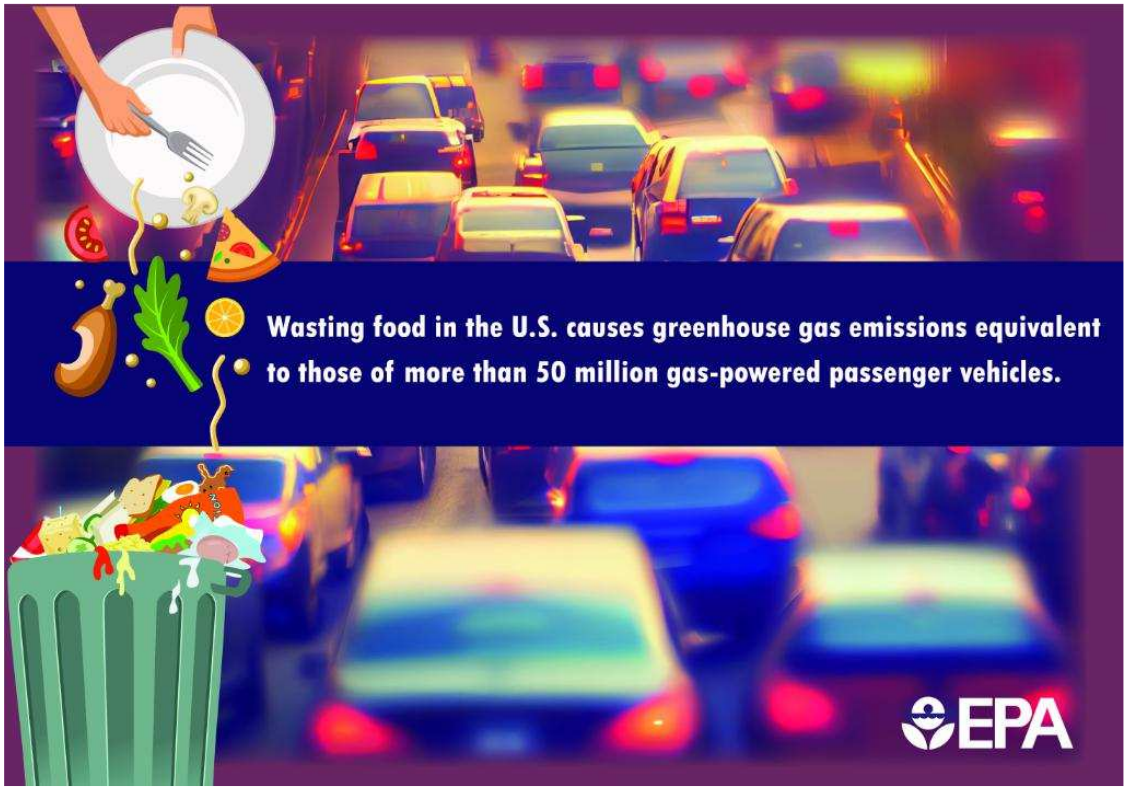
# Stop wasting food,

# Stop Microplastic Poison!

By Cornelius Lungu

1,000,000,000,000 (trillion!) $ of wasted food worldwide is at stake;

We will bring back most of it!




**We aim to go from "manual" to fast automated & digital sale with**

FCS
Food Chain System

Direct from the source to the consumer's plate. Food Waste = 0 is achievable!

# Food waste - law and ecology, today.

Global food waste costs one trillion dollars a year that needs to be put back into the economy.

*I quote: "Around the world, food waste has been recognized as an urgent issue requiring immediate action - the United Nations, the U.S. government, the European Parliament, global business coalitions such as the Consumer Goods Forum, and others have all set targets to halve food loss and waste by 2025 or 2030."*

In this context, the European Parliament's binding Regulation (EU) 2021/1119 aims to reduce greenhouse gas emissions by more than 50% by 2030.

The problems under the title "stop", which concern 30 to 50% of the food purchased, are due to the billions of packages in which we buy the food, which degrade to the detriment of the biosphere.

The mandatory law asks us to stop them, but it is not known exactly how.
We know the new solution, through digitalization and automation, where the disposable packaging disappears and the meals can be distributed exactly in the form of food, cooked and dosed perfectly according to everyone's wishes, hot, ready at the chosen time in our home. This will be explained in detail after we list the reasons why, for the sake of the climate and our budget, we must abandon the 2000year old ancestral distribution system, which is already harming us due to contemporary habits and "modernization" with plastics.

# Where we are now:

https://www.epa.gov/system/files/documents/202303/2019%20Wasted%20Food%20Report_508_opt_ec.pdf

***I quote: "Figure 1. Percentage Distribution of Wasted Food Generation from the Food Retail, Food Service and Residential Sectors (2019)"***

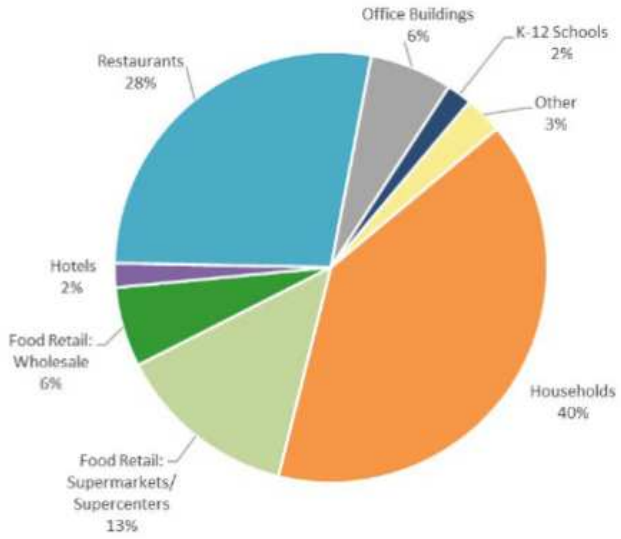



Figure 1 shows that households account for 40% (59% according to German sources) of food waste. These are supplied by supermarkets, so their 13% share can be added to the previous 40%, so the current retail system leads to 53%* (US sources) of waste, showing its inefficiency.

(*Implementing the FCS system for restaurants would not eliminate the entire 28%, but it would avoid a large portion of it.

As can be seen from this Figure1, looking at feeding the population from the opposite perspective, i.e. achieving zero food waste, would have the following huge benefits for society and the environment:

- **The avoidance of a current loss of more than 50%, which means that the same production at the same cost will bring**

>a) The total elimination of the negative environmental impact caused by waste,

>b) Double the number of consumers, or

>c) A 50% reduction in food expenditures,

>d) The ability to sell or export this saved surplus,

>e) A 50% reduction in the amount of land needed to feed the same number of consumers,

>f) Invest the saved amounts in other sectors.

But this "dream" has to become reality instead of the actual situation described above.

# Who is to blame for this? What is wrong with the "manual" system?

<u>So supermarkets, shops, discounters.</u>

These were originally created in Rome, 2000 years ago (Fig. 12, below), as they were ecological at that time, but in modern times materials, especially plastics, and new market conditions have led to the negative side effects mentioned.

Through the present system, which we call "manual", food ends up in the hands of billions of people, well hidden in colorful, expensive, we think useless but indestructible packaging, to be distributed in an irresponsible way all over the world.

Do you think it is possible that in a few years they will radically change their habits? The old manual system has gone global, but now with globally harmful results.

Even a 50% reduction in food waste will be impossible to achieve without a new retail system like FCS, which mainly uses machines instead of hands.

Wasted food and discarded packaging degrade and surround the biosphere with a layer of harmful, persistent (greenhouse gases, microplastics), but poorly understood biotic toxins, seriously accelerating climate change. (Fig.4, 6 below)

Not only do 'modern' packaging and discarded food emit climate-damaging greenhouse gases, but also the invasion of microplastic particles.

All of this is the invisible "elephant in the room", made up of CO2 and other greenhouse gases, especially methane, which brings us what we feel more and more clearly every year: climate change, a danger for us and the future. And in addition, the pollution of the surface of the planet by discarded disposable packaging, real "high tech" inseparable from metal foil, plastic, colored substances... which turn into microplastics, dangerous for humans and the rest of the biosphere. see Fig. 3, 6, Note 3.

Why does the overwhelming majority of the world's population participate in this wasteful disposal against their own interests? Because they have no choice but to shop in today's supermarkets, which definitely pollutes the biosphere and the global climate,

Climate change is the biggest challenge of our time. Here are some examples from around the world; (Figure 1-11, Note 4)

# We offer a truly effective solution:

FCS
Food Chain System

FCS has been developed as a unique system. A system that aims to eliminate plastic waste, to eliminate all packaging, plastic, paper, cardboard, bottles, all the packaging that is actually standard in food retail, all the packaging that is only necessary because the food is sold in consumer-sized portions, packaging that is only needed for 15 minutes (the time it takes to deliver the food to a home).

Once in the kitchen, the package has lost its function and is thrown away to become waste.

You see, we are talking about 15 minutes of function, which cause costs of billions of dollars.

The new system FCS is a digital and structural system ready to order, which includes its own casing (reuse), automatic vending, automatic processing. A new way to get your food that does not require throwing away packaging. And, as a further advantage, FCS avoids food waste.

## The FCS solution

The customer no longer buys what he needs to fill his pantry at home.

He now buys what he wants to eat.

He buys a meal, one meal, two meals or more, meals of the same recipe or of different tastes.

It is similar to ordering a pizza or any fast food - but with FCS the quality is high and healthy.

And it is prepared fresh at your home, in the customer's kitchen.

All you have to do is choose from the (huge) variety of recipes displayed on your screen, or create your own and order by cell phone.

The vendor's shop is fully automated.

As soon as your order arrives, it is automatically checked if all the necessary ingredients are available and (within 5 s) you get the answer that you can now pick up your order at the Corso.

At the same time, in the shop, the ingredients for your meals are automatically moved from the shop storage to the cutting machine, where they are automatically weighed, cut, and distributed to the FCS transport cassettes, which are neatly stacked in the Trolley, the FCS transfer shuttle tool.

The trolley is offered to the customer or a delivery service on the Corso with several automatic pick-up stations where it can be collected.

Once at your home, the Trolley is parked at the docking station of the SlaveCook (FCS cooking machine that can be purchased or rented).

That's it.

After the meal has been prepared, the SlaveCook gives the signal that the meal is ready.

# The story

The goal was to completely eliminate all packaging in food retail. Having understood that this is not possible, but with automated and digitalized processes, it took 2 years to develop the complete edition, the invention of the FCS system with a "split automation" consisting of a "Master Portioner" and a "SlaveCook", which is an affordable cooking automat at the customer's premises. As all the demanding operations are done by the “Master”, the SlaveCook can be kept inexpensive by following the "KISS" principles. It is a special "Pick & Place" automat with thermal cooking capabilities that "blindly" opens the shuttle trolley where it picks up the perfectly shaped and placed ingredients to quickly perform the final sequences for the finished meal.

Now the invention is complete in all details, but until now there is no demonstrator, we do not have a first prototype to test the cooking processes.

# The result

After creating the complete system, more and more benefits became visible.

Here is a list of the benefits we have seen so far. Surely there will be more. See the list at www.freshfood-zero-waste.de .

One big advantage became clear recently. The huge savings potential.

You save because you order what you need, not what is offered in a closed standard package.

You don't have to throw away food that you have bought too much of, that has gone out of date, ... .

Shopping at the FCS avoids throwing away food because the food is always fresh as a result of a fast turnaround. and storage in special root cellars.

Packaging is not thrown away because it is not used, produced or disposed of.

Because there is no single packaging, you buy what you need and want, not more than you planned (e.g. "special offers" like bigpacks with supposed price reduction).

Prices are low because the store infrastructure is small, with few employees. There is no packaging, large parking lots, and buildings with high energy consumption. Less material, no endless shelves, carts, public gatherings. And you buy exactly what you want, not a third more.

# "Manual" shopping at the moment:

The consumer dilemma: Waste favors the seller who sells more, but it harms the consumer, society and the climate.

So it deserves closer observation and correction.

The current aggressive marketing, paid for by the seller, is aimed at a heterogeneous population that has no lobby and no choice, but is encouraged by subtle methods to buy more.

In supermarkets, food is offered in standard packages, bags, portions. The customer is forced to buy what is offered, he cannot buy what he needs and not in the size he wants. A standard package usually contains more than he needs - or less.

This forces them to produce leftovers, which hurts them.

Different package sizes from different brands are difficult to compare in terms of price. The necessary comparison calculation can sometimes be a challenge. With FCS, the price is independent of weight and size - and shown on your screen.

When we put food on our plate, we eat until we are satisfied, or if the portion is too large, we may eat even more, which can be harmful to us. So we don't have good control and clear knowledge about one of the most important things in our lives, food.

In addition, more and more processed food is being offered and sold, which is very unhealthy.

Even processed additives are sometimes not labeled whether they are harmless or harmful.

With FCS you get the pure food, you decide what is in your dinner and what is not.

Consumers do not have a clear picture of what they are eating in terms of quantity, quality and price. Eating for mood often leads to nutritional disorders such as diabetes, obesity, etc. Discovering this too late leads to personal tragedy and high social costs.

# Mirror of waste: The plate should be the true mirror of waste.

The consumer only sees what he puts on the plate; sometimes he eats the whole thing, sometimes there are leftovers.

Most of the waste comes from portioning before cooking, when there are definitely leftovers that decompose. He also counts to the last cent when he buys (that's why prices like 1.99 euros appear), but he has no clear relationship between waste and money (in the retail system there is no feedback to the store). Alienation has occurred and the buyer is forced to accept the conditions of the seller.

As a result of competition there are shops that work with subtle tricks, but all with an inadequate system.

The consumer is often deceived by the appearance of " Mogelpackung ". (deceptive packaging)

All shops work in the manual system, actually inefficient due to the multitude of manual operations, totally outdated in the age of digitalization and automation. (Fig. 6, Notes 2, 4).

The more segments the food distribution chain has, the higher the losses associated with them.

One solution to reduce losses will be to reduce the number of steps and speed up the flow (from production to the plate), because some foods degrade very quickly (see "Comparison", below).

I explained the buyer's dilemma above. Without other, more efficient distribution processes, grocery stores have a virtual monopoly, but cannot be morally or legally accused of harming their own consumers.

So the consumer, society and the environment are in the weakest position, paying for all the excess (+30-50%) that is thrown away and for the packaging,

This system, although harmful, continues to feed a recycling system with many dubious aspects.

In this way, today's stores, with the unwitting help of the consumer, are harming our planet by disposing of discarded packaging and creating greenhouse gas emissions that result from the decomposition of food waste. The amount is shown below. (Fig.1,2,3,4,6, 11, Note1,4,).

Huge losses are observed in all countries where statistics have been made (Fig.1,3,6,7, Note1; USA, Germany, India, Israel).

It could be argued that consumers are responsible for 40% of the waste, but this view is neither accurate nor constructive. At best (see Figs. 5, 8, 10 below), this waste should be stopped at the source, but the direct source of this waste is billions of hands that are virtually impossible to control. So food in disposable packaging should not pass through their hands on its way to your plate!

FCS works automatically, not manually.

The decomposition of food in landfills is a major contributor to greenhouse gas emissions.

*I quote " Preventing food waste is the most impactful of Project Drawdown's solutions to limit temperature rise to 2°C by 2100. We need a significant acceleration to meet the national goal of reducing food loss and waste by 50 percent by 2030."*

*I quote: " Landfills are the third largest source of human-caused methane emissions in the U.S., and methane is a potent climate pollutant that traps 80 times more heat in the atmosphere than carbon dioxide over a 20-year time horizon. Addressing methane emissions is a critical priority for reducing global warming emissions."*

# The real cost of food waste

*I quote: " It costs labor, resources, time, and ultimately money. A US family of 4 can lose at least $1500 a year on wasted food."*

In 2022, Germany spent 287 billion euros on food, but more than a third of that, about 100 billion euros, was a drain on the economy and consumers. How is this possible?

The fact is that 59% of the losses (see Figure 1) occur in the household.

It wouldn't make sense to try to influence the economic behavior of all families, it is better to design a proper retail system to reduce these possibilities of waste.

The demand for food is guaranteed by biological necessity, but the supply is in the hands of the sellers; they will not let their customers go hungry because it is neither moral nor good business. But if customers pay more or less voluntarily by a third (Fig. 6) and have no other choice .... what can be done?

Here we see a distortion of the market economy.

# The nefarious relationship between seller and buyer

is dominated by the former wanting to sell as much as possible, while the customer only discovers the ruse after buying the goods. This is a market relationship that cannot be avoided. Neither participant would harm himself. It is obvious that under these conditions, the goal of reducing food waste (and its consequences) by 50% in a few years is almost impossible to achieve.

# Our conclusion:

We have seen from above that the current "manual" food system

is totally inadequate and leads to the huge losses listed in this paper.

# Now, we propose


In the " manual " system, even with a shopping list, the customer cannot portion the contents of pre-packaged ingredients without leftovers. FCS cuts this Gordian knot by simplifying the choice. When ordering (via the Internet), the customer directly specifies the recipe and the quantity (number of portions, optional: special size of a portion), and the rest of the operations up to the plate are carried out automatically.

# The new alternative: "FCS => zero waste".

ensures fast and automated sales and payments and a complete processing of food up to the plate.

However, the current retail structure must be changed or completed by transforming stores or adding automated delivery centers for trolleys.

These Fresh Food Centers (FFC) will contain a "master" portioning and dispensing machine for all customers.

Rearranging kitchens will create space where the SlaveCook (cooking machine) will dominate, saving us the chore of cooking and cleaning cutlery.

FCS is cost effective and can suppress the "consumer dilemma".

Instead of browsing store shelves, the customer places a precise order using his or her smartphone. The order is based on recipes from a library (or created by the customer). The order is immediately executed by a portioning and dispensing machine ("Master-Automat") from freshly delivered goods. When the order is accepted (immediately), the customer sees the prices and can replace an ingredient with a cheaper one. With his agreement, he completes the order.

The ingredients placed in the reusable cassettes are transported in special containers (trolleys) to his kitchen, where they are automatically processed by the SlaveCook at the desired time, after which the food is placed on the plate.

In this system there is no waste of food and the cost of packaging is saved.

We remind that in the manual system a loss of up to 60% is caused by the consumer (Fig. 1,2,11).

# FCS - Zero waste and self- control

The SlaveCook finishes cooking and places on the plate (our "waste mirror") exactly what we have ordered.

If desired, an adaptive ordering process can be used: If there are no leftovers on the plate, there is no waste. If there are leftovers, the customer knows that it has ordered and paid too much, and next time it will order less, e.g. 0.85 portions instead of one, or 0.5 portions for a child, and thus a self-controlled, waste-free eating discipline is created by habit, which in the manual system cannot be prevented by calls to moderation.

This self-monitoring can also be useful when the client wants to follow a diet or medical treatment.

In parallel, he can keep statistics of what he has eaten and inform a doctor or even receive an indication from the FCS software that he is eating too much or too little.

It is well known that it is almost impossible to influence the habits of the population in the short term, so the actual food supply system must be changed.

In the FCS system, the consumer loses nothing (waste = 0) unless he leaves something on his plate, but since this is a visible financial loss, he is likely to order only the bare necessities for himself and his children, who will be educated in this spirit.

By eliminating food waste and packaging costs (about a trillion dollars worldwide, Fig. 6), society recoups at least an amount equal to what is overpaid. The data presented here, which are in good agreement with each other, have been selected from the recent sources listed below (see P.S.), which seem to confirm that as welfare increases, food waste increases.

We cannot allow welfare to contribute to pollution!

# Fact: FCS and Autocontrol will allow us to reduce waste to zero.

(Autocontrol is a free option) In the FCS system there is no more packaging, plastic bags or paper leaflets, because everything is done digitally via smartphone as audio-visual information, both, payment and ordering system. The audiovisual information is available in a large number of languages and their characters.

There are many more details about the FCS system. For further details, technical or otherwise, you can contact the author of these lines at this address or visit his website www.freshfood-zero-waste.de . There you will also find a long list of pros and cons.

The core of the FCS consists in purchasing unpackaged food from producers, delivering it in wholesale quantities to stores, storing it in "Fresh Food & Service Centers" (FFC), portioning it as needed according to digitally received consumer orders, and making it available for collection (by the consumer) at the stores' Corso.

Orders are placed in the form of recipe numbers with the desired quantity (1, 5, 0.8, ... special quantities). The ingredients corresponding to the (cooking) recipe are automatically taken from the warehouse, automatically portioned (weighed, divided/cut if necessary) and transferred to the automatic distribution machine (Master), which fills the corresponding capsules (assigned to the recipe) and places them in the trolley.

At the customer's location, the ingredients are picked up by the SlaveCook (cooking machine), which unloads them from the trolley, recognizes their placement (defined in the recipe) and uses them to prepare the dish requested by the customer.

It is essential for the FCS that the ingredients coming from the FFC are transferred to the Trolley and removed by the SlaveCook. The interaction between the FFC, the Trolley and the SlaveCook is the same as if the automated equipment of the FFC and the SlaveCook were directly connected, as if they formed a single automated unit. This is an exceptional division of a " master-slave " automation.

FCS is unique because it physically assembles the ingredients for all customers according to each of the recipes ordered. The required ingredients are cut directly from unpackaged wholesale quantities of food, accurate to the gram. Individual ingredient sets are created according to the recipe order.

The ingredients must be processed into finished dishes in that exact order by the SlaveCook, miles away. The Trolley helps to meet these requirements. The Trolley contains appropriate small food-safe capsules that are used to transfer the ingredients in the specified order.

In the customer's kitchen, when the SlaveCook picks up the ingredients in the specified order, it is important which capsule contains which ingredient. The SlaveCook empties the capsules accordingly

and returns them to the trolley. It then processes the ingredients into the final dish. The Trolley acts as a shuttle between customers and the FFC. The trolley can also take back some leftovers for orderly collection. There is no packaging to lose and no food waste.

# Industrial perspective

This is how we designed the Food Chain System (FCS). An international patent application has recently been filed (PCT -DE2024/150001, not yet published). We have uncovered the serious worldwide waste that could feed the hungry and contributes significantly to global warming through its greenhouse gas emissions. This waste can be turned into a win-win-win situation for the consumer, the environment and the supplier.

# Global perspective.

So there is a proven concept and a market. FCS can be implemented at a competitive price using existing technologies.

Patent rights guarantee exclusivity for at least the next 19 years. Practical implementation will allow accurate calculation of production and sales prices. The benefit to the consumer is obvious due to the elimination of waste, in addition to the time saved by the consumer, estimated at more than five hours per week.

The introduction of the FCS will be a pioneering achievement in the world and will bring secure profits through the sale of mass-produced products (the "SlaveCook" machines replace the contents of current kitchens). And there will be a profit from production licenses.

It will be necessary to speed up the physical realization of the latter machine, which is not strictly necessary for the system, but whose operation, coordinated with the delivery of portioned ingredients by the seller's high-productivity "master" machine, leads to high productivity of the whole system.

The food business is dominated by balance sheets and profits. FCS can grow quickly because it significantly reduces the price of even better nutrition.

The advantages of FCS can be clearly seen in the comparison below with the situation of the "manual" trade, where food must first be portioned and packaged (and then unpacked), and then passes from the producer to the consumer through a long series of expensive manual operations that take a long time before it is consumed (see "Comparison").

It should also be noted that handling operations performed mechanically by a machine are extremely fast and cheap compared to manual handling by personnel, which is the standard today.

More information about the technical implementation of the FCS system can be found on the website, and more details can be obtained directly from the inventor of this system. From what has been described, we can see that more developed and industrialized countries have more waste at the household or individual level.

It is precisely in these countries that FCS can be implemented very quickly, which will have a knock-on effect on other countries. Poorer countries have higher levels of waste due to poorer production, storage and handling conditions. (Fig. 2)

# Comparison:

Let's briefly compare the path of freshly produced food from the place of production to the consumer's plate in two scenarios;

**a)** The "manual" solution, used in retail today, which practically excludes the automation commonly used in other sectors and has serious environmental disadvantages,

**b) FCS, a system that eliminates many unnecessary work steps** by automation and digitalization in order to achieve the goal faster and more cost-effectively.

**A brief characterization of the two systems is facilitated by the colouring of the background. It refers to the processes that take place after production up to the consumer's plate.**

Automated processes appear on a green background,
manual processes are highlighted in yellow and
environmentally harmful processes on a pink background.
Manual" distribution processes (supermarket), *which are unnecessary and do not appear in the FCS version, are highlighted in italics*.
The left column is dedicated to "manual" processes (current, global state) the right column to automated and digitized processes, which are only included in the FCS concept.

| **"Manual" process (a)** | **FCS process (b)** |
|---|---|
| Production<br>>*first portioning, by type of packaging:*<br>*>packaging )*<br>>transport to the supermarket, (packaged goods)<br>*> (placement on the sales floor, (aleatory lay time).*<br>*> Stick on price tags*<br>*>removal by customer,*<br>*>placement in shopping cart,*<br>*> removal before checkout*<br>*>, value determination at checkout,*<br>*> payment,*<br>*>placement in shopping cart,*<br>*>transfer to trunk,*<br>*>removal at home,*<br>*>unpacking*<br>*>new portioning according to recipe,*<br>*>disposal of empty packaging,) ….. The meal, (cooked under supervision,) is ready and*<br>*>eaten,*<br>*>then tidying up, washing up, etc.*<br>*>(Waste and leftovers are produced).*<br><br>All of these activities take about one hour per day. This list of procedures alone shows that automation is not possible with today's means. FCS fundamentally changes the procedure and makes the impossible possible and even profitable. | Production,<br>> Transport to the FFC in unpacked retail quantities,<br>> Goods receipt with entry on the website,<br>> Customer order<br>> Customer orders are portioned, by Master-Automat, distributed on trolleys<br>> Value determination, (display)<br>>Confirmation, trolley release,<br>> Storage for later actions such as shelf life warnings, health assessment, long-term values)<br>> Trolleys are brought individually to the "SlaveCook"<br>> The SlaveCook takes the ingredients from the trolley, places the empty reusable capsules and any foil residues back, processes the ingredients into the desired dish and offers it.<br>>After the meal, the customer places the used dishes inside the technocook,<br>>which cleans itself and the dishes inside, collects the leftover food and places it in the trolley for recycling.<br><br>Some washing-up liquid is produced, but no waste. Human involvement is minimal and only takes minutes. |

| | | | | |
|---|---|---|---|---|
| Time evaluation of the processes in the manual (a,) {supermarket} and FCS (b) variants | **Variant SM (a)** | Time min. | **Variant FCS (b)** | Time min |
| | Production | 0 | Production | 0 |
| | *Pre-portioning* | 2 | Transport to FCS | 30 |
| | *Packaging* | 3 | Ordering | 1 |
| | Transport S-markt | 30 | distribution acc. recipe | 2 |
| | *filling of shelves* | 20 | pick-up, transfer time | 20 |
| | *waiting time* | 180 | Trolley deposit at SlaveCook | 1 |
| | *checkout* | 5 | Cooking, automated | 15 |
| | Transfer time | 20 | plate filling | 2 |
| | *moving, parking* | 5 | | **71** |
| | *unpacking* | 5 | | |
| | *portioning acc.recipe* | 10 | | |
| | *waste disposal* | 2 | | |
| | *leftovers collect* | 1 | | |
| | *cooking survey* | 30 | | |
| | | | | |
| | *plate filling* | 3 | | |
| | | **316** | | |

The cumulative benefit **of FCS is the time saved (for citizens) and thus an important social gain that can increase the competitiveness or prosperity of a society. Two important differences can be easily identified from this color-coded illustration:**

> The manual system (a) can practically not be automated (highlighted in yellow, nothing but the harmful packaging, which is not necessary with FCS, is produced automatically here:

**>** In FCS the automation, (b) is almost complete (green), so that in the bulk business the prices for the actions are practically negligible and these are also reduced in terms of numbers.
> If we look at the time required to perform the operations, **there is a large discrepancy in favor of FCS (71 vs. 316 minutes).** This means that potential losses due to prolonged storage of sensitive goods are drastically reduced, especially **as there is no loss of time due to overnight storage** in the FCS system. The FCS system goes one step further than Hello fresh, as **it offers completely individualized portions that each customer can influence from purchase to purchase, allowing for even greater savings on food.** And as Hello Fresh still needs cooking action, made and controlled by hand, while FCS saves this time for the customer

Pictures & Notes:

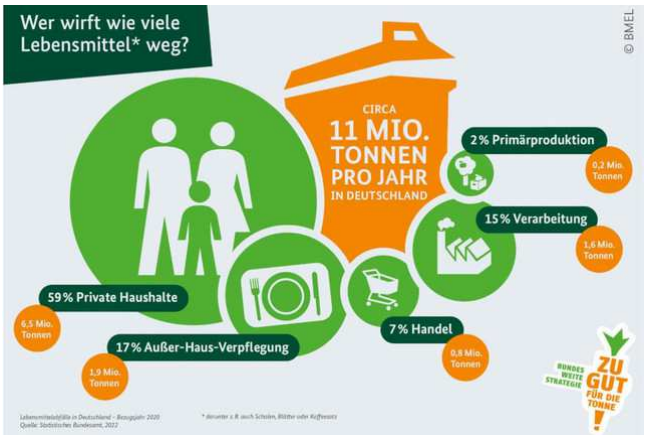


Fig.1(Germany)

**Per capita food waste in North America and Europe is 95-115 kilograms (kg) per year.**
That is more than ten times the waste of developing regions
like Sub-Saharan Africa, Southern Asia, and South-Eastern Asia (6-11 kg).

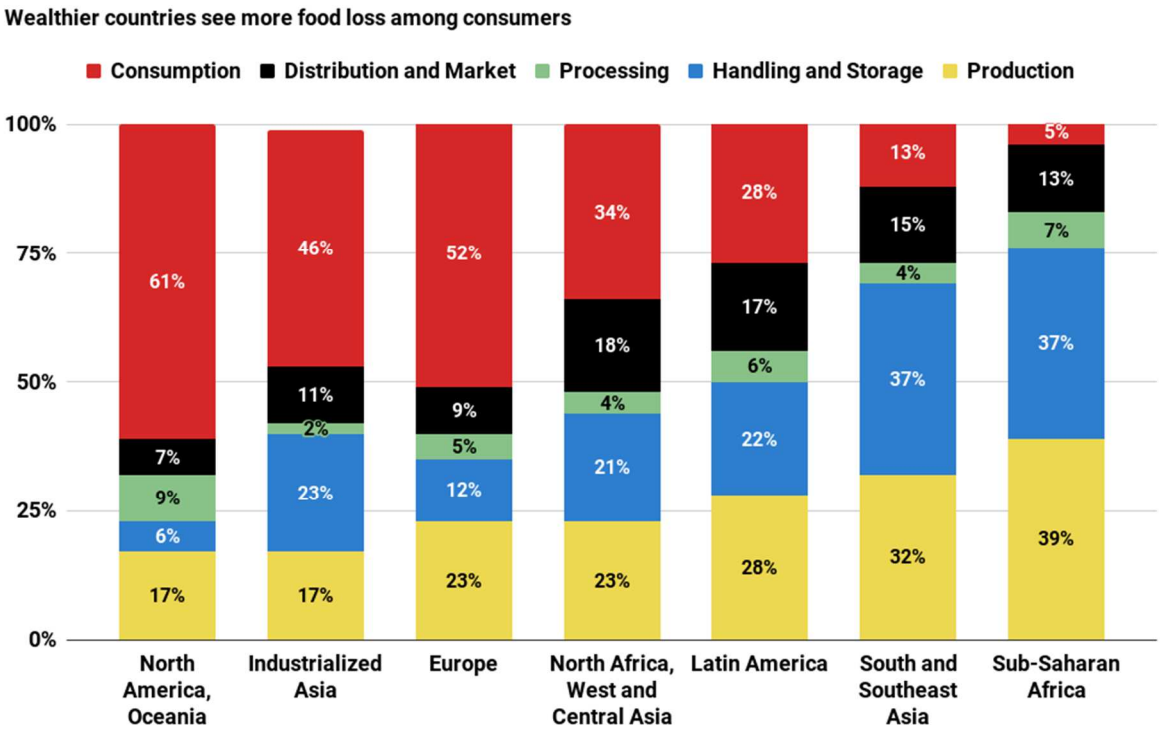


Fig. 2 (Global)

Totals may not add to 100% due to rounding.
[Matt Leonard / Supply Chain Dive, data from WRI analysis of FAO]

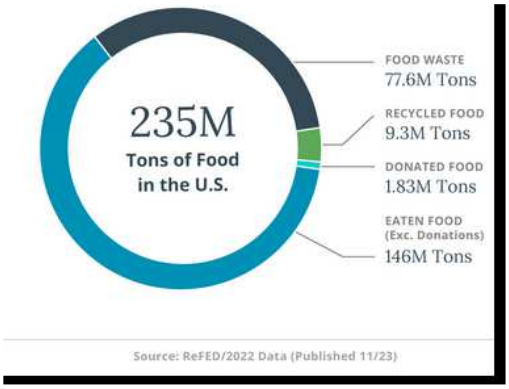



Fig. 3 (US)

> Our **food system is radically inefficient.**
> In 2022, the U.S. let a huge 38 % of 235 million tons in our food supply go unsold or uneaten.
> One third of food (1.3 billion tons) produced globally is wasted every year, amounting to about one trillion US dollars' worth.
> Across the entire supply chain, wasted food in the U.S. creates greenhouse gas emissions equivalent to the emissions from 50 million gas-powered cars (and if those cars were lined up, according to EPA, they would wrap around the earth nearly four times). Fig.3
U.S. Environmental Protection Agency (EPA)

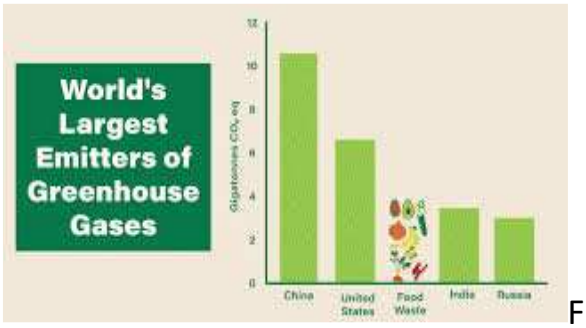



Fig.4


Fig.5

… Largest Emitters….

**If food waste were a country**, it would be the third largest emitter of greenhouse gases after the US and China.

## Key insights from the "Quantifying Methane" report:

**In 2020, food waste** was responsible for approximately **55 million metric tons of $CO_2$ equivalent (mmt $CO_{2e}$) emissions from** U.S. MSW (municipal solid waste) landfills**.**
For every 1,000 tons (907 metric tons) of food waste landfilled, an estimated 34 metric tons of fugitive methane emissions (838 mmt $CO_{2e}$) are released.
Across the entire supply chain, **wasted food in the U.S.** creates greenhouse gas emissions equivalent to the emissions from **50 million gas-powered cars**
(those cars lined up, according to EPA, would wrap around the earth nearly four times).

An estimated **58 percent** of the fugitive methane emissions (i.e. released to the atmosphere) from MSW landfills **are from landfilled food waste.**

In 2020, landfills overall emitted methane equivalent to 94 million metric tons of carbon dioxide ($CO_2$).
At the state and local level, landfills are often the largest inventory.
**Food waste produces 3.3 billion tons of carbon dioxide,** a greenhouse gas that contributes to climate change.

# Food Waste

After the food has been grown, transported and prepared for consumption, it harms the environment by wasted food. Food is wasted throughout the entire production chain; from initial crop growth, to **supermarket screening, to final household consumption**. Food waste includes food scraps, discarded food, and uneaten food.

Some facts about food waste:

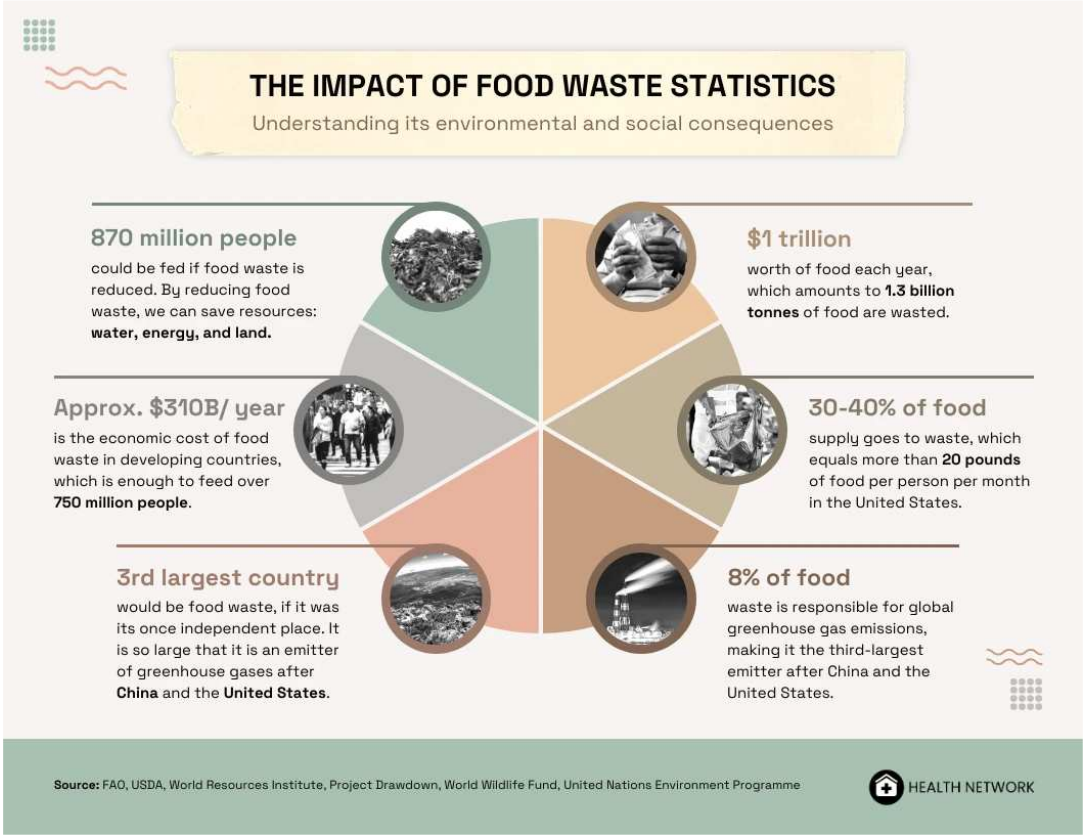


Fig.6

One third (1.3 billion tons) of food produced globally is wasted every year, Amounting to about **one trillion US dollars'** worth.

Fig.7

**Per capita food waste** in **North America and Europe is between 95-115 kilograms (kg) per year.** That is more than ten times the waste in developing regions like Sub-Saharan Africa, Southern Asia, and South-Eastern Asia (6-11 kg). (**Note 1**)

This wastage not only squanders resources like water, energy, and labor
but also **contributes to a problem of high urgency: greenhouse gas emissions.**

This poses a significant threat to our planet.

An area larger than China and 25% of the world's fresh water supply is used to grow food that is never eaten.

According to **Food and Agricultural Organization, (FAO)** we waste about **one-third** of all produced food.
To say it roughly: if food waste were a country it would be the third-largest in the world.
Also, this is not about just wasting food, think about the land, water, fertilizer, money, fuel, and energy spent on raising that wasted food on the farm.

All this is vain because we don't handle food properly**.**
By the year 2050 the world's population will **increase 33% to 10 billion.**
To meet the food demands of this growing population we could increase food production
**60-70% or repurpose food waste. (Note 2)**

**Roting food** produces Methane - a **Greenhouse gas**
**that is 28 times more potent than Carbon dioxide.**

**Methane contributes to 20% of Greenhouse gas emissions. (Note 3)**
Food waste means land waste and fuel waste! To grow, transport, store, and cook food we use oil, diesel and fossil fuel. We never really understand what we waste along with the About **67 million tons of food in India** is wasted every year among which 70-75% of food waste rots in landfills.

Nearly 40% of the food produced in India goes to waste.

In today's "first world", household food waste is about a third of the food expenses!

This paints a grim picture of ***inefficiency*** of the global food supply chain.

Reducing food waste can save households money, making it a win-win-win for individuals, biosphere and communities. (Note 4)

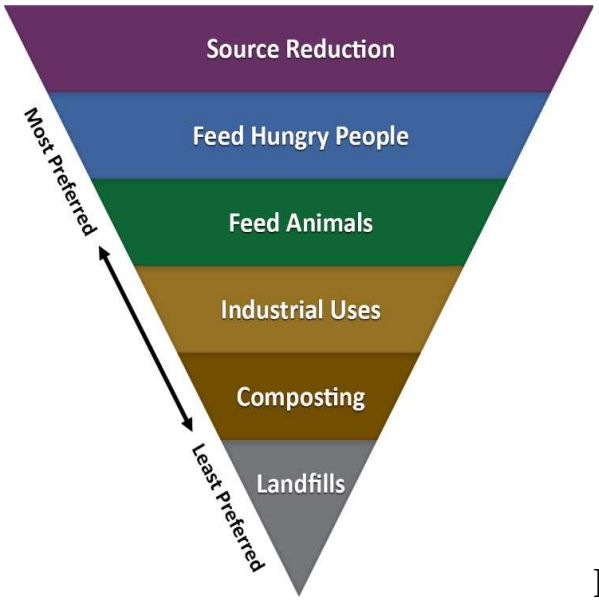



Fig.8

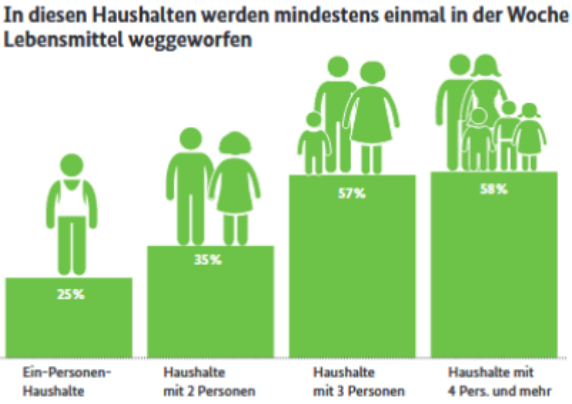
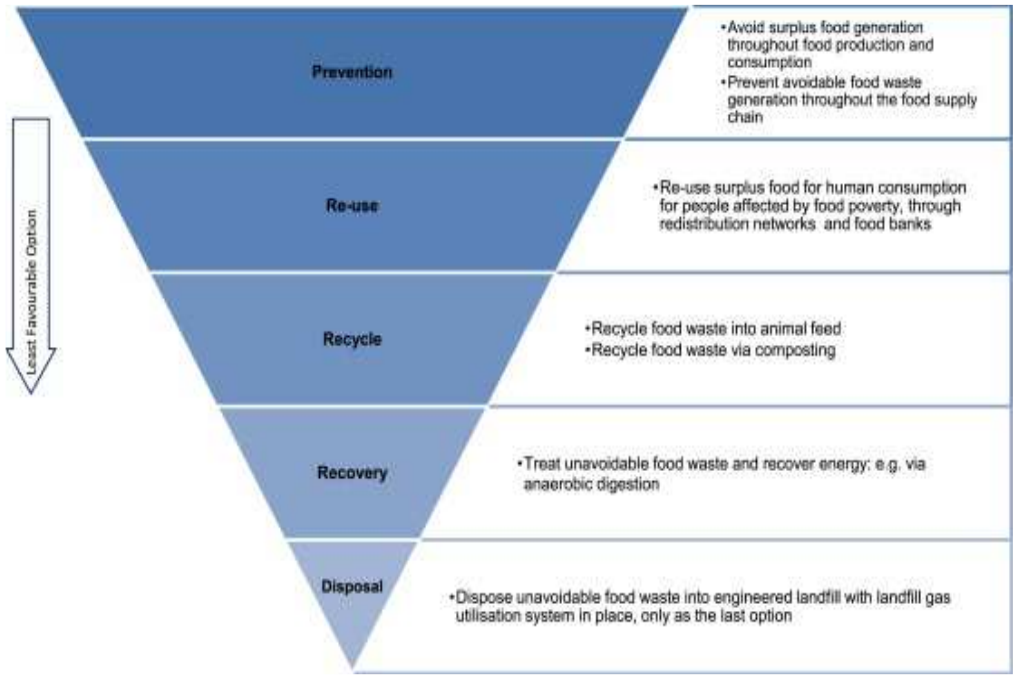
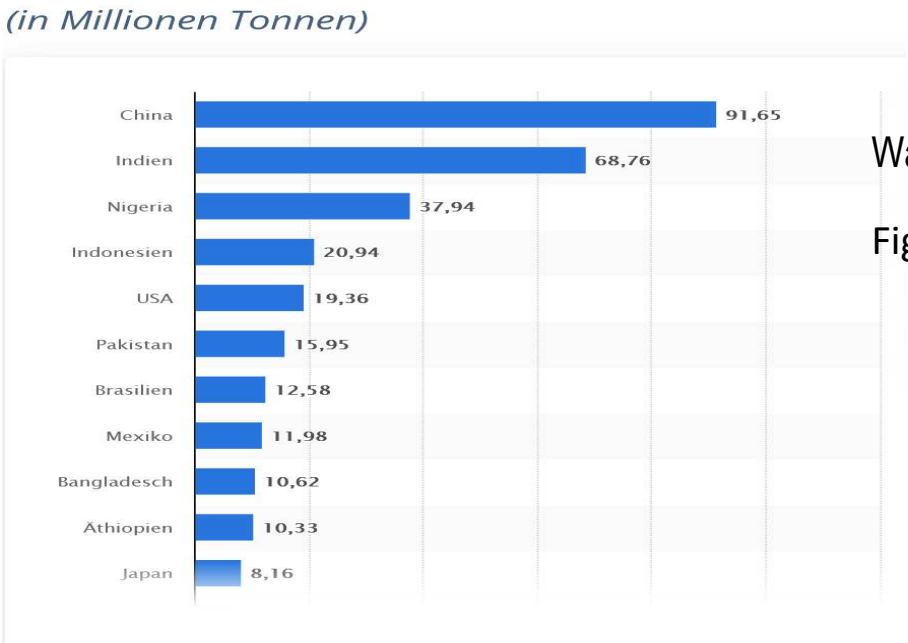



Fig.9 (Germany)

In industrialized countries like Canada, almost 40% of produce food waste occurs at the retail level because the food does not meet high cosmetic standards. (Note 5)

Fig.10






Wasted Food

Fig.11 (Global)


Fig.12- First “Supermarket” 2000 years old.

## Contact:

Cornelius Lungu, 77830 Bühlertal, Rössbühlstr.11.
E-Mail lungu@plusmotor.de cornelius@freshfood-zero-waste.de
Website www.freshfood-zero-waste.de

Edit: 9 March, Y24

**P.S.** Information sources, Internet and literature.

**https://twitter.com/EPAresearch/status/1715367021666320588**

https://www.cdfa.ca.gov/is/foodrecovery/hierarchy.html

**https://www.nrdc.org/bio/andrea-collins/prevent-food-waste-climate-week**

**https://savethefood.com/**
Quantifying Methane Emissions from Landfilled Food Waste

From Farm to Kitchen: The Environmental Impacts of U.S. Food Waste (Part 1)

Wasted Food Scale

NRDC

https://www.nrdc.org › bio › epa-...

CDFA Office of Farm to Fork: Feed Hungry People

U.S. Environmental Protection Agency (EPA) Food Recovery Hierarchy  1

https://www.nrdc.org/bio/andrea-collins/additional-research-household-food-waste

https://www.dsir.gov.in/index.php/national-research-development-corporation

**National Research Development Corporation - NRDC**

Department of Scientific and Industrial Research (DSIR)
*https://www.dsir.gov.in › index.php*
https://pirg.org/edfund/updates/household-food-waste-highlighted-in-new-mitre-gallup-report/
https://www.avristech.com/food-waste-impacts-on-environment/
https://www.avristech.com/managing-food-waste-in-india/

## Environmental Impacts of Food Production | Maple Ridge, BC
Maple Ridge
*https://www.mapleridge.ca › Foo...*
**Think.Eat.Save** | UNEP Campaign

- Learn about food waste | Think.Eat.Save | UNEP
- Gaspillage alimentaire | Canton of Geneva
- Reducing food waste | City of Geneva
- Reducing Food Waste | WWF International
- Food Loss and Waste | WWF International
- Fight climate change by preventing food waste | WWF International
- Gaspillage alimentaire | WWF Switzerland
- Food Waste Backstage: Vue d'initiée sur une installation de traitement des déchets alimentaires | Natalia Krylova, UNIGE | March 2023

Sustainable Food Cold Chain: Opportunities, Challenges and the Way Forward

- Beatrice Garske et al.: *Challenges of food waste governance: An assessment of European legislation on food waste and recommendations for improvement by economic instruments.* In: *Land.* (ISSN 2073-445X) Bd. 9, H. 7 (2020), S. 231–253 (PDF-Download).

- FOCUS Online: *Restaurantchefs lassen unartige Gäste draufzahlen - das könnte großes Problem lösen.* Abgerufen am 17. April 2022.
- Mark Siemons: *Chinas Ernährungsbewusstsein: Ein Teller weniger*. In: *FAZ.NET*. ISSN 0174-4909 (faz.net [abgerufen am 26. August 2021]).


third largest source of human-generated methane emissions in the U.S.

Quantifying Methane Emissions from Landfilled Food Waste

From Farm to Kitchen: The Environmental Impacts of U.S. Food Waste (Part 1)

Wasted Food Scale

https://www.nrdc.org › bio › epa-...

U.S. Environmental Protection Agency (EPA) Food Recovery Hierarchy

https://www.dsir.gov.in/index.php/national-research-development-corporation

**NRDC**Department of Scientific and Industrial Research (DSIR) *https://www.dsir.gov.in › index.php*

Derbyshire County Council

*https://www.derbyshire.gov.uk › ...*

## Environmental Impacts of Food Production

Our World in Data
*https://ourworldindata.org › envir...*

food waste **problem**

https://utopia.de/ratgeber/foodwaste-stoppen-wir-den-wahnsinn/

food waste **solutions**

food waste **worldwide statistics**

**Think.Eat.Save** | Learn about food waste | Think.Eat.Save | UNEP

Gaspillage alimentaire | Canton of Geneva

Reducing food waste | City of Geneva

Reducing Food Waste | WWF International

Food Loss and Waste | WWF International

Fight climate change by preventing food waste | WWF International

Gaspillage alimentaire | WWF Switzerland

Food Waste Backstage: Vue d'initiée sur une installation de traitement des déchets alimentaires | Natalia Krylova, UNIGE | March 2023

Sustainable Food Cold Chain: Opportunities, Challenges and the Way Forward

In China wird seit 2013 mit einer Leere-Teller-Kampagne gegen Lebensmittelverschwendung vorgegangen, die unter anderem daraus resultiert, dass es bei gemeinsamen Mahlzeiten üblich ist, einen Anstandsrest übrigzulassen.[27] Auch 2022 ist dieses Verhalten in Ostasien noch weit verbreitet, z. B. in Südkorea.

## Literatur


Nadine Arnold (Hrsg.): *Wenn Food Waste sichtbar wird: Zur Organisation und Bewertung von Lebensmittelabfällen.* transcript, Bielefeld 2021, ISBN 978-3-8376-5538-4. Marc F. Bellemare et al.: *On the measurement of food waste.* In: *American Journal of Agricultural Economics.* (ISSN 0002-9092) Bd. 99, H. 5 (2017), S. 1148–1158. Carla P. Caldeira et al.: *Quantification of food waste per product group along the food supply chain in the European Union: a mass flow analysis.* In: *Resources Conservation and Recycling.* (ISSN 0921-3449) Bd. 149 (Oktober 2019), S. 479–488. Tara Garnett: *Where are the best opportunities for reducing greenhouse gas emissions in the food system (including the food chain)?* In: *Food Policy.* (ISSN 0306-9192) Bd. 36, Suppl. 1 (2011), S. S23–S32. Beatrice Garske et al.: *Challenges of food waste governance: An assessment of European legislation on food waste and recommendations for improvement by economic instruments.* In: *Land.* (ISSN 2073-445X) Bd. 9, H. 7 (2020), S. 231–253 (PDF-Download).

*GbR*: *Das grosse Wegschmeissen – Vom Acker bis zum Verbraucher: Ausmaß und Umwelteffekte der Lebensmittelverschwendung in Deutschland* (PDF, 24. Dezember 2018)
*Lebensmittelabfälle in Deutschland: Neue Studie über Höhe der Lebensmittelabfälle nach Sektoren.*
*Lebensmittelverschwendung.* In: *WWF Österreich.* Abgerufen am 2. März 2023 (deutsch).
Lebensmittelverschwendung: Containern erlaubt? Fremdes Eigentum, auf ergo.de
*Lebensmittelabfälle.* In: *bafu.admin.ch.* Abgerufen am 19. Januar 2020. *Nicht aufessen kostet extra | Radio Gong 96.3 - Dein München. Deine Hits.* Abgerufen am 17. April 2022.
FOCUS Online: *Restaurantchefs lassen unartige Gäste draufzahlen - das könnte großes Problem lösen.* Abgerufen am 17. April 2022.
Mark Siemons: *Chinas Ernährungsbewusstsein: Ein Teller weniger*. In: *FAZ.NET*. ISSN 0174-4909 (faz.net [abgerufen am 26. August 2021]) Neues Gesetz für die Umwelt


Mehr als 1000 Euro Strafe: China erlässt Gesetz gegen Lebensmittelverschwendung

https://www.unep.org/
https://www.unep.org/beatpollution/
https://www.bmel.de/SharedDocs/Downloads/DE/Broschueren/Ernaehrungsreport2016.pdf?__blob=publicationFile&v=4

s. "Focus" online Monday, 25.12.2023, https://www.focus.de/earth/experten/expertin-dominique-ertl-das-mindesthaltbarkeitsdatum-wird-zum-klimakiller-in-der-kueche_id_259522520.html
Hier werden *„unglaubliche Zahlen"* genannt, ich zitiere:. (Translation: Here *"unbelievable figures" are mentioned,* I quote: . ... *"All the worse that* ***almost 35 percent*** *of the food grown does not* ***even make it to the dinner table****.")*
, quote:

EU directive on packaging waste.<<< https://eur-lex.europa.eu/homepage.html https://eur-lex.europa.eu/eli/dir/1994/62/oj?locale=de >>>
*„…… Die beste Art, Verpackungsabfall zu vermeiden, ist die Verringerung der Gesamtmenge an Verpackungen.“* (end of quote) (Translation *"..... The best way to avoid packaging waste is to reduce the total amount of packaging.")*
**This is exactly what the FCS is consistently striving for.**

https://www.destatis.de/DE/Presse/Pressemitteilungen/Zahl-der-Woche/2023/PD23_50_p002.html ***„Zahl der Woche 237 Kilogramm Verpackungsmüll pro Kopf fielen 2021 in Deutschland an*** *Seit 2005 ist die Pro-Kopf-Menge an Verpackungsmüll um 26 % gestiegen“*

https://www.youtube.com/watch?v=KD8fcTyjP1E Dokumentarfilm NDR Doku „Plastik - Die Recycling-Lüge“, Dieser Titel sagt Alles! („Plastik- the Recycling lie“- This title says it all!)
https://www.unep.org/