



## Mini Review

### Food Security into a Circular Economy

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#### Abstract

The global emerging economy corroborated with fast urbanization and exponential population trend imperatively imposes a new strategy for the complete transformation of the present wasteful food system into a new, regenerative and restorative system. Another reason is that in recent years the quality nutrition chain has been steadily declining as a direct result of the negative effects of pollution, intensive agricultural practices and the need to increase food production. Studies have demonstrated the present of traces of potentially hazardous substances (e.g., Bisphenol A (BPA), hormones, pesticides, herbicides, chemical additives, preservatives) in different many foods. Therefore, novel food technologies and short food sup-

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ply chains can play an important role in increasing food quality and implicitly enhance the human health. Regardless of the level of economic development, each region of the world contributes to the food waste generation. Only the causes which appear in food chain supply differ between high and low-income countries. This paper aims to highlights food chain potential solutions and current challenges towards the new economy pattern. Circular economy implementation will lead to achievement of a sustainable food system in all its three dimensions: Environmental protection, economic and social. Hence, the development smart and durable strategy of food system smart is the key factor to provide food security.

**Keywords:** Circular economy; Food chain; Food security; Food system

#### Introduction

Food security represents one of the wide word greatest priorities. The development of sustainable food chain will be a permanent challenge in particular, due to several factors, including an increasing trend of global population, pollution, water resource depletion and but not least the increased food demand [1-3]. Paradoxically, although the amount of food produced today is enough to provide food to the whole of humanity, over one billion people suffer from hunger [1-12]. The phenomenon is easy to explain. Basically, there is unequal distribution of food in different regions of the world, due to some economic and political considerations. Thus in developed countries, the food abundance inevitably leads to a large amount of food waste. According to the estimations the food waste is about 40% from the entire food production. From this reason, is required a detailed analysis of each stage from the food chain to highlight the main factors contributing to the food waste [1-14].

The studies have demonstrated that food waste is generated by extremely various reasons such as: Consumer behavior, improper storage, infrastructure, production management, distribution and many others. The causes that lead to food waste differ depending on the level of a region economic development. Thus, in low-income countries the food waste mainly derived from the absence of a modern agriculture techniques and food production infrastructure. More, practically, there is no functional food recycling system due to economical and even political reasons.

Instead, in developed countries, the major causes are excess food production and consumer behavior (e.g. the amount of food purchased exceeds the consumption, etc.) [1,14,15]. The negative effects of the actual food waste on environment are quite huge. And an attempt to summarize the main adverse effects should include: Carbon footprint, blue water footprint, biodiversity damages [1,2,10,11].

Agricultural production and food processing are consuming water and at the same time produce large volumes of waste water. Also, in food waste is an important source of greenhouse emissions, particularly methane gas. On the other hand, the food chain involve a high energy consume from food manufacturers, distribution, storage and end to food preparation [3-10,14].

Natural biodiversity was irrevocably affected by intensive agriculture. Thus many ecosystems were destroyed and transformed into agricultural land. Several species of animals, birds and insects have disappeared [3]. In many cases, raising agricultural output to meet the growing demand for food has implicitly led to the excessive use of fertilizers, pesticides, insecticides, substances that have a direct impact on the nutritional quality of food and human health [1,2].

Regarding to food waste on economic impact it should be noted that each year the costs associated with food waste exceed 700 billion dollars [3-5,16-18]. Only in EU this cost are over 140 billion euros [8]. The circular economy action plan was adopted at recently at EU level and aims to shift the linear economy to a sustainable economy [19].

The circular economy model is intended to minimize:

- Pollution
- The pressure on non-renewable natural resources
- Generation of greenhouse emissions and wastes
- Costs associated with waste and water management etc.,

Basically, the main advantages will be:

- Waste became resource
- Extended life cycle of products and material
- Innovative sustainable technology
- New jobs
- Preserve and regeneration of natural capital

In accordance with the reglementation of EU circular economy strategy a special attention is paid to research and innovation activities which would have an essential role in identifying and developing of new methodologies and techniques which will ensure the implementation of this new economic model [19]. Food security will be another benefit of circular economy materialized through an innovative and durable food waste management. Thus, emphasis will be placed on design of methods to decrease and reuse the food surplus without a negative effect on human health and food nutrition properties.

The consumer behavior will play an important role regarding the change of supermarket quality standards. Currently, foods meeting the criteria of nutritional quality and health safety become food waste because due to their different appearance (color, size or shape) from that required by supermarkets. People have to understand that the taste and the nutritional quality of a fresh fruit or vegetable are not dependent on its appearance. Even more, these artificial criteria (same size, perfect shape and color) are difficult to satisfy by organic products. There is required wide dissemination of the most efficient ways of reducing food waste by consumers, as well as highlighting the financial and ethical benefits [3,4,6-8,14,16-18].

Promoting and expanding the concept of local economy will directly contribute to shortening the food chain and implicitly direct access to fresh high quality organic products from farmers and small food manufacturers. Other important benefits are:

- Avoiding artificial quality standards imposed by supermarkets
- Reducing the costs associated with transporting and storing food
- Minimizing to the exclusion of possible hazardous food contaminants (hormones, pesticides, insecticides) and additives

- And not least, adapting local food production to market demand and thus reducing the amount of food waste [3,4,6-8,14,16-18,20-23]

Adopting a healthy eating behavior by drastically reducing the consumption of fast-food or super-processed foods in favor of fresh, organic food can contribute to decrease the healthcare budget allocated to diseases associated with a hyper caloric diets but poor in quality nutrients: Diabetes, obesity and hypertension. This situation is all the more pressing as this phenomenon has grown especially among the population from poor or developing countries [24].

Moreover promotion and implementation of a healthy dietary pattern represent a key factor for a sustainable socio-economic development. The packaging innovation will drastically reduce food waste amount. The design of new and sustainable food packaging techniques will allow to extend the food shelf life, minimize any traces of potentially hazardous substances (Bisphenol A (BPA), chemical additives, preservatives) and to eliminate ambiguities concerning the food validity [3,4,6-8,14,16-18,22].

Setting up food banks for donation in underprivileged communities and shelters will contribute not only to reduce the food waste but mainly malnutrition for this social category. In this respect, an important role can be played by supermarkets, food producers and even restaurants. Sustainable measures in hospitality industry to manage the food excess without compromise the food quality, safety and human health [3,4,6-8,14,16-19]. Reuse of residues from agriculture as sources of clean energy (biogas and biodiesel) and products with high economic value (organic fertilizers and animal feed). In this respect, household consumers can also contribute [3,4,6-8,14,16-19].

Higher valorization of wastes and by-products from meat, poultry and fish industry to obtain useful products as: Biofuels, chemicals (solvents, soaps), organic fertilizers, pet feed, etc., [25]. Reuse of cooking oils and render fats as raw material for candles, renewable biodiesel, soaps.

It should be taken into account that food security in circular economy main goal is to enhance life quality and eradicate world hunger. And of course, solutions for the greatest challenges facing humanity at present:

- Huge healthcare costs for malnutrition or unhealthy eating behavior
- Scarcity of natural resources
- Accelerated destruction of ecosystems
- Alarming levels of global pollution

## Conclusion

The circular economy concept support food system innovation designed to: Regenerate the natural capital towards the food value chain enhancement, new food waste valorization processes as well as the sustainable food security frame.

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