

The Benefits of Reducing Food Waste

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1/3 of the world's produced food is wasted while **820 million** people are undernourished

Food waste is food that is thrown away even though it would be appropriate for human consumption

- Lack of infrastructure / techniques / education
- Oversupply
- By choice or “best before” dates
- Wrong treatment

Food waste as a resource?

Promising solution: Worms!

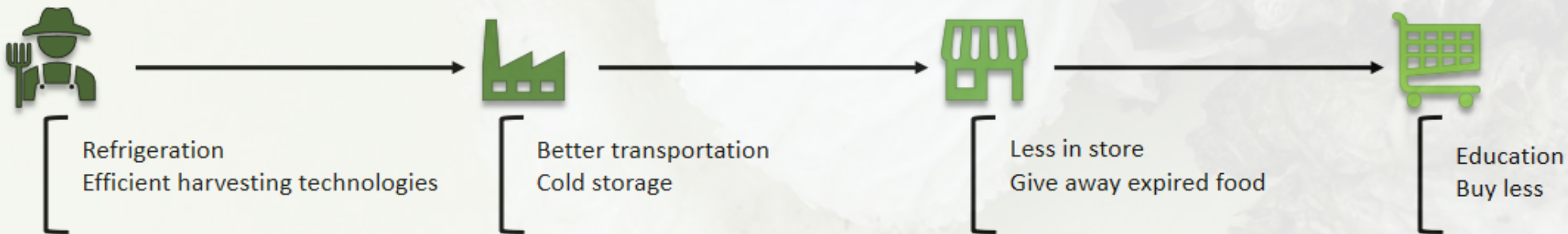
1,000 worms compost 2 kg waste/week

- Use as animal feed
- Reduce soy dependence, less emissions and deforestation

What if we cut our food waste by 50 %?



Solutions for the supply chain



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Abstract

According to the Intergovernmental Panel on Climate Change global food loss as well as food waste contributed to 8-10 % of the global greenhouse gas emissions (GHGE) between 2010 and 2016 (IPCC, 2019). These unused resources of food occur all along the value chain from agriculture to the consumer and have direct and indirect negative impacts not only on GHG but also on hunger, water, land use, and many more. There are different kinds of food waste in the global north and south and, therefore, different kinds of solutions to reduce this waste. A successful reduction of food waste will benefit both humans and nature. The question is, what impact would a reduction of food waste by 50%, as the Agenda 2030 wishes, have on the environment, and are there other ways to reduce the footprint of food waste by giving it a new value?

Introduction

One of the most urgent challenges of the Anthropocene will be to feed up to 9 billion people by 2050. Today there are already more than 820 million undernourished people (FAO, 2018) and especially this part of the human population will increase. Regarding this number, it seems contradictory and far from sustainable that about one-third of all produced food is either lost or wasted (FAO., 2011).

According to the Food and Agriculture Organization (FAO) of the UN, food waste is food that would be suitable for human consumption but is thrown away either by choice, because of expired “best-before” dates, it is treated wrong or due to oversupply. Food waste appears often at the consumer level but also through retailers and foodservice providers and is closely connected with policies, regulations, and consumer behaviour (FAO, 2011).

It is crucial to reduce food waste to feed more people but also to relieve agriculture from using even more land for food production. We have to recognise that food waste is not only the actual food that is wasted but also all the work, resources like water, fertilizers, and land, as well as land-use change, emissions, and energy that is lost by throwing away actually edible food. It is obvious that reducing food waste is one step to solve several of the sustainable development goals such as SDG 2: Zero hunger, SDG 6: Clean water, SDG 12: Responsible consumption and production, and SDG 13: Climate action (Carrero-Martinez et al., 2019). In this paper, we will discuss three aspects of food waste: the current state and global problems, the environmental impact and benefits of reduction, and suggestions for utilizing food waste. We will point out why reducing food waste is necessary for SDG 15: Life on Land, and in which way this goal could benefit from a reduction of food waste.

Current state of food waste and methods to cut food waste

Food waste is a global problem, it occurs at all various stages, from early in the supply stage, during production, processing, and transport, and later during and after sale. Where the main problem lies varies from country to country, and the different solutions on how to handle this issue are highly dependent on whether it is in a developing or a developed country.

Starting with developing countries, food waste mainly occurs during production, storage, and transport. Economical pressure leads farmers to harvest prematurely even though it might not be fit for consumption yet. Lack of infrastructure and proper storage conditions ruin food even before the sale is possible. Markets for food sales can be unsanitary or again lack proper storage conditions. All these reasons for food waste also harm the economy and food supply in developing countries. This waste can be seen as “accidental” because the developed countries have proven that there are ways of fixing it (FAO, 2011; Godfrey et al., 2010).

In the production state, farmers often overproduce food in order to be robust against pesticides, extreme weather conditions, etc. As they produce more than they are financially able to harvest, a lot of food is lost in this stage for developing countries (Ishangulyyev et. al., 2019).

Another area that is especially harmful to developing countries, is the transportation and storage stage. How the different products are harmed in this stage differs a lot depending on the food type but looking at all food loss and waste combined globally, this is the stage where most food is lost. In hot weather conditions, it is crucial for fresh products such as meat, fish, and vegetables to be stored at a cooler temperature, in addition to right moisture, oxygen, sanitation, and light. Having the possibility to store food the proper way would be the solution on how to reduce waste for this stage, as it will extend the quality of the products (Ishangulyyev et. al., 2019).

Today, facing the Covid-19 crisis, not only developing countries have problems with storage and transport of food, but also the US and Europe have trouble with food waste in these stages of the value chain. Usually, in developed countries, the problems related to food waste are largely caused by consumers throwing away food rather than eating it. Stores’ and consumers’ aesthetic standards for food (e.g. shape, size, colour)

prevent food from reaching the stores even though it is edible. Too large quantities of food in relation to the actual need in stores cause more food to reach the expiration date without being bought.

Another issue is that the price of food in developed countries is so low that consumers can afford to waste food, without it harming their personal economy (FAO, 2011). In addition, retailers are setting prices and special offers to encourage consumers to buy more food than they need, meaning that the stores also have a responsibility of how much food is wasted in the home of consumers, as their marketing promotes buying more than necessary. If these campaigns were to end, the customer would go home with less food in the first place. Also, if less food were produced, that would consequently give an increase of food prices, which again could lead to the consumer buying less food and thinking twice before throwing something away.

Even worse than the waste of inedible food due to overconsumption is the waste of edible food due to faulty sell-by and expiration dates. The food labeling is for health safety reasons and stores are therefore prevented by law to sell food that has passed the date. Consumers are not bound in the same way, but many still follow them to be on the safe side rather than judge the state of the product themselves. Educating and spreading awareness of what these marketing labels are, and how the producers are obligated to set a date, is important to challenge people to look beyond the expiration date and evaluate for themselves whether the product has gone bad, or if it is still suitable for consumption.

The benefits of reducing food waste

One important part of food production and waste is agriculture, which is one of the biggest threats to life on land (Ramankutty et al., 2018). The human-made land-use change over the last decades is highly unsustainable due to forest degradation and soil erosion (Hooke et al., 2012; Steinfeld et al., 2006). Agricultural land is only one of the resources which are needed to produce food. An ecological footprint of food includes, additionally, the water needed for the plants, livestock, and during processing, fertilizers which can cause, for instance, eutrophication, and the greenhouse gases which are emitted during production, processing, transportation, and storing of food. The ecological footprint of food differs between food products. For instance, while apples need on average 822 liters of water per kg, beef needs 15.415 liters of water per kg (Waterfootprint, 2017). Furthermore, certain food products have a higher negative impact on biodiversity, for instance, meat and cocoa (Beretta & Hellweg, 2019). While the awareness of the difference in the sustainability of food products has risen over the past decades, the reduction of food waste, especially in households of the developed countries, must decline significantly in the future. By wasting edible food, we also waste water and cause unnecessary land degradation, use of fertilizers, and emissions of GHG. This wastage has not only a negative impact on the environment but also on food availability in developing regions, which needs to be solved to fulfill SDG 2.

Munesue et al. (2014) drew a global scenario for the reduction of food waste by 50%. As in the paper, we focus on water-use, land-use, and GHGE of food waste. Regarding FAO (2013), the global food wastage of 1.6 Gt in the year 2013 caused 3.3 Gt of CO₂ eq., while 250 km³ of water was used and 1.4 billion hectares of land have been cultivated. All these resources were used on nearly 30% of the world's agricultural area for food which has been thrown away in the end.

Another SDG of the UN is the reduction of food waste by 50% until 2050 (SDG 12.3). We will now examine the positive impacts on the environment (SDG 15) and SDG 13, and the nutrition of the human population (SDG 2) if food waste would be reduced by 50%.

First of all, the reduction of food waste would have a positive impact on food availability for people in developing countries. Even if it would not solve the issues of food insecurity, the number of undernourished people could decrease by 63.3 million (without income revision). Due to the decrease in food demand in developed regions, the international prices will decline and, thereby, the purchasing power of poor people in developing countries and their consumption rise.

For the environment, food waste reduction would be beneficial because we would need less agricultural land, waste less water, and cause less GHGE. A reduction of 50% of our global food waste would effect a decrease of 3.4 Mha (34.000 km²) of the global harvested area; 1.5 Mha in developed countries and 1.9 Mha in developing countries. As a comparison, in the year 2019, the area which was degraded in the Brazilian Amazon forest added up to about 1 Mha (TerraBrasilis, 2020). Furthermore, halving the food waste would save 17.3 Gm³ of water in developed regions, 41.3 Gm³ in developing regions, and 58.6 Gm³ worldwide, which makes up to 1.1% of the global water footprint. It seems to be a small number, but clean water is in many regions a scarce resource. Lastly, we can reduce our global GHGE by 74.3 Mt (23.2 Mt in developed countries and 51.1 Mt in developing countries) which makes up to 1.6% of the global GHGE in food production stages. In connection to SDG 13, reducing our global GHGE is important for SDG 15 to mitigate habitat and species loss due to climate change.

Utilizing existing food waste

One promising reuse solution is to give food waste to worms as a food resource. Using worms is an option in order to create compost. They help create valuable soil as 1,000 worms can consume up to 2 kg of organic waste per week (Braw, 2015). Their larvae are useful as they contain about 40% protein, are easy to harvest, and can be used to feed animals like chickens, cows, and fish. Reducing our dependence on soy-

based protein imports from America would reduce emissions and could lead to less deforestation as most of the livestock food is produced on former rainforest ground (Wageningen, 2014).

By now, worms would be classified as production animals and can therefore not be fed to other production animals. To optimize the composting and feeding throughout worms, Europe would have to change some regulations. In addition, bigger composting areas would ensure efficiency.

Conclusion

Global food waste consists mainly of food which is edible and, due to different reasons, it is thrown away. Food waste occurs at different stages of the value chain, whereas there are different trends between developing and developed countries. In developing countries, food waste mostly occurs at the early production stages, while in developed countries it is a consumer-based issue. Due to the fact that natural resources, like agricultural land and water, are needed to produce food, while GHG are emitted during the different stages of production, food waste has a bad impact on the environment. If we were to cut our food waste by 50%, we could save a lot of resources and relieve the environment. Even if the food waste is not preventable, there are several possibilities to reuse food waste, for instance for animal food, and hence reduce the environmental impact of food waste.

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