Food safety versus food security in a world of famine

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Abstract

The article presents aspects of interference between food security, as a priority objective of global security, in general and security of each state, in particular, with food safety, regulated by increasingly demanding norms. These legal food safety regulations, which can be exaggerated in some situations, are further exacerbating food waste, to the detriment of the population from Earth who is suffering of famine. The purpose of the research is to reveal the negative situation created by the tightening of regulations regarding food safety and food security. The necessity of the population, from developed countries, to be completely safe in terms of food safety, has created habits of food waste, both at industrial level and at household consumption. Around 88 million tons of food are wasted annually in the EU, with associated costs estimated at 143 billion euros. Wasting food is not only an ethical and economic issue but it also depletes the environment of limited natural resources. All actors in the food chain have a role to play in preventing and reducing food waste, from those who produce and process foods (farmers, food manufacturers and processors) to those who make foods available for consumption (hospitality sector, retailers) and ultimately consumers themselves. The food waste does not refer nowadays only to the remains from the consumers’ table or those resulting from handling and storing the food products. As a paradox, this waste arrived currently to translate into excessive care for their own safety, by exaggerating the food safety measures. The maximum limits admitted for different contaminants is almost constantly changing and sometimes these shifts are only the expression of excessive care and concern somehow selfish of the people from the developed countries.

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INTRODUCTION

Nowadays, when the contemporary population in the developed countries is increasingly concerned about personal and family well-being, the effects of this concern with safety are becoming more and more acute. In the short and medium term, it is compared to the rest of the population from the less developed countries, to the increasingly imitated resources of the Earth, to the protection of entities other than the personal and family ones.

The main objective of the research presented is to evaluate the factors that negatively influence food waste, and which today formally translate into food safety concerns. These factors, once they are known, analyzed and monitored, can be a basis for informing and raising awareness of the population, all the actors in the food chain and the decision makers.

The concerns of recent research, as more and more researchers show, regarding food security, most often highlight the need to ensure, among other things, food safety. But just by highlighting these issues regarding food safety, the developed countries are progressively tightening the conditions of admissibility in the consumption of food products, raising the quality gap year by year and neglecting the concept of "good enough quality" (Chalfoun & Davidaviciene, 2018; Gherman & Balan, 2019; Gheorghescu, Velcoță, Martin, & Bălan, 2019).

Summing up technological food losses and food waste, Food and Agricultural Organization of the United Nation (FAO) has identified the food chain segments where food loss and waste are generated. Thus, it is concluded that on the farm are important causes of losses and implicitly of food waste, which include inadequate harvesting

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time, climatic conditions, practices applied to harvesting, handling and treatments applied to food before being marketed. At storage, significant losses are caused by improper storage, as well as by decisions taken in earlier stages of the supply chain that determine that the products have a shorter shelf life. In transport (the transit of products from the farm to the food warehouses, and then to the stores), good infrastructure and efficient commercial logistics are essential to prevent food loss. Processing and packaging play a decisive role in food preservation, and food waste is often caused by inadequate installations, technical failures or human error. In stores, the causes of food waste at the retail level are related to the limited shelf life, the need for food to meet aesthetic standards in terms of color, shape and size and variability of demand. At home consumption, consumer food waste is often caused by poor procurement and meal planning, over-buying (influenced by excessive portioning and packing dimensions), confusion on the labels ("best before..." and "use before...") and poor storage indoors.

To all this, the authors of the present research supplement that the updated regulations regarding the rules of food hygiene as well as the conditions of food admissibility, are getting stricter every year, often without sufficiently motivated scientific coverage, which induces the withdrawal from the market of foods that, often, can be consumed with minimal or even non-existent risks for certain categories of consumers.

**LITERATURE REVIEW**

The literature consulted for the research contains titles of the consecrated profile organizations (Food and Agricultural Organization, 2019; Les Amis de la Terre, 2014; World Health Organisation, 2010), as well as articles resulting from the researches of different renowned researchers from all over the world (Jangulashvili, Balan, Iancu, Jangulashvili, & Pirvulescu, 2017; Shiklomanov, 2000; Sperber & Stier, 2009; Zahiu & Dachin, 2001), but also young Romanian researchers, members of the new generation of researchers and consumers, coordinated by the authors of this article (I. Balan, Popescu, Iancu, & Popescu, 2017; Ene, 2005; Gheorghescu & Balan, 2019; Gherman & Balan, 2019).

For reducing food waste it is necessary to know where it is happening and where interventions with the strongest impact should be applied. However, the specialized literature presents slightly the fact that most of the population is educated at an excessive level regarding food safety, as a decisive factor in food security. In European Union, young adults learn from primary classes what a healthy food means and what to look for when they are reading a food label, but no authority explains to them that excessive care for healthy foods which has become an obsession for the contemporary world in the developed countries, is often unjustified and causes a food waste that is hard to imagine.

The food waste actions are not explained by consecrated research units to the younger generations nor the fact that this food waste it generates a huge waste from a wide range of other resources.

**METHODOLOGY**

Part of the research presented we performed on the situation of Romania, considering that this country is somewhere in the middle between the highly developed and the undeveloped countries. (Gheorghescu et al., 2019).

The study presents particular aspects of the European Union, but they can be generalized worldwide. The case study is the most appropriate method when a complete and in-depth investigation of a topic is desired, but also of the context in which it is conducted. The emphasis is on the choice of the study unit, respectively on Romania as a state of the European Union, and on its delimitation to the detriment of the considerations related to the research method. We chose the case study because in the context of the topic of food security it is more intensive, being more complete, richer and more detailed.

The evolution in time of the food waste, as a determinant element of the food security is not included in the presented study, because we considered the evolution irrelevant, in relation to the actual impact of the state of affairs. Last but not least, the case study presented in Romania in the context of the European Union, does not neglect the case’s relationship with the outside, which is why delimiting the borders of the case is important to see what goes into the case and what remains in its context.
RESULTS AND DISCUSSION

Researhing the situation of the food security measures applied in Romania and the effects it has had on the food waste, measures that are approximately similar to those of all the other member states of the European Union, we have highlighted three reference sections of the research, which relate between its in several directions (I. M. Balan, 2007).

Section I-Food Security

Food security is part of each country’s security and subsequently a part of the global security. Ensuring the food security of country’s people is one of the primary duties of the state. A country needs to manage efficiently and rationally the resources as otherwise even the existence of the people and the state in endangered.

The issue of food security, of providing basic agri-food products of a certain quality represents a major concern facing on a smaller or larger extent all countries but those underdeveloped or developing even more. As a paradox for the current period, in full development of an information society many countries are facing this problem. Therefore, today, the food issue represents a factor that may lead to global instability. Ensuring the food security for all and every person contributes to the social peace of each country, to stability and prosperity (Ene, 2005).

Food security is one complex and general issue of the humankind and its responsibility is shared by all countries worldwide. This aspect was proved by different studies researching the people’s nutrition, the evolution of the agricultural production, the population’s evolution and the use of resources. A proper nutrition has to be regarded both from the perspective of satisfactory quantity of food and from the perspective of its quality and diversity (Zahiu & Dachin, 2001).

The concept of food security was first formulated after the Second World War within the frame of the debates of the FAO when in 1963, in Rome, Italy was launched the famous manifest "Proclaiming the right of each person to eat for coping with its hunger".

FAO defines the food security as follows: "the direct access of all people to the required food” to satisfy the vital functions and to live a healthy and active life. The food security of each country can be ensured primarily from its internal resources by the public policies of each state. The food security is an extremely dynamic concept that has evolved over time. In this respect, in the developed countries the food security was achieved by creating a viable agricultural sector by practicing long-term and costly policies that supported the sector. Nowadays in these respective countries the concept has evolved to different meanings. Due to the fact that these countries managed to ensure the food in sufficient quantities, the highlights focus on quality, food safety and social protection, more oriented towards the protection of the health of the consumers (Zahiu & Dachin, 2001).

The food security in developing countries is more difficult to achieve and in conditions less favourable. In these countries, the food consumption is extremely low with regard to the quantity as well as to the quality, being characterised by a structure in which the products of animal origin have a very low share, this situation being present in many countries worldwide. It is highly important that these countries ensure the food from their own resources and consolidate the agri-food markets in order to achieve independence form the developed countries large producers of agri-food stuff.

Food security is a relatively recent concept rising from the beginning of the ’70s. The concept evolved from considerations rather quantitative and economic towards a definition encompassing the quality of the food and the human dimension.

The concept has developed on the background of the current overpopulation of many parts of the planet and the price increase for the food products all while in general, their quality is decreasing. Another factor that imposed the need of finding a system approach of the food issue at global scale is the accelerated urbanisation, the fact that more and more people live in cities while the rural areas are depopulated.

The FAO has edited a quarter of a century ago, in 1987, a special report on this theme, the Brundtland Report, taking the name of the main author, launching at the time the complementary concept of "sustainable development".

At the same time, in the same policy was introduced the concept of "traceability” which supposes the possibility to trace back the origin and the processing technology of a food product, following the expression, "from
stable to table" (Revista Nato, 2012).

What is the food waste?

Food and Agricultural Organization (2019) The food waste means that entire quantity of food produced for human consumption that are lost or being thrown away from the production place to the plate.

We buy more than we need. The difference between the available quantity and the consumed one is very large resulting in food and final products loses but also in processing stages for consumption. The wasted food (garbage) are products that are not used in the daily consumption but still we continue to buy more.

Around 88 million tonnes of food are wasted annually in the EU, with associated costs estimated at 143 billion euros. Wasting food is not only an ethical and economic issue but it also depletes the environment of limited natural resources.

All actors in the food chain have a role to play in preventing and reducing food waste, from those who produce and process foods (farmers, food manufacturers and processors) to those who make foods available for consumption (hospitality sector, retailers) and ultimately consumers themselves (Popescu, Iancu, Popescu, & Balan, 2017).

The most recent estimates of European food waste levels reveal that 70% of EU food waste arises in the household, food service and retail sectors, with production and processing sectors contributing the remaining 30% (European Commission, 2016).

The largest food waste in UE is recorded in the urban areas: while the rural communities are using traditional methods to valorise the food remains for the household, in urban areas over 95% for the cities’ food waste end up in the trash landfills, making impossible the recycling of any type of waste, food or non-food.

Beyond the moral and social aspects, the waste is translated into considerable negative effects over the environment: waste and loss of water resources, soil and energy, habitats and biodiversity, Green House Gas (GHG) emissions and contribution to the climate changes, pollution (water, soil, air) by fertilisers, pesticides and methane resulted from the decomposition of food that end in the trash landfills.

The food waste drives to considerable material loss all along the chain: producers/importers, traders and consumers (Food and Agricultural Organization, 2019).

Food waste in Romania

The food waste in Romania represents a major social problem: throwing away about 250 kg of food per inhabitant (above the European average), while 4,74 million people are living on the poverty edge and have difficulties to ensuring the food (Wolek et al., 2009).

In Romania, the statistics indicate 5 million tonnes of food wasted yearly, representing between one third and half of the total quantity of food designated for human consumption produced for one year, meaning approximately 250 kg/person, compared to 179 kg/person, the European average, while approximately 25% from the country’s population (4,74 million people) live at the edge of poverty and have difficulties to find their daily food.

Approximately one third of all products from Romania end in the trash bin or are uselessly wasted every year. This amount corresponds to approximately 2,55 million tonnes of food products or the cargo load of 127.500 lorry trucks lined up from Bucharest to Munchen.

Absolutely every single one of us wastes in his/her household in average 353g food per day. In most situations, the food wasted represents a full meal.

What are the reasons for food waste?

- We do not have a shopping list or when we do, we don’t follow it.
- We go shopping before the fridge is empty.
- We don’t trust our senses and we follow only the information on the labels.
- We don’t check the fridge before shopping.
- We do not store properly the food products.
- We cook in quantities too large.
We shop when hungry.

At the level of the consumers a research report indicates that 24% from the food waste is cooked meal, 22% fruits, 21% vegetables, 20% bread/bakery stuff, 11% milk and milk products, 1% meat products and 1% other food (Figure 1).

How can we avoid the food waste?

The food waste can be prevented if we take into account few simple instruments.
1. Buy wisely
2. Store correctly
3. Portion correctly
4. Use the remains.

Is the food waste in Romania larger than in other countries?

The losses over the entire food chain in most countries are basically the same. However, they are different in most cases according to the stage of processing in the food industry. While in the rich countries almost half of the food gets wasted by the end consumer, in poorer countries the food wastes are reduced since people cherish the food. In these regions, unfortunately, the losses during the harvest, storage or processing are larger due to obsolete or inefficient technologies or even poor know-how.

Losses in trade and processing

From a commercial or processing stand point 30% of food is wasted. Industrial processing cannot always guarantee the conformity of the products and those not filling the standards are withdrawn from the market. The sales of food products are not always as expected by the producers and once the validity period exceeded the commercial operator has the obligation to withdraw from the shelf the respective product and send it to another operator that has the obligation to destroy the respective food. Also, during the processing of different food stuff there is collateral loss. During the processing stages of milk products and cheese every time the secondary product whey is produced.
Losses in agriculture

In agriculture are lost 20 percent of total food waste. This situation happens, for example, due to the fact that not all the harvest can be gathered in time under the influence of the weather conditions or the soil horizontality in certain areas. Also, in large supermarket chains the products not following the strict quality standards are rejected and sent back to the storage with the risk of degradation overtime.

Avoiding the food waste

The large food wastes have deep implications and effects over the nature and the people. The food production induced 30% of the food waste with direct impact over the environment. What would happen if we purchased only the food and water that we need? We buy a lot and use a little. The food waste produces economic loss both to governments and households since we practically throw the money in the trash bin.

Is there a difference if a throw away an apple or a piece of meat?

Yes! More resources were used to output a product greater is the impact the wastes have, if not consumed. For one kilo of veal meat is required approximately 50 times more land and 20 times more water than for one kilo of apples.

How real are the information presented?

We do not have until today one research at the scale of over 1 million people. Most recent data are based on enquiries and estimates of the production facilities in food industry. Those elements are supplemented by data from the specialty references. For the household’s’ trash the best estimates originate from England accounting 2000 households. Currently there are large scale researches.

On the other hand, the structure of the nutrition diets has a tremendous impact over the food security at global level. According to the annual report elaborated by Les Amis de la Terre (2014) in 2015, approximately 15,500 litters of water are necessary to produce one kilo of veal meat. With the same amount of water 12 kilo of wheat or 118 kilos of carrots can be produced. In the same report, it is highlighted that "The industrial production of meat is not only a torture for animals, it also destroys the environment and engulfs large quantities of raw materials that we import to feed our animals. Europe is, after China, the largest importer of soybeans. Argentina and Brazil continue to significantly increase soybean cultivation, which is mainly eaten by the animals we slaughter. By increasing our consumption of meat, we are driving up land prices. The consequences are disastrous: on the one hand, nearly a third of the world’s land is used to raise food for animals, on the other, small farmers lose their land and their livelihoods. This steak on our plate is a threat to the food security of many humans (Les Amis de la Terre, 2014).

Assurance of food security is based on three fundamental elements (Figure 2):

![Figure 2. The house of food security](image)

Balan et al., / Food safety versus food
- Sufficient food available for consumption (quantity) and sufficient food safety level to assurance healthy diet (quality-nutritionally and hygienically);
- The effective access of the population to the purchase of food through the solvable demand of the population (money, purchasing power);
- An agri-food system and a proper food market (offer and access to supply).

All three of these elements are necessary and indispensable for ensuring constant food security. This "building" of elements supports food security both in small communities (isolated villages) and at the Earth’s level.

Section II-Food Safety

Food safety is an umbrella term that encompasses many facets of handling, preparation and storage of food to prevent illness and injury. Included under the umbrella are chemical, microphysical and microbiological aspects of food safety (Hanning, O’Bryan, Crandall, & Ricke, 2012).

The European Union’s objective in terms of food safety is to protect the consumers guaranteeing at the same time the well-functioning of the common market. Dating back in 2003, the policy is focused on the traceability concept of both inputs (e.g., feed) and outputs (e.g., primary production, processing, storage, transport and retail sales).

EU has agreed over the standards for ensuring the food products’ hygiene, the health and the welfare for the animals and crops’ health, as well as preventing the contamination with external substances such as the pesticides. At each stage, there are rigorous checks and the imports (e.g., meat) from outside EU have to meet the same standards and pass the same verification checks as the food produced in EU.

Key-aspects

No food product dangerous for the health or improper for the human consumption can be offered on the market. The following factors are considered:

- The normal conditions under which the food product is used by the consumer
- The information offered to the consumer
- The effect over the health on short and long term
- The toxic cumulated effects
- Specific sensibilities of certain group of consumers, such as the children.

When a food product or feed appears unsafe and is part of a products’ lot, it is assumed that the entire lot is unsafe. The legislation regarding the food products is applied to all stages of the food chain, from production, processing, transport and distribution to the delivery. The companies with food profile have to: guarantee the traceability of the food products, the feed and the animals from which the food products are obtained in all production and distribution stages; to withdraw immediately from the market the food products or the animal feed or to recall all products delivered if it is considered that those are hazardous for the health; to inform the competent authorities and the consumers if necessary.

The authority provides for the European Commission and to all EU member states the technical and scientific assistance in all domains that impact over the food products safety. Also, it is responsible for the coordination of the risk assessment, identification of potential risks and for the formulation of recommendations for managing the crisis situations.

In the case of a risk identification following a risk assessment the EU member states and the European Commission can adopt precautionary measures according to a high level of health protection. In case the food or feed are presenting a major and uncontrollable risk for health or environment the emergency protection measures of the Commission can include the trade or import suspension of the respective products. Also, the EU targets the consumer protection against fraud or deceiving practices in food trade such as counterfeit food products and ensures a basis that allows the consumers to make qualified choices regarding the food products.

The European Union Parliament adopts the legislation regarding the food safety by issuing directives and regulations out of which a major part is compulsory for the member states and subsequently are incorporated in the national legislation of each country. Still, being an extremely large organisation founded for eliminating the barriers
in trade among the member states and where the individual member states only have a proportional influence the results are often regarded as an excessively bureaucratic of a scale that does not fit all member states. Regarding the food safety, the error tendency forms the side of the maximum protection of the consumer can be regarded as a positive benefit.

The member states can also have legislation and controls on their own in the field of the food safety respecting the condition of not interfering with the trade flow with other countries and be considerably different in their inner structures and approaches in regulative control of the food safety.

If analysed from a scientific standpoint the food safety is a science in its essence that targets the handling, the preparation and the storage of the food products in a manner that prevents the food diseases. These aspects include a series of measures to follow in order to avoid potential health hazards.

The paths inside this flux are regarding the safety between the industry and the resellers and further on between the resellers and the end consumers. Taking into consideration the practices from the industry facing the practices form the market the considerations for the food safety include the food origin and the practices regarding the labelling of the food products, the hygiene of the food products, the food additives and the pesticide residues, as well as the policies regarding the biotechnologies and food and the orientations of the import and export management and the certification of the food quality. When the market practices for consumers are considered it is rational that the food is safe on the market in safe delivery conditions of food for consumers.

The food that can transmit diseases from one person to another, as well as those products favourable for the bacteria development that can lead to food poisoning. In the developed countries, there are complex standards of food preparation while in the less developed countries the main issue remains the availability of safe and proper water that usually represents a critical element (Jangulashvili et al., 2017; Shiklomanov, 2000)

The five key-principles of the food products’ hygiene according to WHO, are (World Health Organisation, 2010):

- Preventing the contamination of the food by pathogens from humans, pets and pests
- Separation of the raw or processed food to prevent the contamination of the processed food
- Processing the food at a recommended time duration and appropriate temperature to destroy the pathogens; - Storing the food at proper temperatures
- Use of safe water and safe raw material.

In theory, the food poisoning is 100% prevented by implementing the management system of food safety known under the acronym Hazard Analysis and Critical Control Points (HACCP). Practically, the reality is slightly different as like all other management systems the management system of the food safety can and has to be permanently improved.

HACCP was developed in the 1960s in the United States to ensure food safety for the first manned National Aeronautics and Space Administration Space Missions (NASA). NASA required a ‘zero defects’ program to guarantee safety in the foods astronauts consumed in space. The HACCP system has grown to become the universally accepted method for food safety assurance. HACCP is believed to stem from a production process monitoring used during World War II because traditional “end of the pipe” testing on artillery shell’s firing mechanisms could not be performed, and a large percentage of the artillery shells made at the time were either duds or misfiring (Wikipedia, 2018).

HACCP itself was conceived in the 1960s when the US NASA asked Pillsbury to design and manufacture the first foods for space flights. Since then, HACCP has been recognized internationally as a logical tool for adapting traditional inspection methods to a modern, science-based, food safety system. Based on risk-assessment, HACCP plans allow both industry and government to allocate their resources efficiently in establishing and auditing safe food production practices.

Food safety targets essentially three types of contaminations:

- Physical contamination
- Chemical contamination
- Biological contamination.
HACCP expanded in all realms of the food industry, going into meat, poultry, seafood, dairy, and has spread now from the farm to the fork (Sperber & Stier, 2009). Function of the nature of the food, the food safety establishes ceilings admitted for different contaminants for all three origins. These admission limits, in fact are the admissibility limits for consumption. Their levels are debatable and varies sometimes even inside the EU function of the regulative norms in force. The development of the HACCP, of the concept and the principles as well as of its technological capacity more and more competitive of the industries in the food sector led these admissibility limits to tighter and tighter levels and this happened with an impact over the food safety.

Section - III Consumer Ethics – Food Security or Food Safety?

The natural resources of Earth still allow, on paper, the nutritive support of the entire population of the globe. Certainly, the uneven distribution, the large transport and conservation during transport costs, as well as the distribution of food in less accessible areas are elements of high interest in ensuring the food security (Figure 3).

Nevertheless, nothing can justify the food waste (and not only of food) that reaches worrisome levels even for economic operators that are processing these wastes. The food waste does not refer nowadays only to the remains from the consumers’ table or those resulting from handling and storing the food products. As a paradox, this waste arrived currently to translate into excessive care for the own safety, by exaggerating the food safety measures. As indicated above, the maximum limits admitted for different contaminants is almost constantly changing and sometimes these shifts are only the expression of excessive care and concern somehow selfish of the people from the developed countries. Certainly, the people display more and more forms of food allergies, although these forms are expressions of the body’s incapacity to adapt to certain conditions. We reserve therefore the motivated right to destroy the food products that presumably cannot be included under the requirements of "good for consumption". Whose consumption?!

CONCLUSION

The aspects presented are limited to the particularities of Romania, in the context of the European Union, but it can be observed that the situation does not differ at all in other states. In addition to what we have presented, we could extend questions related to the human need for protein quantity and quality, by type of protein (of animal and vegetable origin), by age groups of the population and by daily activity of these age groups. This human need for protein consumption would be useful to be disseminated to the decision makers and then transposed into the daily diet of the population, thus avoiding food waste, thus contributing to the reallocation of resources effectively and thus contributing to the reduction and even eradication of famine. As long as the concept of "good enough quality" will not be implemented and then corroborated with sufficient quantity, reducing world hunger will not have the success that humanity now urgently needs.
If we analyse comparatively the nutritional needs of the different people of the planet, members of an EU member state and members of a less developed country we cannot observe significant differences. As example, a child aged of 5 years from EU has approximately the same nutritional needs as one child from Ethiopia or Sudan of the same age. Nevertheless, in the EU, exceeding the maximum number of germs that are allowed, for example, in milk consumption leads to its withdrawal from the market and sometimes its complete destruction. If the same milk was offered to a child from the above mentioned less developed countries (even including an effort for its treatment), it could offer an extra day of life for that child in malnutrition situation. Therefore, the question returns, for whose consumption a certain contaminated product is not fit?

Isn’t this concern of ours exaggerated? The chemical, physical and biological contamination are they truly and always with no exception dangerous for us within the limits that we adopted? If so, are they so hazardous as our safety comes before the food security of millions of people suffering of famine?

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