

Carbon dioxide emission, possibilities of reducing it in the food chain

É. Erdélyi

Department of Methodology for Business Analyses, Budapest Business School, Budapest, 1054, Hungary

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Presenting author email: SzaboneErdelyi.Eva@uni-bge.hu

Wastage of food could have many sources, through the food-chain, from production of raw materials, processing and retail to households; and could be explained as a shortage because of eg. climate change reasons. When it comes to food waste reduction, it can be reached thanks to prevention, charity for needy people, redirecting for animal consumption and industry, or recycling, instead of deposition and disposal or renewable energy usage. First of all, and thinking of adapting to climate change we have to focus on prevention, as much as we could. Greenhouse gas emission is monitored, and estimations based on the trend are calculated (Figure 1). Greenhouse gas emission is measured in carbon footprint equivalent, for services and products, following the directions of PAS 2070, and the ISO 14000 package standards.

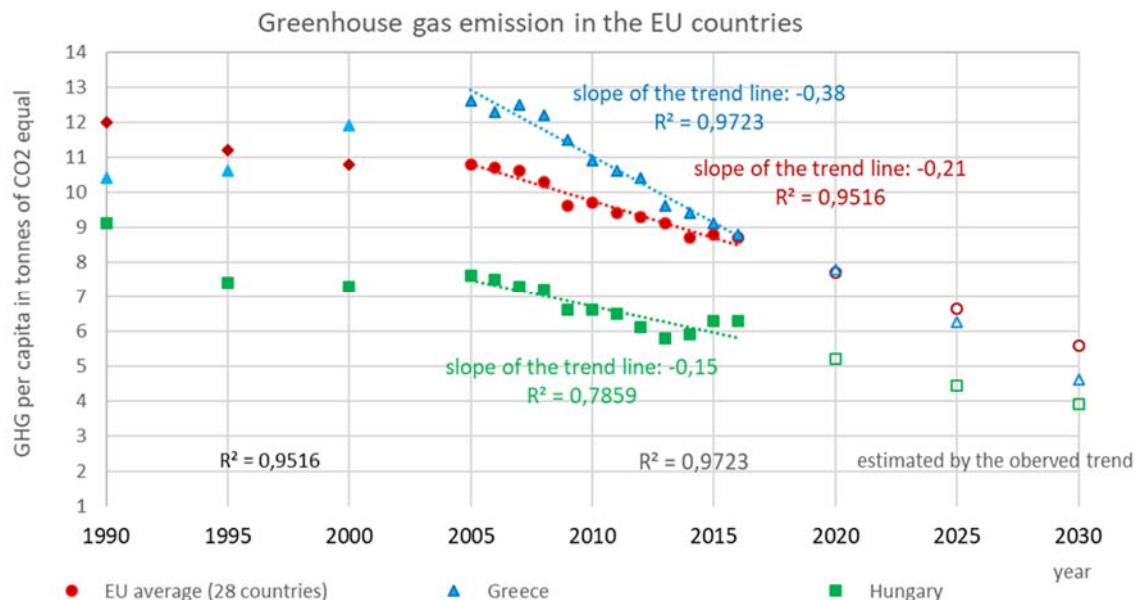


Figure 1. Greenhouse gas emission per capita of the member countries of European Union, given in carbon-dioxide equal (European Environmental Agency)

We should think about how much carbon dioxide emission can be reduced by preventing food losses in the food chain, too. The question of food waste is a complex challenge, so the answers of how we could reduce it, are various, but all important. Figure 2. shows us the stages of the food chain where food losses can occur, and the possible reasons too, which are important in searching for prevention strategies. Everybody is responsible for reducing it, producers, retailers, and customers. In addition, efficiency improvement means cost reduction, as well.

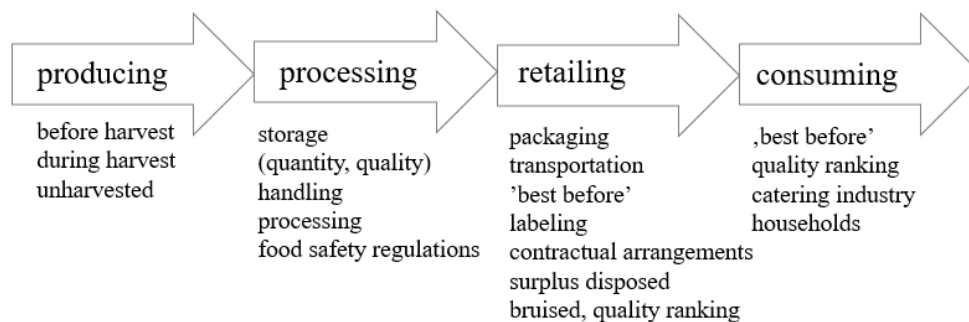


Figure 2. Stages when food loss occurs, and its reasons

According to Bódi and Kasza (2014) there is a significant amount of waste which is avoidable (Table 1). According to the research of National Food Chain Safety Office, an average Hungarian consumer generates 68 kg food waste annually. 49% of this amount would be avoidable. Similar can be said for other countries, too. With this approach we can distinguish the following categories: avoidable, possibly avoidable and unavoidable.

Waste categories	Amount of waste in kilogram (kg)	Proportion of waste in percentage (%)	Estimated for a household (kg)
Unavoidable food waste	86.744	33.89 %	1.73
Avoidable food waste	42.113	16.45 %	0.84
Another waste	127.076	49.65 %	2.54
Total	255.933	100.0 %	5.11

Table 1. Proportion of food waste in Hungary (Bódi and Kasza, 2014)

Beside prevention, losses need to be reduced. Food waste takes place all along the value chain: during production and distribution, in catering, and is depending much on the household usage and practice. EU Publications (2018) says, 10% of food waste could be used as food, because its date until it is good for consumption, is still valid. In many countries the practice is that in the last days of the best before date, the selling price is decreased by 50%, or more. Based on the study of the European Parliament (2017), we see that in 2014, 88 million tons of food was waste, and the targeted result is to reduce it by 30% until 2025, and by 50% by the end of 2030. The sources of food waste are also given in this study with their contribution to food losses: production, processing, retail, households, catering.

In this work we focused on retail on consumption, because we think that educating could help much in reducing carbon dioxide emission and waste. We made interviews with companies and collected phone applications which could help in educating consumers. Educating is one of the most important things, in giving good strategies and practices and making people responsible in everyday life. If we reach this goal, greenhouse gas emission can be reduced, because unnecessary production and consumption can be avoided.

The paper reports the most important finding of this study and highlights the importance of every small step and efforts for food waste reduction, and the responsibility of all stakeholders in food-chain. There are different applications supporting waste reduction, meaning reducing carbon dioxide emission, as well. One of them has the idea that restaurants can register their last portions and sell price reduced online. Some others are just introducing the daily menus and price reductions. The others are focusing on savings by buying less, or purchasing more focused for nutrition balance, or quantities. We introduce two new phone applications. One of them was a winner's project of a student's team at the national innovation competition in Hungary. It is called SmartOn, developed for retail and consumer food waste reduction. The idea is based on point collecting cards, for companies with more stores. It would use an existing barcode GS1-128 (containing the best before date of products) for registering and controlling the supply, instead of the manual registering practice. Another idea of this team was to give ideas for the consumers how to use these food products in cooking by having a set of recipes, and a search option for the bought products. Another mobile phone and tablet application is called Virtual fridge. It allows users to efficiently keep track of the groceries in stock. Virtual Fridge registers the products bought in supermarkets into the application. The aim of the application is to diminish household food waste without demanding substantial behavioral change from its users.

All players in food chain are responsible for waste production. At every stage in the food chain we can calculate the carbon footprint of the waste and summarising it we could see how much it results in total. So, whenever we reduce waste, greenhouse gas emission is reduced at the same time. Producers and retail companies have to build and improve their strategies. The same holds for the processing and consuming stage, considering all the possible reasons listed in Figure 2. Every step is important, and reminding, that, many a little makes a mickle.

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