



REDUCING FOOD WASTE SAVES MONEY AND HELPS OUR PLANET

Ofira Ayalon^{1,2*}

¹School of Environmental Sciences, University of Haifa, Haifa, Israel

²Samuel Neaman Institute for National Policy, Technion, Haifa, Israel

YOUNG REVIEWERS:



REUT

AGE: 11

About one-third of all food that is produced (from the farm to our tables) ends up being thrown away. This is a tremendous waste of resources, including the energy, water, soil, fertilizers, and pesticides used to produce food. Food waste also damages the environment because decaying foods release pollution, including methane, a very powerful greenhouse gas. In a study conducted in Israel, we found that 45% of all household trash is food waste, and 54% of food waste consists of food that is still edible, especially fruits and vegetables. The cost of avoidable food waste is ~\$40 per month per household—money that is literally thrown in the trash. Understanding why and how food is wasted is a key step toward teaching people about this problem and creating public policies that will reduce food waste and persuade people to change their behavior.

FOOD LOSS

The decrease in the quantity and quality of food during the production of agriculture produce and food-production processes, due to things like improper refrigeration that causes food to spoil.

FOOD WASTE

The decrease in the quantity and quality of food that occurs in homes, markets, restaurants, and institutions with dining halls.

SUSTAINABLE DEVELOPMENT GOALS (SDGs)

A set of 17 goals aimed at creating a better world by addressing global challenges like poverty, education, and the environment. [Click here](#) to read more about the SDGs.

GREENHOUSE GASES

Gases that are increasing in the atmosphere due to human activity and can trap heat, causing global warming and climate change. Burying food waste emits a dangerous greenhouse gas called methane.

HOW MUCH FOOD IS THROWN AWAY IN THE WORLD?

Have you ever stopped to think about how much of all the food produced in the world is actually eaten? The [Food and Agriculture Organization](#) (FAO) of the United Nations estimates that about one-third of all food produced in the world is lost somewhere along the food supply chain. This is called **food loss**, and it happens everywhere from the agricultural field, through the stages of food production and processing, to our plates [1]. **Food waste** refers to the discarding edible food by consumers, retailers, and food service establishments. Food loss and food waste are particularly big problems because there are many hungry people in the world who could benefit from all that food if provided to the needy. To address this worldwide food crisis, the United Nations, as part of its **Sustainable Development Goals**, set a goal to **eliminate world hunger** by **cutting food waste in half** by the year 2030 [2].

WHAT A WASTE!

In addition to the fact that discarded food could be used to feed the world's hungry populations, food loss and food waste are also bad for the environment and the economy. To produce one kg of rice, for example, it takes almost 3 m² of land and 2,248 L of water; and 4 kg of **greenhouse gases** are released during the process. To produce one kg of beef, it takes ~370 m² of land and 1,451 L of water; and 60 kg of greenhouse gases are released (for more details, see [here](#)).

Shepon et al. [3] show that replacing all animal-based items in the US with plant-based replacement diets can add enough food to feed 350 million additional people.

Additionally, the food-production process requires huge amounts of manpower and money, not to mention pesticides, and fertilizers—both of which also require water, energy, chemical substances, and more for their own production.

WHAT HAPPENS TO GENERATE THE ONE-THIRD OF ALL FOOD THAT DOES NOT GET EATEN?

During food production and distribution, various “accidents” can happen to cause the food to be lost. For example, food may be transported in refrigerated trucks that are not cold enough; produce may be stored in conditions that cause it to spoil; a restaurant may cook too much food for the number of customers; or too much food may be served at family gatherings. Here is an amazing analogy to help you understand the amount of food wasted in the world: If we were to compare the greenhouse gas emissions from all the food lost or wasted in the world with the greenhouse gases emitted from

countries, the emissions from food waste would be the third largest “country” after China and the USA!

In Israel, an **annual report** is published on food loss and waste within the country, classified according to the various stages of the food-production and distribution chain. From these data we can see that, in Israel alone in 2021, about 673,000 tons of agricultural produce were lost, almost 300,000 tons during the production processes and in industry, almost 450,000 ton at retail, and more than 1.1 million tons (!!) in private households. This is a tremendous loss of food, which amounts to a huge amount of money lost every year.

WHAT IS IN THE TRASH OF FAMILIES IN HAIFA?

In a study performed at the University of Haifa, almost 200 families in the city of Haifa were asked to collect their garbage in bags and place it near the doors of their houses, instead of throwing it in the trash can. The research team came every morning for a week to collect the waste. During the experiment, which was conducted in five cycles, the researchers collected 2.5 tons of garbage. They separated the waste and weighed each item that was thrown out. Luckily, since the trash was collected every day, it did not have enough time to start smelling bad. The team only checked the discarded food scraps. Other materials such as bottles, cans, and cardboard were removed. The researchers found that food waste made up 45% of the total waste produced by the households, by weight. Discarded food was divided into **unavoidable waste** (unusable foods, such as potato peels, eggshells, or corn cobs; **Figure 1**), and **avoidable waste** which accounts for 54% of all food waste. That is, more than 50% of the discarded food should not have gone into the trash at all.

UNAVOIDABLE WASTE

Unusable food waste that must be thrown away, such as eggshells and apple cores.

AVOIDABLE WASTE

Food waste that did not have to be thrown out. It includes food that has not been eaten, food that has been partially eaten, and leftovers that no one ate.

Figure 1

Unavoidable waste consists of the unusable parts of food that must be thrown away, like corn cobs, eggshells, and apple cores (Photo credit: Noa Hollander).



Figure 1

THE FINDINGS

The collected avoidable waste fell into three almost equal categories (Figure 2): 1/3 was waste that was not eaten at all (for example, a sweet potato that rotted in the pantry because it was not eaten in time); 1/3 was partially consumed waste (for example, a pizza from which only one slice was eaten; Figure 3); and 1/3 was leftovers from cooking too much food (such as leftover cooked rice).

Figure 2

Of all the avoidable food waste collected in our study, 34% was unconsumed food like a closed cheese box or a rotting potato, 33% was partially consumed food like the barely eaten pizza in Figure 3, and 32% was leftovers, like uneaten rice or salad (we asked the participants to put these leftovers in a small plastic bag). The remaining 1% was unidentified food waste.

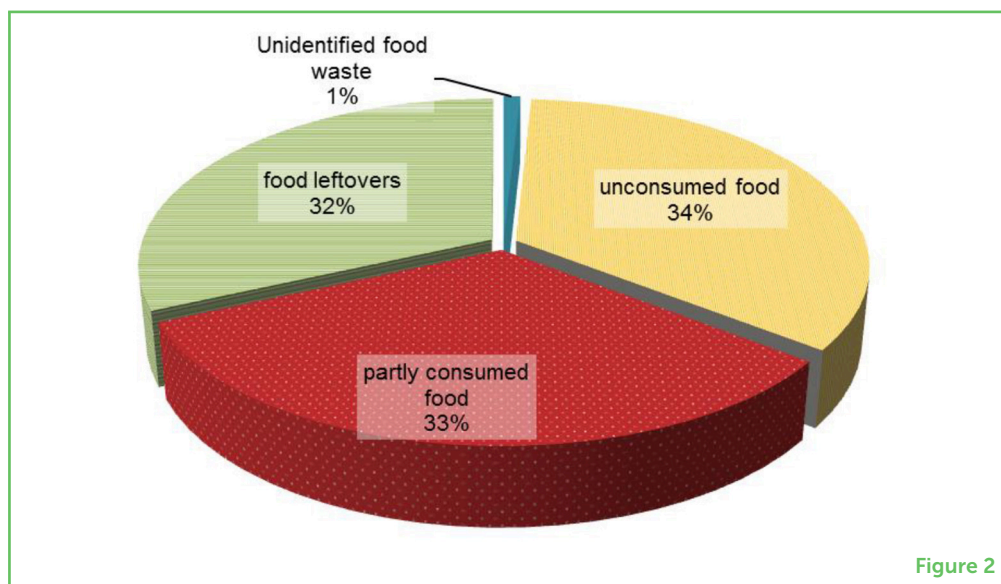


Figure 2

Figure 3

Some food waste consists of partially eaten food that was thrown away, like this pizza with only one slice gone (Photo credit: Efrat Elimelech).



Figure 3

Close to two-thirds of the avoidable waste consisted of fruits and vegetables. Some of this was produce that had rotted in the refrigerator or the pantry and was thrown away (unconsumed waste), some was cut into a salad that no one ate (leftovers), and some was bitten into and then discarded (partially consumed food).

When participants in the study were asked to estimate how much food they usually throw away, they estimated about 13.7% of all the food they purchased. The actual measurement, however, was higher—about 16.3%.

We were also interested in why people throw food—and hence also money—into the trash. We found that the number of people living in the house affected the amount of waste: As the number of people in the home increased, so did the amount of food waste. On the other hand, we found that families that separated their garbage (for recycling) wasted less food. We hypothesize that families that recycle are more likely to be aware of and understand the problem of food waste and waste less food as a result.

We also found that people who described themselves as being worried about environmental problems did not necessarily waste less food. This tells us that even people who are aware and concerned about environmental issues do not always understand how food waste affects the environment and the importance of reducing food waste.

SO, WHAT CAN WE DO?

We can save a great deal of food (and money while also protecting our planet) with a few simple actions. Here are some things you can do at home daily to reduce the amount of food your household wastes:

- Before you go to the supermarket, check the refrigerator and pantry to see what you really need. Then go to the store with an organized shopping list so that you do not buy too much food.
- Try not to be tempted by sales—for example, do not buy 2 kg of cheese just because it is on sale, especially if you will not be home to eat it before it spoils.
- When choosing fruits and vegetables, remember that imperfect or slightly damaged produce can still be used. For example, a carrot that is slightly crooked can be cut and mixed into a soup, or an imperfect apple can be used to bake a pie.
- Store food in proper conditions to avoid spoilage. Certain items require refrigeration, while others need to be stored in a dry, dark place.
- Try to organize your food products in order of expiration dates, so that the fresher products (those with the later expiration dates) are placed behind the older ones. This helps you to use the older products first.
- Serve yourself only the amount of food you think you can finish, so you do not have to throw away food because you are full. If you

are still hungry, you can always take more. The food in the main serving dish can be saved in the refrigerator or freezer as leftovers.

- Smell and check each product before throwing it away, to see if it might still be OK to eat. For example, a package of dried pasta past its expiration date does not need to be thrown away. Cook it and eat it with a delicious sauce made from some tomatoes that have become a bit wrinkly in the fridge!

SUMMARY

Both food loss and food waste have significant social, economic, and environmental implications. They contribute to inefficiencies in resource utilization, exacerbate food insecurity, and have negative environmental impacts, including greenhouse gas emissions, water wastage, and land degradation. If you share this article or the recommendations in it with your family and friends, hopefully they will also start to think about how the Earth's resources and money are wasted when we throw edible food into the trash. If we manage to change even just a few of our food-wasting habits, we can contribute to the global effort to reduce food waste, improve sustainability, and make our Earth a better place to live on.

ACKNOWLEDGMENTS

The study was funded by the Chief Scientist of the Israeli Ministry of Agriculture and Rural Development -research grant no. 20-14-0030.

ORIGINAL SOURCE ARTICLE

Elimelech, E., Ayalon, O., and Ert, E. 2018. What gets measured gets managed: a new method of measuring household food waste. *Waste Manag.* 76:68–81. doi: 10.1016/j.wasman.2018.03.031

REFERENCES

1. Porat, R., Lichter, A., Terry, L. A., Harker, R., and Buzby, J. 2018. Postharvest losses of fruit and vegetables during retail and in consumers' homes: quantifications, causes, and means of prevention. *Postharv. Biol. Technol.* 139, 135–49. doi: 10.1016/j.postharvbio.2017.11.019
2. Gil, J. D. B., Reidsma, P., Giller, K., Todman, L., Whitmore, A., and van Ittersum, M. 2019. Sustainable development goal 2: improved targets and indicators for agriculture and food security. *Ambio* 48:685–98. doi: 10.1007/s13280-018-1101-4

3. Shepon, A., Eshel, G., Noor, E., and Milo, R. 2018. The opportunity cost of animal-based diets exceeds all food losses. *Proc. Natl. Acad. Sci. U. S. A.* 115:3804–9. doi: 10.1073/pnas.1713820115

SUBMITTED: 23 April 2023; **ACCEPTED:** 29 June 2023;

PUBLISHED ONLINE: 14 July 2023.

EDITOR: Idan Segev, Hebrew University of Jerusalem, Israel

SCIENCE MENTORS: Gur Mittelman

CITATION: Ayalon O (2023) Reducing Food Waste Saves Money and Helps Our Planet. *Front. Young Minds* 11:1210806. doi: 10.3389/frym.2023.1210806

CONFLICT OF INTEREST: The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

COPYRIGHT © 2023 Ayalon. This is an open-access article distributed under the terms of the [Creative Commons Attribution License \(CC BY\)](#). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

YOUNG REVIEWERS

REUT, AGE: 11

I live in Lehavim and love to program computers, dance, and act. I would like to tell you a little about programming, because I think it is important: I study programming with “Alice code”, which aims to train girls (!) in the field of programming. Many girls want to learn programming, but because there are no girls in this track, they do not enroll. In this way the cycle of not having girl programmers continues. The “Alice code” community helps to change the situation, and if I had not joined, I would not be a programmer.



AUTHORS

OFIRA AYALON

Dr. Ofira Ayalon is a professor in the Department of Natural Resources and Environmental Management at the University of Haifa, and at the Samuel Neaman Institute for National Policy at the Technion. She did her academic studies at the Technion. Her bachelor’s degree is in food engineering and biotechnology, and her master’s degree and Ph.D. dealt with waste treatment—specifically food waste and the plastic used for food packaging. Ofira has three lovely children who grew up knowing that food is not thrown away, and even if the cottage cheese is a little sour, you can always make a pie out of it. Ofira’s four grandchildren also already know



that it is necessary to preserve the limited resources of the Earth and not to pollute our environment. And yes, they eat cake made of bananas that are slightly black and gooey—and they even enjoy it! *aofira@gmail.com