is at the lower level of food waste in Europe, ahead of Eastern European countries (68 kg/capita/year), then Northern countries Europe (74 kg/capita/year), and the highest incidence of food waste in European regions is Southern Europe (85 kg/capita/year).

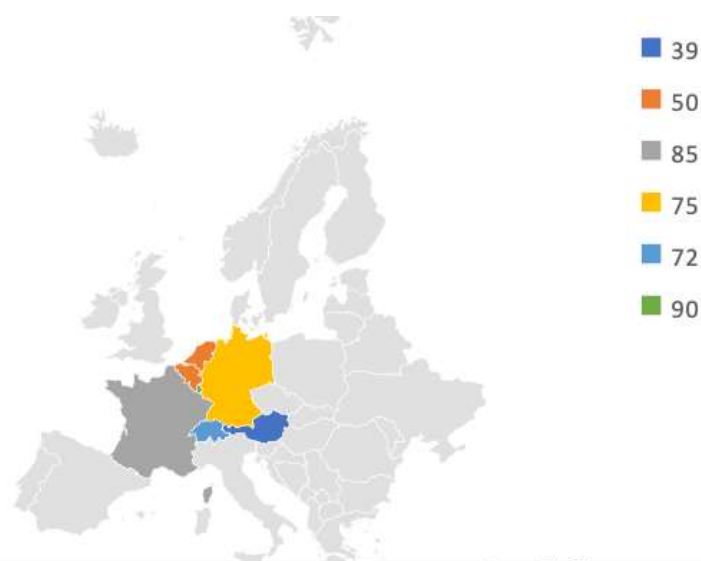


Figure 4. Map of food waste in Western Europe

Source: *Graphic interpretation of authors based on FOOD WASTE INDEXREPORT 2021 United Nations Environment Program*

With regard to the member states of the European Union, ie part of those presented above (in addition - Cyprus), it is revealed that the estimates of food waste in countries such as Austria and Malta exceed at most over 100 kg/capita/year, while in Slovenia and Austria these estimates are below 1/3 of the estimated amount in these countries, at the top of the European Union food waste ranking (Figure 5).

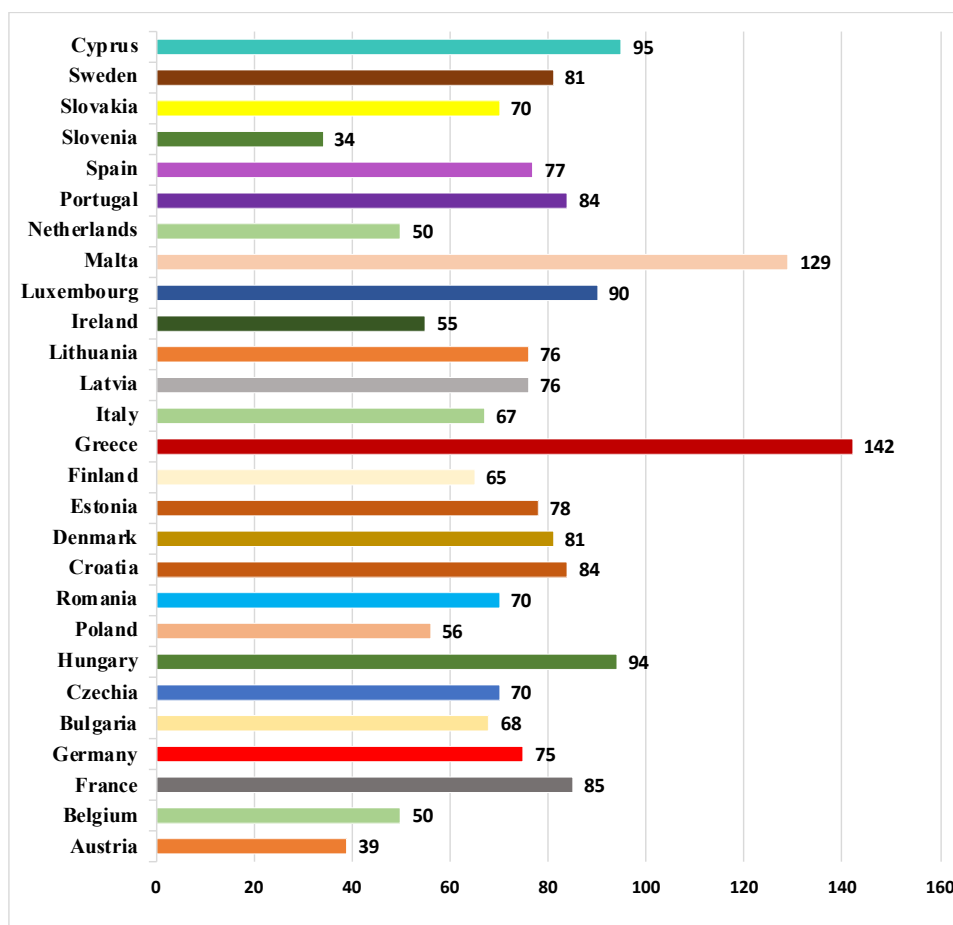


Figure 5. Food waste in European Union (kg/capita/year)

Source: Graphic interpretation of authors based on FOOD WASTE INDEXREPORT 2021 United Nations Environment Program

The arithmetic average of food waste estimates in European Union countries is 76 kg/capita/year, while the same arithmetic average in all European countries is slightly lower, respectively 74 kg/capita/year. The difference is greater in the case of the weighted average, which we consider more representative in terms of impact on the economy and the environment. However, the arithmetic mean remains a basic indicator in assessing the individual behavior of consumers in terms of food waste.

Table 6.

Household food waste estimate - Europe and European Union

	Household food waste estimate (kg/capita/year) Arithmetic average* ¹	Household food waste estimate (kg/capita/year) Weighted average* ²	Household food waste estimate (tonnes/year)	Country population (2019 estimated in 2021)* ³
I	76	73,23	32.588.056	≈ 445.030.554
TOTAL EUROPE	74	65,98	49.397.832	≈ 748.698.622

Source: FOOD WASTE INDEXREPORT 2021 United Nations Environment Program - authors statistical analysis

Legend

*¹Arithmetic average simple, unweighted

*²Population-weighted averages

*³Approximation of authors based on data from mentioned report

CONCLUSIONS

Food waste is a problem present throughout the food chain and, implicitly, measures to reduce it need to target all its components, with benefits for all actors involved [1,2,3,4]. It is necessary to focus on preventing the phenomenon of food waste, because the benefits that are generated from avoiding food waste will be superior to the benefits generated from the remedial solutions that will be implemented. Although there are European Union policies that can, to some extent, combat food waste, they are not exploited, and the opportunities offered have not been put into practice. There is a lack of assessments of the impact of different European Union policies on combating food waste [10,14,17]. Major policy areas, such as agriculture, fisheries and food security, they all have a role to play and could be used to combat food waste more effectively [9,12].

The arithmetic average of food waste estimates in European Union countries is 2 kg/capita/year higher than the arithmetic average of food waste estimates in all European countries (from 74 kg/capita/year to 76 kg/capita/year). The difference is greater in the case of the weighted average (EU, 73 kg/capita/year, all European countries 66 kg/capita/year, the one we consider more representative in terms of impact on the economy and the environment. However, the arithmetic mean remains a basic indicator in assessing individual consumer behavior with regard to food waste [8,10,11].

Regarding food donation, there are many barriers. It is necessary to update the legislation and correlate the different interpretations of legal rules. If these problems were eliminated in order to facilitate food donation, they would be wasted in very small quantities [12,15].

ACKNOWLEDGEMENTS

The authors are grateful for the data provided by the colleagues from United Nations Environment Program in FOOD WASTE INDEXREPORT 2021.

REFERENCES

- [1]. **BALAN I.M., POPESCU A.C., IANCU T., POPESCU G., TULCAN C.**, 2020, Food safety versus food security in a world of famine Journal of Advanced Research in Social Sciences and Humanities (JARSSH) 5, 1, 20-31
- [2]. **BALAN I.M., LILE R., SALASAN C., DINCU A-M**, Quality evaluation using benchmarking analysis of meat products retailed in Romania, *Lucrări Științifice Management Agricol* 22 (1), 5
- [3]. **GHEORGHESCU I.C., GHERMAN E.D., BALAN I.M.**, 2021, The importance of food waste reduction measures in order to ensure food security in Romania in the context of Covid-19, *Lucrări Științifice Management Agricol* 22 (3), 187
- [4]. **GHEORGHESCU I.C., BALAN I.M.**, 2019, Managing, minimizing and preventing food waste from Romania in the European context, *Lucrări Științifice Management Agricol* 21(3), 58
- [5]. **GHEORGHESCU I.C., VELCOTA I.I., MARTIN A.R., BALAN I.M.**, 2019, Food waste a major problem in the European Union, *Lucrări Științifice Management Agricol* 21 (3), 65
- [6]. **GHEORGHESCU I.C., BALAN I.M.**, 2018, Food waste and food loss in Romania, *Lucrări Științifice Management Agricol, Seria I*, 20(3)
- [7]. **GHERMAN E.D, GHEORGHESCU I.C., BALAN I.M.**, 2021, Is the Future of Our Food Secure?, *Lucrări Științifice Management Agricol*, 22(3), 201
- [8]. **GHERMAN E.D., BALAN I.M.**, 2019, The impact of food insecurity on the world's population, *Lucrări Științifice Management Agricol Seria I*, 21(3)

- [9]. **SALASAN C., BALAN I.M.**, 2021, The acceptability of environmental acceptable damage and the future of the EU's rural development policy (Part I: Economic Emergencies - 4.), Economics and Engineering of Unpredictable Events - Modelling, Planning and Policies –Editor - CRC Press (Taylor&Francis Group) - Caterina De Lucia, Dino Borri, Atif Kubursi, Abdul Khakee ISBN 9780367641900, Vol.1, 1st Edition, 304
- [10]. **JANGULASHVILI T., BALAN I.M., IANCU T., JANGULASHVILI L., PIRVULESCU L.**, 2017, Research Regarding Food Security in Georgia–Dynamics of Livestock, Animal Productions and Self-Sufficiency, Advanced Research in Life Sciences 1(1), 53-58
- [11]. **SALASAN C., BALAN I.M.**, 2014, Suitability of a Quality Management Approach within the Public Agricultural Advisory Services, Quality-Access to Success, 15(140)
- [12]. *** EUROPEAN COURT OF AUDITORS
https://www.eca.europa.eu/Lists/ECADocuments/SR16_34/SR_FOOD_WASTE_EN.pdf
- [13]. *** FOOD WASTE INDEXREPORT 2021 United Nations Environment Program
ISBN No: 978-92-807-3851-3 Job No: DTI / 2349 / PA
- [14]. *** Global Panel, 2018, Preventing nutrient loss and waste across the food system: Policy actions for high-quality diets. Policy Brief No. 12. London, UK: Global Panel on Agriculture and Food Systems for Nutrition.
- [15]. *** WHO, 2020, WHO Manifesto for a healthy recovery from COVID-19
<https://www.who.int/newsroom/featurestories/detail/who-manifestofor-a-healthy-recovery-fromcovid-19>
- [16]. *** Global Network Against Food Crises, Food Security Information Network, 2020, Global Report on Food Crises, Joint Analysis for Better Decisions
[//www.fsinplatform.org/sites/default/files/resources/files/GRFC_2020_ONLINE_200420.pdf](http://www.fsinplatform.org/sites/default/files/resources/files/GRFC_2020_ONLINE_200420.pdf)
- [17]. *** <https://romania.europalibera.org/a/onu-rom%C3%A2nia-arunc%C4%83-1-3-mil-de-tone-de-m%C3%A2ncare-la-gunoi-we-have-a-law-of-food-waste-%C3%AEn%C4%83-is-inefficient%C4%83/31135315.html>