FOOD WASTE ANALYSIS IN ROMANIA IN COMPARISON TO THE EUROPEAN UNION

ANTONEAC (LUNGU) Andreea, PETRE Ionut Laurentiu, NICA Maria, IANA Adrian Silviu
The Bucharest University of Economic Studies, Bucharest, Romania
andreea.antoneac@gmail.com
laurpetre15@gmail.com
nicamaria93@yahoo.com
adrianiana92@gmail.com

Abstract: This paper focuses on analyzing food waste and assessing its economic impact. In order to wrap our heads around the context of food waste in Romania, there was a need to see how the subject was legislated in the country. Unfortunately, it had a rather difficult journey, requiring at least two years to enter into force in a fair form. To correctly identify the essential aspects of food waste, we presented the ideas of several theorists who have addressed this matter from various perspectives. It is noteworthy that, endorsing a feasible approach, to production and consumption, is very important in order to prevent food waste. Meanwhile, there is not always a clear incentive, for the producer or consumer, in how to reduce food waste. The European and national directions are aimed at accomplishing the sustainable development goals (SDGs) by 2030. The most important sustainable development objectives, related to our subject, are the number two target - zero hunger and number twelve target - responsible production and consumption. In order to achieve these objectives, the measures taken by the competent institutions, in Romania and at European level, are identified. The graphs and analyzes, presented in our article, show the correlation bounded by food waste at the European level and at the national level, both prior to joining the European Union and beyond. With regard to total food waste, both at national and European level, the overall trend is constant. Actions to diminish food waste in Romania were subsequently observed in Romania's accession to the European Union. Prior to its` accession, Romania did not respect all existing European measures on this issue, but afterwards, a drastic improvement was observed. As a result of this research, we see that food waste raises major problems at national and at European level. The authorities' desire to solve this problem is noticed, and the steps towards resolving it are constantly taken, but it is exceedingly strenuous to estimate the time when food waste will be reduced to such an extent that a change for the good is noticed.

Keywords: *food waste; sustainable development goals; responsible production and consumption.*

JEL Classification: *Q18; Q53.*

1. Introduction

We live in an era marked by strong contrasts in terms of public nutrition. On the one hand, we are talking about excess food production and, on the other hand, we are talking about food waste and the achievement of sustainable development objectives, respectively goal number two - zero hunger and objective number 12 -

responsible production and consumption. In order to achieve these measures, the Romanian competent institutions have created a working document entitled "The National Strategy for Sustainable Development". This document has a European correspondent, "The next steps towards a sustainable European future. European Action for Sustainability". These documents are closely linked to Agenda 2030 for Sustainable Development, adopted by UN General Assembly.
This paper seeks to identify national legislation in this field, to recognize the current state of food waste at national and European level, to find the causes of food wastage and to assess its economic impact. Over the last years, there has been a fierce need to quantify the amount of food discarded, in the context of global famine and the effects of this action.

2. Food Waste seen through the Eyes of the Theorists

The issue of the topic tackled, food waste, has been dealt with in the literature by a number of theorists who have drawn attention to the impact on the society, on the economy, and not to mention, on the environment. Effie Papargyropoulou et al. (2014) conducted a study based on interviews with specialists in the food waste field, analysing the limits among avertible and inevitable food waste, food excess and food wastage, and as well as waste prevention and management. This research proposes that the first step towards a more feasible solution to the issue of food waste is to adopt a sustainable approach to production and consumption and to address the food and waste surplus in the worldwide food distribution system. The researchers investigate the causes that produce food wastage within the food distribution system and suggest a plan for identifying and prioritizing the most suitable alternatives for the prevention and for the management of food waste (Papargyropoulou, E., et al., 2014).
The identification of the root of food waste was emphasized in the work researched by Jessica Aschemann-Witzel et al. (2015). They revealed the circumstances that produce food waste, starting from household consumers and ending with the supply chains. The results have shown that consumers' catalyst to prevent the wastage of food, their abilities to manage the supply of food and to manipulate it have an extensive influence on food waste behaviours. The authors identify the actions that governments, the stakeholders and the retailers can launch to reduce consumer food waste, highlighting that the synergic action between all parties is the most promising (Aschemann-Witzel, J., et al., 2015). The issue was also addressed by Norbert Raak et al. (2017) in their research. They identified the following causes: on the one hand, a part of the losses occurs from the processing operations and from the assurance of the quality of the food and on the other hand, the existence of the products that do not meet the quality requirements of the trade (Raak, N., et al., 2017).
In order to participate in the "Save Food!" Congress, from 16 to 17 May 2011, Jenny Gustafsson et al. (2011) composed two studies: one on food waste, and, respectively, one on wastage in general. Studies have quantified the volumes of food and food waste occurring globally each year. Food losses refer to a decrease in the quantity or quality of food in the early stages of the food distribution system, reducing the amount of food appropriate for human consumption. The concept of food waste is, thus, often linked to post-harvest activities that do not have system or infrastructure capabilities. Food waste, by contrast, often refers to the later stages

of the food supply chain, such as retail households and consumers. Therefore, the causes of food waste are often related to human behaviour (Gustafsson, J., et al., 2011).
In a research conducted by Silvia Scherhaufer et al. (2018) it is assumed that the predicament of food waste lies in the discharge caused during the distribution system and in the kind of food which is wasted. Impact from food waste treatment and disposal is not the driving factor of food waste. Most of the impact derives from the primary production step. Priority should be given to food waste avoidance, as a result. By preventing food from being wasted, emissions in any consequential stage of the food distribution system can be avoided. Priority should also be given to preventing meat and dairy products from going bad, as they generate most of the repercussions. Food waste prevention at household level has the greatest effect to mitigate global warming (Scherhaufer, S., et al., 2018).
In the work of Raveendran Sindhu et al. (2019), we find that food waste is extremely effective for generating high-value chemicals. Although there is a real interest in this, because the chemical compounds, resulting from the decomposition of food, find utility in production and economy, unfortunately, there is no technology for an efficient conversion (Sindhu, R., et al, 2019).

3. Relevant Romanian Legislation in the Food Waste Field

Food waste has a wide-ranging approach at European level and has become a subject of interest, including in Romanian society. In 2016, the first law on food waste was drafted, namely Law 217/2016 regarding the reduction of food waste. This should have come into force on May 21, 2017, however, it suffered three successive deferrals, a modification and a republication brought by Law 200/2018 and, the most important fact, the creation of a set of methodological norms for the implementation of the law. On 11 February 2019, the law regarding the reduction of food waste entered into force in an improved form with provisions needed by any state that is evolved and worried about the fate of its citizens and nature.

3.1. Provisions of the Initial Form of Law 217/2016 on the Reduction of Food Waste

In the initial form of the law, economic operators were advised to manage expired foods. Thus, they were forced to take several actions regarding the status of the food.
First of all, economic operators had to try to prevent waste by educating suppliers and consumers. If after this action they remained on stock with out-of-date products, the next step was trying to sell them at a reduced price. If they were not able to sell them after the price cut, the next action was donation during the last three days of validity, either to non-profit entities (NGO), which redirected them free of charge to the underprivileged population, either to organizations or companies that used it as animal food. Unless the food was suitable for human or animal consumption, it could be transformed into compost, biogas or neutralized. In addition, NGOs working in the social welfare area could buy the food up to 3% + VAT out of the purchase price and could sell them up to 25% + VAT, thus, these NGOs could cover the costs of redistributing and storing food.

The fines for those who did not respect the law ranged between 1,000 and 3,000 RON for micro-enterprises, between 3,000 and 6,000 RON - for small and medium enterprises and between 6,000 and 10,000 RON - for large enterprises.

3.2. The Provisions of the Current form of the Law 2017/2016 on the Reduction of Food Waste

In the present form of the law, the requirement is waived for the economic operators to undertake all the actions mentioned in the normative act, being enough to fulfil at least two of the actions.

The law brings a number of additional tasks for economic operators opting to apply preventive measures, so they have the obligation to draw up annual reports presenting plans for diminishing food wastage. Food donation can also be done by economic operators at any time during the past 10 days of shelf life until the minimum durability date is reached. The following perishable food is exempt: unpasteurized vegetable and fruit juices, pre-cut vegetables and fruits, germinated seeds, fresh meat and offal from bovine, porcine, caprine, sheep, horses, poultry, wild or farmed game, minced meat, prepared meat, raw milk and raw milk products, fish and fresh fishery products, eggs and raw egg products.

The law provides that the receiving operators may sell food to the final consumer at a price that allows annual coverage of personnel, utilities, business operations of the receiving operator for the commercialization of the donated food, according to the law. For staff salaries, the average salary for the economy will be taken as reference point.

Including the value of the fines has changed, so the economic operators that do not abide by the law can be sanctioned between 1.000 RON and 10.000 RON, without any differentiation between the size of the economic operators.

3.3. The Existing Norms at European Level

National legislation has its origins in rules emerging at the European level. The European Commission has a plan to stimulate Europe's transition to a circular economy that will boost global competition, drive sustainable progress and create new jobs. This idea has created a European action plan that includes revised waste legislation. Thus, at present, there is in force the Directive 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98 / EC on waste. This directive calls on the EU to take action to decrease food waste at every level of the food distribution system, monitor the food waste and to report on progress made.

In order to meet the goals of sustainable development, the Commission has set up a platform on food waste and is working on a methodology for measuring food waste. (https://ec.europa.eu/food/safety/food_waste/eu_actions_en, 13 Apr 2019)

4. Achieving Sustainable Development Goals in the Field of Food Waste

According to the 2030 Agenda for Romania's sustainable development, the main objectives are to eradicate food hunger and growth of food security by increasing agricultural productivity and reducing food waste. It also aims to ensure sustainable consumption patterns and production (http://dezvoltaredurabila.gov.ro/web/obiective/odd2/, 13 Apr 2019). There are steps taken by the European Commission in order to reduce food waste, at

European level. According to data from a European Union study, led in 2016, approximately 88 million tonnes of wastage from food is generated annually in the European Union. Average costs associated with food waste in 2012 were about 143 billion euros. Thus, the EU-per-capita spending on food waste for 2012 was about 284 euros per capita.

5. Methodology

In order to determine, on the one hand, the ongoing situation and, on the other hand, the evolution of the quantities of wasted materials and wasted food, quantitative and qualitative data were analysed from the European bases, namely Eurostat.

6. Results and Discussions

In the beginning of the analysis an assessment will be made of the evolution of waste in Romania compared to the European Union in the agricultural sector, the household sector and in total, in order to determine both the trend of evolution and the share of Romania in the total waste in the Union EU.

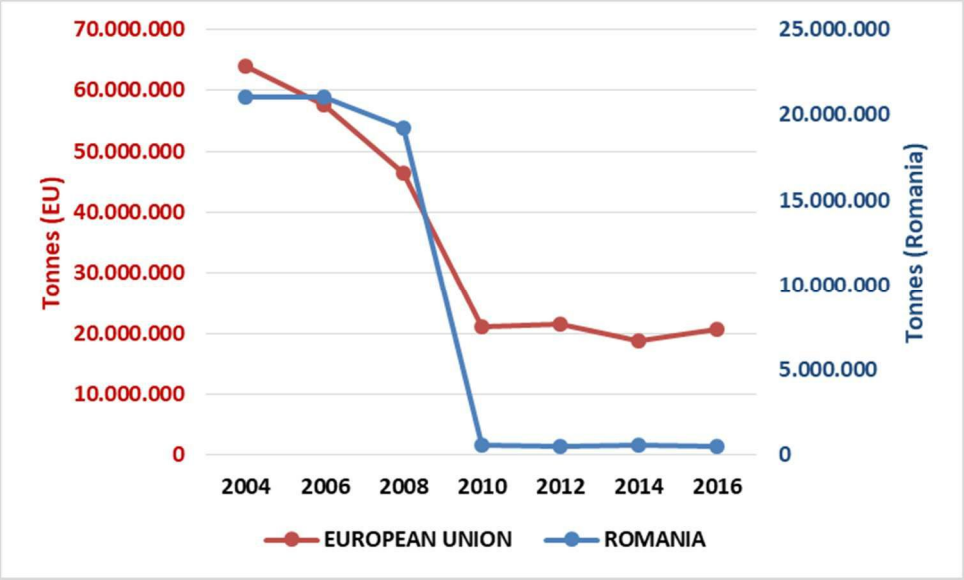


Figure 1: Agriculture waste
Source: own data processing https://ec.europa.eu/eurostat

Figure 1 shows the evolution of scarce quantities in agriculture over the period 2004-2016, both at national and EU level. As we can see, these quantities show a decreasing trend, as could be expected, given the intentions of EU policies in recent times, which are increasingly focusing on environmental protection and sustainable development. Romania had a significant share of the scattered amounts in agriculture in the pre-accession period, compared to the EU total, respectively 33-36%. In 2008 (the second year after accession), the share of the quantities scattered in agriculture in Romania reported to the EU as a whole was 41.3%, respectively.

However, Romania has managed to reduce this waste to 2.45% of the EU total in the last year, with agricultural waste going to about 508 thousand tonnes of the EU total of 20.7 million tonnes.

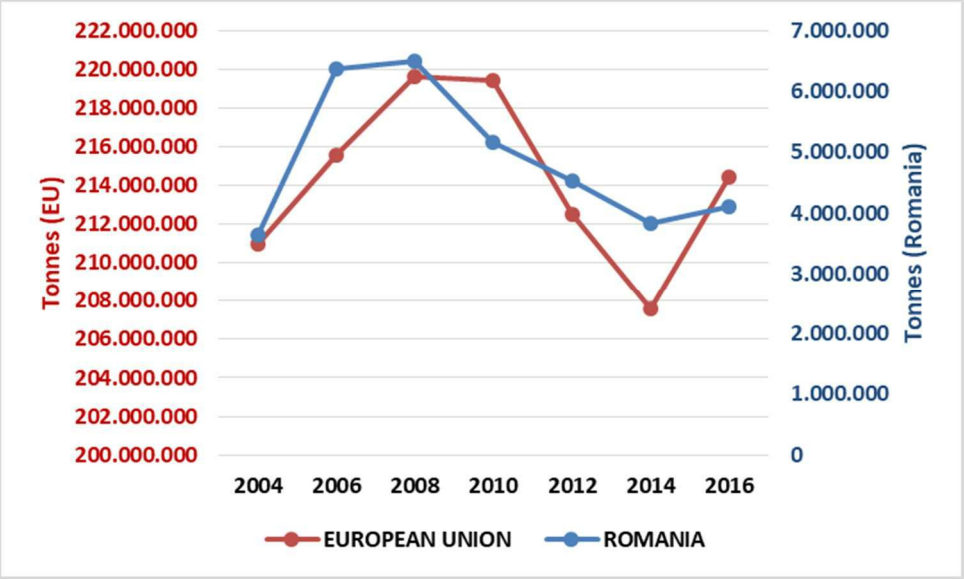


Figure 2: Household waste
Source: own data processing https://ec.europa.eu/eurostat

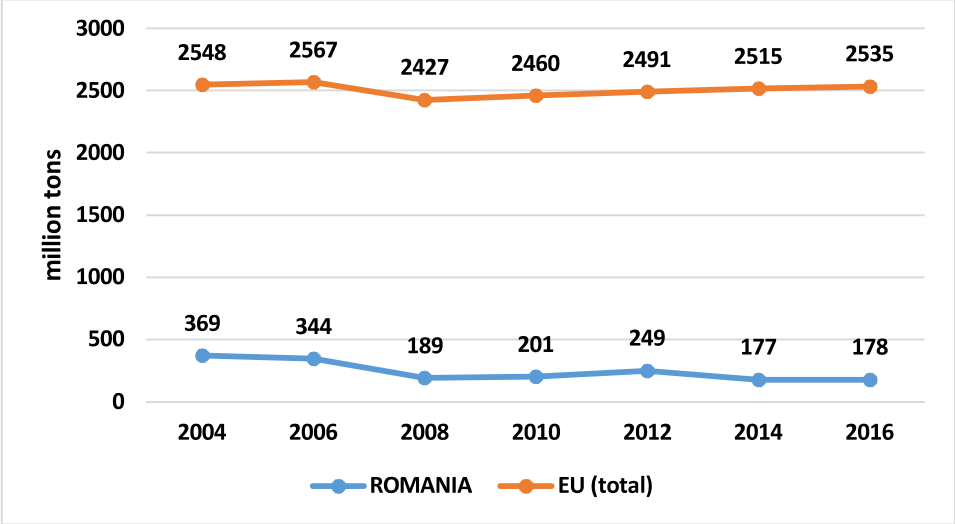
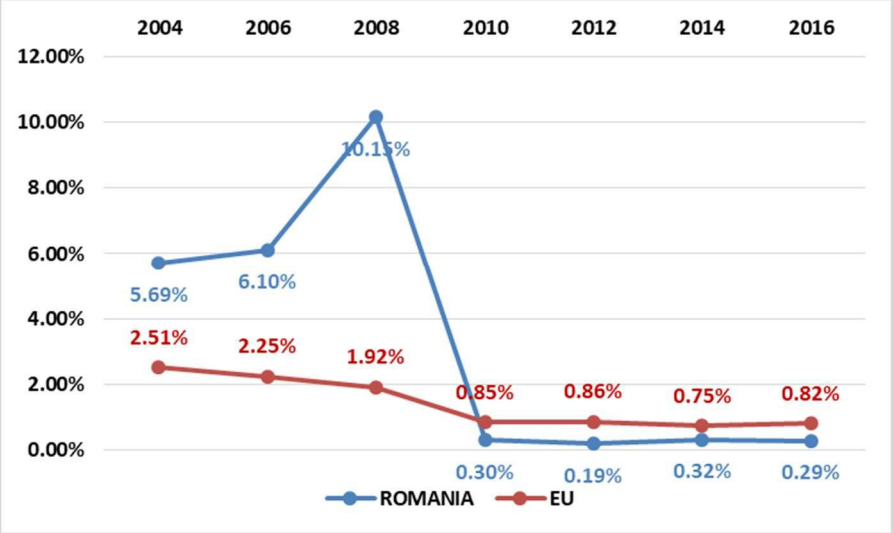


Figure 3: General waste (millions of tonnes)
Source: own data processing https://ec.europa.eu/eurostat

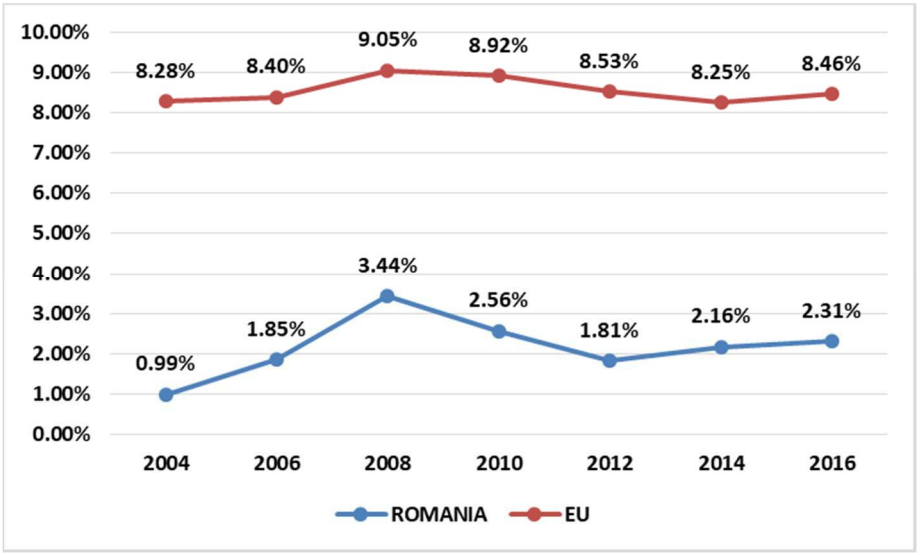
In Figure 2 we can analyse the evolution of the scattered quantities in the households, respectively at the final consumer. As can be seen from the figure, it is possible to observe different levels of this type of waste, as Romania recorded over

the entire period of analysis scattered quantities between 3.6 million tons and 6.5 million tonnes, compared to the level EU with a total waste of 208-220 million tonnes. The general trend of evolution is slightly increasing, with an average growth rate of 2% for the scattered quantity in Romania and only 0.27% for the total. Although the situation seems favourable in Romania, the share of waste in the household is similar to that in the agricultural sector, so Romania has a constant level. In the last year, the amount displaced at household level in Romania represented 1.9% of the total EU.

Regarding the overall waste, both at national and European level, the overall trend is decreasing, but not very fast. In other words, at EU level, there is a negative average rate of only 0.08%, so we can say that the general waste at this level is constant, and the community's policies are holding back these quantities. At the national level there is a negative average rate of 11.5%, but this is for the entire analysed period, including the pre-accession period, in which Romania had to make efforts to comply with the European Union standards, therefore there is a significant decrease in this, if we look only at post-accession periods where it can be seen that the tendency tends towards a constant one, similar to that of the Union. At a general level, over the whole analysis period there is a share of the scattered quantity in Romania, about 9.7% of the total EU, and in the period 2008-2016 this share was about 8%.



a) Agriculture



b) Households

Figure 4. The share of waste from agriculture and households of Romania and the European Union in total activities
Source: own data processing https://ec.europa.eu/eurostat

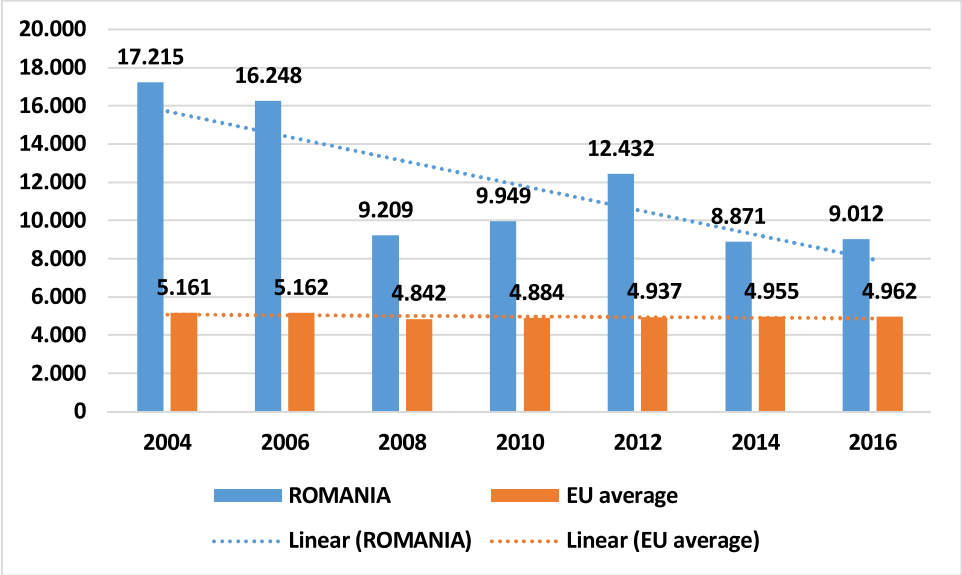


Figure 5: Evolution of scattered quantities per person (kg / inhabitant)
Source: own data processing https://ec.europa.eu/eurostat

As can be seen, Figure 4 shows the weights of the quantities scattered in agriculture (a) and in households (b) both of Romania and of the European Union, in the total quantities scattered.

As far as waste in agriculture is concerned, as we can see, the share of the European Union has decreased, reaching in 2016 at 0.82%. In Romania, although at the beginning of the period, the share of agricultural waste has reached 10%, following EU accession and compliance with standards, Romania has complied, therefore, in the period 2010-2016, the waste of agriculture reached below the EU average, respectively 0,29% in 2016.
As far as household waste is concerned, it can be noticed that the shares are quite distant, thus, on average, for the whole analysed period, at European level there is a share of 8.55%, instead in Romania, the share of waste from households in the total is 2.2%.
If we divide the total scattered amounts to the number of inhabitants, we can analyse the situation at micro level, if so. Thus, in Figure 5 are graphically depicted the scattered quantities of each inhabitant, both in Romania and in the European Union. Considering the total amount scattered at the level of the European Union, which does not have very high oscillations in time, remaining constant, as is the case with the population, there is also a constant scattered quantity per inhabitant of about 5 tonnes per capita. In the case of Romania, there is a scattered amount, higher per capita, than the EU average, oscillating between 8 and 12 tonnes in the last period, but it is on a downward trend taking into account the pre-accession years when were recorded amount was of 16- 17 tonnes per capita.
In the second part of the analysis, the food waste that is recorded at the European and national level in the statistical bases of the European Union Council will be assessed as well. These data was only available in the 2010-2016 timeframe.

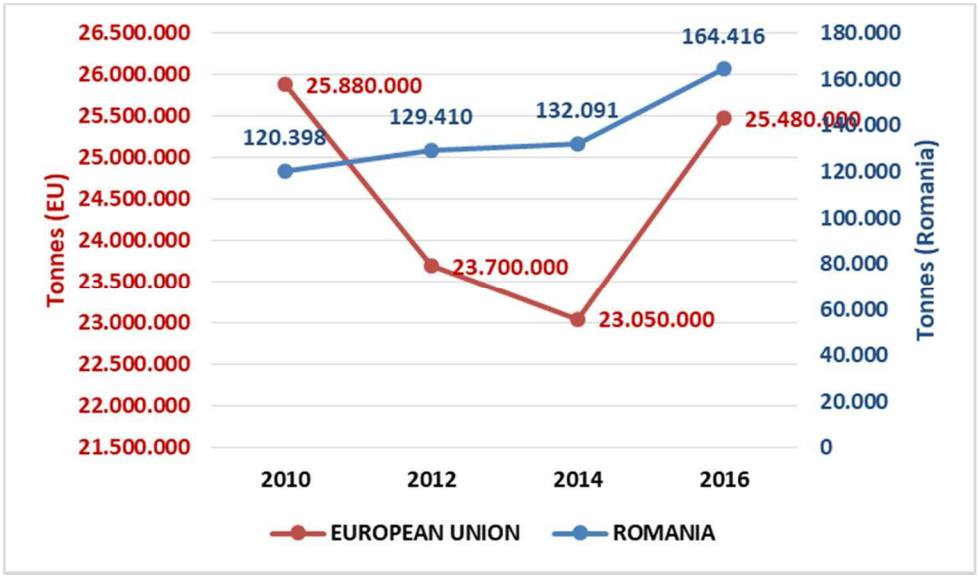


Figure 6: Evolution of food waste in the European Union and Romania (tonnes)
Source: own data processing https://ec.europa.eu/eurostat

Figure 6 compares the evolution of scattered food quantities as their volume cannot be compared. In the case of total food waste (EU level), there is a decreasing trend over the period 2010-2014, and in 2016 it is close to the initial situation, given that

another state (Croatia) joined in 2013, and this can be noticed later in the level of food waste. On average the growth rate was negative, respectively -0.51%, maintaining the character constant in this case too.
In Romania, the situation is slightly different, in the sense that there is an increase in the quantities of scattered food, respectively, on average the growth rate of 11%. If in 2010 there was about 120,000 tonnes of waste, in 2016, food waste grew by 36.5%, reaching about 164,000 tonnes. This increase in food waste can also come on the backdrop of economic growth, and on the increase in income earned by the population.

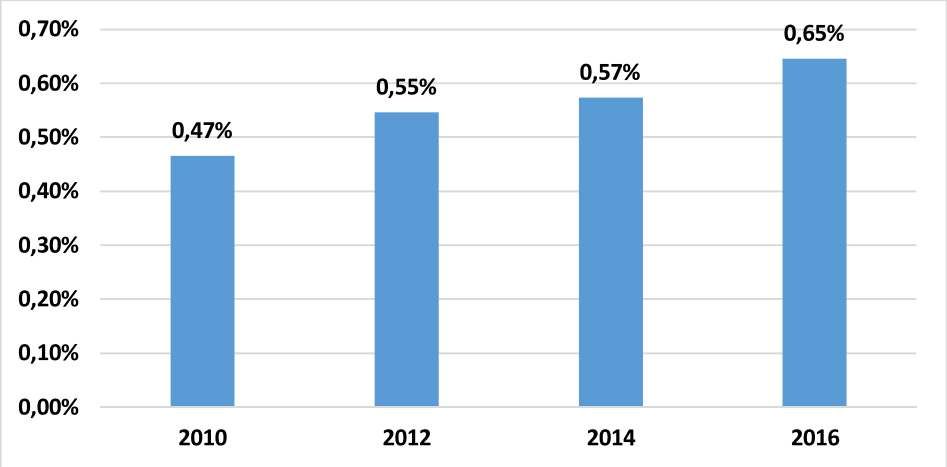


Figure 7: Share of the amount of food waste from Romania in the European Union
Source: own data processing https://ec.europa.eu/eurostat

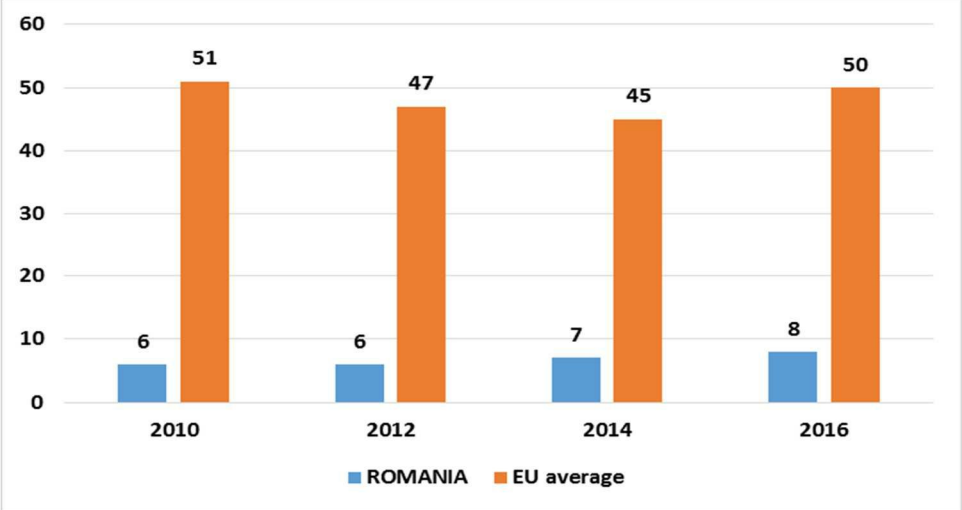


Figure 8: Evolution of food waste per capita in Romania and the EU
Source: own data processing https://ec.europa.eu/eurostat

As expected, after analysing the quantities, and the share of Romanian food waste in the European one shows an increasing trend, with a rhythm even worse, of 11.5% biannual, given on the one hand by the increase of the quantities, and on the other hand by the reducing of the total quantities at EU level; thus, if in 2010 Romania wasted about 0.47% of the total of 25.8 million tonnes of scattered food, in 2016 it wiped 0.65% of the total.
Following the analysis of the quantity of food scattered at a total level, both in Romania and in the European Union, the evolution of the average per capita quantities of scarce food can be determined.
At the European Union level, the evolution trend of per capita food waste has kept the trend of total quantities, thus falling in the first part of the period from 51 kg per capita to 45 kg per capita, and in 2016 it increased to the level of 50 kg per capita, 1 kg less than at the beginning of the period.
Likewise, in the case of Romania, the evolution of food wastage per person followed the trend of the total quantity at the national level, thus increasing from 6 kg per capita to 8 kg per capita. Realizing a weight, this is different from the quantity analysed, so a Romanian scatters food 6.2 times less than the average of any European.
Thus, if in 2012 there were spent about 284 euros per capita on food waste, it turns out that in 2012 for one kilogram of wasted food was spent about 6 euros.

7. Conclusions

This paper was aimed at analysing food losses in Romania, both in terms of current status and evolution, in comparison with the European Union. As a result of the analysis, it can be concluded that generally the trends of scattered quantities are decreasing, so in Romania there was a 11% annual drop in the waste quantities, but it should be taken into account that the analysis period covered both, accession and pre-accession periods, when additional efforts have been made at national level to comply with EU standards and norms. As far as the quantities scattered in the European Community are concerned, we can conclude that they are constant, being a positive aspect, considering the Community has increased since 2014, registering the 28th member in 2013. This was noteworthy when food waste was analysed at EU level, registering a sudden increase at that time, while previously decreases were recorded. The amount of food wasted in Romania increased regarding the income, but considering the average quantity wasted per capita, Romania is below the Community`s average.
As a result of this research, we see that food waste raises major problems at national and European level. The authorities' desire to solve this problem is noticed, and the steps towards resolving it are constantly taken, but it is extremely difficult to estimate the time when food waste will be reduced to such an extent that a change for the good is noticed. Food waste is the kind of problem that has many solutions, from producer to consumer, but these solutions are hard to implement because we are talking about products that are altering in a short span of time. Thus, however effective the measures proposed by the authorities to reduce food waste are, they are struggling with a factor unaware of efforts, time.

References

1. Aschemann-Witzel, J., De Hooge, I., Amani, P., Bech-Larsen, T., & Oostindjer, M. (2015). Consumer-related food waste: Causes and potential for action. Sustainability, 7(6), 6457-6477.
2. Gustafsson, J., Cederberg, C., Sonesson, U., & Emanuelsson, A. (2013). The methodology of the FAO study: Global Food Losses and Food Waste-extent, causes and prevention"-FAO, 2011.
3. Papargyropoulou, E., Lozano, R., Steinberger, J.K., Wright, N. and bin Ujang, Z., 2014. The food waste hierarchy as a framework for the management of food surplus and food waste. Journal of Cleaner Production, 76, pp.106-115.
4. Raak, N., Symmank, C., Zahn, S., Aschemann-Witzel, J., Rohm, H. (2017). Processing- and product-related causes for food waste and implications for the food supply chain. Waste Management, 61, pp. 461-472.
5. Scherhaufer, S., Moates, G., Hartikainen, H., Waldron, K., Obersteiner, G. (2018). Environmental impacts of food waste in Europe. Waste Management, 77, pp. 98-113.
6. Sindhu, R., Gnansounou, E., Rebello, S., Binod, P., Pandey, A. (2019). Conversion of food and kitchen waste to value-added products. Journal of Environmental Management.
7. Closing the loop - An EU action plan for the Circular Economy, [Online], Available: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1453384154337&uri=CELEX:52015DC0614, [13 Apr 2019].
8. Directive (eu) 2018/851 of the European parliament and of the council of 30 May 2018 amending Directive 2008/98/EC on waste, [Online], Available: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32018L0851, [13 Apr 2019].
9. Eradicate hunger, ensure food security, improve nutrition and promote sustainable agriculture, http://dezvoltaredurabila.gov.ro/web/obiective/odd2/, [13 Apr 2019].
10. European Commission, EU actions against food waste, [Online], Available: https://ec.europa.eu/food/safety/food_waste_en, [13 Apr 2019].
11. European Commission, EU Platform on Food Losses and Food Waste [Online], Available: https://ec.europa.eu/food/sites/food/files/safety/docs/fw_eu-actions_flw-platform_tor.pdf, [13 Apr 2019].
12. European Commission, Next steps for a sustainable European future. European action for sustainability, [Online], Available: https://ec.europa.eu/europeaid/sites/devco/files/communication-next-steps-sustainable-europe-20161122_en.pdf, [13 Apr 2019].
13. European Union: total population from 2008 to 2018 (in million inhabitants), [Online], Available: https://www.statista.com/statistics/253372/total-population-of-the-european-union-eu/, [13 Apr 2019].
14. Eurostat, [Online], Available: https://ec.europa.eu/eurostat, [13 Apr 2019].
15. Stenmarck, Å., Jensen, C., Quested, T., and Moates, G., 2016. Estimates of European food waste levels. Fusions. [Online], Available: http://www.eu-fusions.org/phocadownload/Publications/Estimates%20of%20European%20food%20waste%20levels.pdf [13 Apr 2019].
16. The National Strategy for Sustainable Development, [Online], Available: http://www.mmediu.ro/beta/domenii/dezvoltare-durabila/strategia-nationala-a-romaniei-2013-2020-2030/, [13 Apr 2019].

17. United Nation, Transforming our world: the 2030 Agenda for Sustainable Development [Online], Available: https://sustainabledevelopment.un.org/post2015/transformingourworld, [13 Apr 2019].
18. Romanian Law no. 217/2016 regarding the reduction of food waste.
19. Romanian Law no. 200/2018 for amending and completing the Law no. 217/2016 regarding the reduction of food waste.