



## Risk of food losses and potential of food recovery for social purposes



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### ABSTRACT

All entities of the food supply chain should be responsible for counteracting food waste, therefore a need arises for joint initiatives in this area. To reduce food waste, businesses should be supported with a number of procedures for the efficient use of food for social purposes that shall be consistent with the law in force.

Although they can bring about some losses, the following factors neither pose a threat to human health nor affect the donation of food for social purposes: wrong labelling of packages, food product wrong weight, close-to-end expiration date as well as mechanical damage to bulk packages. The purpose of this study is to identify such points at each of the four stages of the food supply chain (primary production, processing, distribution, sale) where food losses can be prevented by donating food to those who need it.

A total of 15 Recovery Points were identified at the above mentioned four stages of the food supply chain. Food recovered there is safe to human health, so it can be donated for social purposes.

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## 1. Introduction

One of the most global problems of the 21st century is the disproportion between people's living standards in developed and developing countries. It results in the fact the poorest societies do not have enough funds to purchase of food products in terms of quantity and quality. Developed countries follow a model of overconsumption whereas the populations of developing countries struggle with malnutrition and hunger. Regardless of their economic status, all people should have equal access to sufficient, safe and nutritious food which will meet their dietary needs. Indeed, nowadays developing countries are inhabited by over 820 million undernourished people. Moreover, food security is also a problem in developed regions of the world where 15.7 million people are undernourished (FAO, 2013). Even an adequate intake of calories does not ensure that the need for all micronutrients has been met. An optimum solution is to make a balance between the demand for and supply of food because any deviation to either side can lead to undesirable results. The excess of food in the market leads to the waste of agricultural produce and food products that could be used for consumption. Moreover, it is estimated that

the world's population will increase to 9.6 billion in 2050, so the use of food surplus can be one of the most important solutions to the problem of how to feed all the people in the world.

Due to the complex nature of the food supply chain, i.e. its numerous stages and complex organisational structure, the process of the efficient management of food flows and handling is a big challenge. Excessive quantities of products in the market as well as longer distribution and logistics channels result in the increasing losses and waste of food worldwide. This phenomenon is observed at all the stages of the food supply chain "from field to table", starting from the primary production, through processing, sale, catering, distribution, down to households.

### 1.1. The essence of the food losses and waste phenomenon

There are some reasons why food waste and losses are so important. The main reason to stop further wasting of food is the growing global population and hence a need to ensure more food (Buzby and Hyman, 2012). Climate and environmental change will result in the increasingly unpredictable and difficult production of food in the years to come. It's a challenge to answer the question of how to make food production more environment friendly (sustainable) and more flexible to feed more people more efficiently (Garnett, 2013). Another reason is the fact that food waste costs a lot of money and other resources (e.g. arable land, labour, energy, water, fertilisers) invested throughout the life cycle of the product

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(from production to consumption) that is not used for its intended purpose, i.e. consumption (Buzby et al., 2011). Food waste exerts economic implications on everyone in the food supply chain, i. e. the farmer, the producer and the consumer (Papargyropoulou et al., 2014). Gustavsson et al. (2011) suggest that avoidable food losses have a negative impact on the income of both farmers and consumers. For smallholders who live on the margins of food insecurity, a reduction in food losses can have a significant impact on their livelihoods.

The economic impact of food losses and waste on the food system is the following:

- at a micro level: spending large portions of budgets by consumers and businesses on foods that will not be sold or consumed;
- at a meso level: reducing profits;
- at a macro level: reducing financial resources that can be used for investment in other areas (Food losses and waste in the context of sustainable food systems, 2014).

Apart from the obvious problem of food losses, the waste of food is combined with the further handling, i.e. the storing, sorting and processing of waste, which has a negative impact on the environment (Engström and Carlsson-Kanyama, 2004), mainly in terms of greenhouse gas emissions (Levis et al., 2010).

It is estimated that in developed countries the food system is responsible for 15–28% of total greenhouse gas emissions (Garnett, 2013). The waste of water worldwide related to the food supply chain is estimated at about 250 km<sup>3</sup> annually. In other words, that is the amount of water needed to produce all world's food throughout the food supply chain “from field to table” (during food primary production, storage, transport, etc.). The following require the most amounts of water at all stages of the food supply chain: cereals, fruit, meat, milk and vegetables (FAO, 2013). To be more precise, the production of beef and dairy products is said to require the highest amounts of natural resources and to exert the highest potential impact on the environment (Tukker and Jansen, 2006). The production of 1 kg of beef is estimated to require about 5000–10,000 l of water. It should be noted that meat losses worldwide are estimated at 0.052 billion tonnes (DEFRA, 2012). An increasing demand, especially for meat products calls for an increasing production of food, from 60 to 110% by 2050 (Garnett, 2013).

In addition to the above, the management of excessive amount of waste generates extra costs related to the transport to the landfill, various fees, preventive actions or disposal. What should be underlined are the costs of human labour, purchase of materials, operation of machines and the use of natural resources like water.

To reduce food waste, businesses should be supported with a number of procedures for the efficient use of food for social purposes, that shall be consistent with the law in force.

Most global studies are devoted to the quantitative description of food losses. In Poland such research has not been done yet so there is a need to investigate the phenomenon and develop a system for donating food for social purposes. Therefore in Poland, since 2014 a project called “Food losses and waste reduction model for the benefit of the society” (MOST) has been carried out, financed by the National Centre for Research and Development. The purpose of the project is to identify the causes for food losses and the ways to reduce them by developing a practical co-operation procedure to donate surplus food for social purposes. A solution to be developed shall have an innovative nature to facilitate the sound management of food products by their efficient distribution by non-governmental organisations.

## 1.2. Definitions of food losses and waste

Various terms and definitions are used in international literature to describe inefficient food management (Gustavsson et al., 2011; Griffin et al., 2009; Hodges et al., 2011; Schneider, 2013a). According to the FAO definition, food security is when people have continuous free physical and economic access to sufficiently nutritious food that ensures their proper development as well as their physical and intellectual fitness. Also, the definition underlines food safety understood as the absence of biological, chemical and physical contamination that could pose any health risks to consumers (Gustavsson et al., 2011).

The notion of food losses can also be related to a decreasing total volume of food intended for human consumption as the amount of food diminishes due to (i) some natural processes such as drying up and rotting or (ii) using food for other non-human-consumption purposes such as the production of biofuel, compost, feed, etc. Food losses do not include inedible parts (e.g. bones, shells, etc.) as well as and materials and products intended for non-consumption purposes (feed, biocomponents, bioenergy, packaging materials, etc.) (Gustavsson et al., 2011).

Surplus food is the food which has been produced, processed, delivered to retail outlets or purchased by the consumer, but not sold or not consumed for various reasons. Food waste is surplus food which has not been recovered to feed used people and animals, to produce new products (e.g. juice or jam), new materials (e.g. fertilisers), energy (Garrone et al., 2014). Food losses usually happen at each stage of the supply chain due to, e.g., non-conformance with commercial standards although the food is safe and fit for consumption (excluding only the inedible parts) (Garrone et al., 2014). Griffin et al. (2009) define food waste as the food lost at each stage of the supply chain (e.g. damage to crop in harvest, damage to food in transport, discarding of food or mixing with other waste). According to Buzby and Hyman (2012), food losses are caused by a number of factors, such as natural drying up, rotting, inadequate control of storage conditions and food waste.

According to the terminology adopted by the Polish Working Group on Efficient Use of Food, sponsored by the Federation of Polish Food Banks, food losses are defined as a decrease in the amount of edible food due to the poor management, errors and irregularities in the processes, e.g. in agricultural production, harvest, processing, transport or sale. On the other hand, the notion of food waste refers to caterers' and households' poor management (Fig. 1) (Wrzosek et al., 2012).

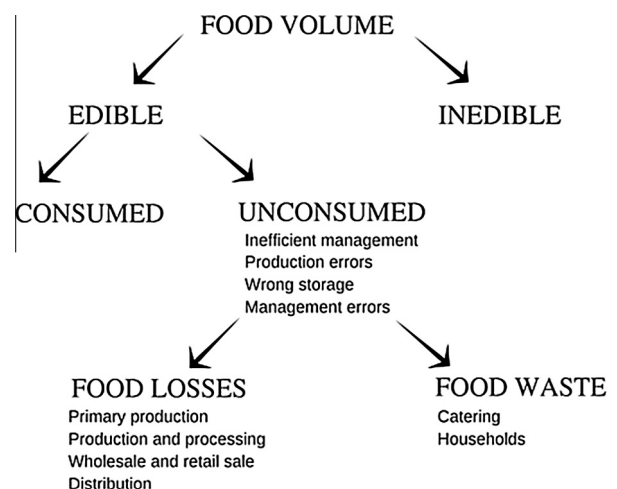


Fig. 1. Schematic representation of the conceptual differences between food losses and waste.

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