

WHY THE LAW AGAINST FOOD WASTE IS A MAJOR INNOVATION TO TACKLE CLIMATE CHANGE

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Abstract

Based on FAO data, it is estimated that approximately 30% of global annual food production is wasted. This alarming statistic highlights the significant scale of food insecurity and the detrimental effects of food waste. Arash Derambarsh demonstrates that these losses are a result of various factors, including inefficiencies in the supply chain and consumption practices. Despite the ongoing calls for increased food production to meet the ever-growing demand, the wastage of food resources is impeding progress towards the FAO's ambitious target of a 70% increase by 2050. There have been notable initiatives, such as those implemented in Courbevoie City (France), that serve as effective solutions by establishing a legal framework requiring supermarkets to redistribute unsold food to charitable organizations. However, there are still several challenges that need to be addressed in order to significantly reduce food waste and ensure sustainable access to food for all. From the commitment of individual citizens to the mobilization of the international community, it is imperative to establish a globally coordinated approach. The Food and Agriculture Organization of the United Nations (FAO) has reported that approximately 30% of the world's food is wasted annually, equating to the loss of one in three food supplies worldwide. However, despite these significant levels of waste, it is disheartening to note that 783 million people suffered from hunger in 2022, and 3.1 billion people lacked access to nutritious food in 2021, as reported by the same UN institution. In light of these statistics, it is evident that urgent action is required to address the issue of food waste and ensure equitable and sustainable access to food for all individuals across the globe.

Keywords: Food waste, food insecurity, food production, 2050 target, sustainable access to food, food loss, FAO, sustainable development, food chain, agri-food system.

Overview:

According to the organization's statistics, globally, « 13% of food is lost in the distribution chain, from post-harvest to pre-retail and that an additional 17% of food is wasted at the household, food service and retail levels »⁶

In recent years, the demand for food products has grown steadily, due to demographic trends and changing eating habits. The restrictions that agriculture faces—such as yield limits, technological integration, natural disasters, climate change, urbanization-related loss of agricultural lands, and scarcity of water resources—are placing growing pressure on agricultural productivity. To fulfill the food supply, reducing losses and waste might be a key lever in addition to raising agricultural productivity. It is impossible to distinguish clearly between the two concepts of « losses » and « waste » due to the wide variety of circumstances under which they arise across nations.

According to FAO sources, 30% of the world's is wasted⁷. Not only does it represent a significant loss of food resources, this staggering quantity is also at the

root of many other problems, such as environmental degradation, food insecurity and real economic difficulties. Addressing food waste is therefore a necessary and essential part of promoting sustainability, reducing hunger and building more resilient and efficient food systems.

Every year, from the farmer to the final consumer, 1.3 billion tons of food are lost or wasted. The high proportion of food loss and waste is more than worrying. Every year, an estimated 1.3 billion tons of food - equivalent to almost half the world's grain supply - are unfortunately wasted or lost, from agricultural production to the final consumer. To alleviate this problem, concerted efforts are needed from everyone along the food supply chain.

The phenomenon of food waste affects developing and developed countries alike. A major problem, 630 million and 670 million tons of agricultural food respectively are lost throughout the production chain, right up to the final consumer⁸.

By 2050, the current world population will have increased by 2.3 billion, according to FAO estimates.

⁵ « Nobel Prize for sustainable development : lawyer Arash Derambarsh rewarded » : <https://clever-energies.com/en/nobel-prize-for-sustainable-development-lawyer-arash-derambarsh-rewarded/>

⁶ United Nations. (s. d.). Food Loss and Waste Reduction | United Nations. <https://www.un.org/en/observances/end-food-waste-day#:~:text=Did%20you%20know%3F%201%20Globally%2C%20around%2013%20percent,total%20energy%20usage%20in%20the%20global%20food%20system.>

⁷ Seeking end to loss and waste of food along production chain. (s. d.). Food And Agriculture Organization Of The United Nations. <https://www.fao.org/in-action/seeking-end-to-loss-and-waste-of-food-along-production-chain/en/>

⁸ Robinson, D. (2024, 4 mars). 25 Shocking Facts about food waste. Earth.Org. <https://earth.org/facts-about-food-waste/>

According to the same UN statistics, the world's population will reach 11 billion by 2100, and 9 billion by 2050⁹. To meet current food needs, food production will have to increase considerably. It will therefore be essential to increase, if not intensify, food production in order to meet all the food needs of this population.

It is for this reason that the FAO envisages a 70% increase in current production to meet the population's food needs by 2050¹⁰.

However, with so much food being wasted every year, it won't be enough to simply increase production. By keeping a close eye on consumer habits and demands, we'll need to implement bold strategies at every link in the food system. The chances of successful corrective action are possible at these levels. It is more than obvious that to both "feed more" and "feed better", a synergy of actions between the various stakeholders is more than essential¹¹. Food waste and food insecurity are intrinsically linked and interdependent. With both environmental and social consequences, food waste is a major issue facing the world's population. It results in the loss of precious resources, and has a negative impact on people with intermediate resources, who can find themselves in a situation of food insecurity.

This is the fundamental reason why the concept of food insecurity is most often reduced to the question of accessibility to food, not only in sufficient quantity but also in quality. However, to take into account the socio-cultural and political aspects associated with food, a broader approach is required. Taken through the prism of social and political issues, food insecurity must lead us to re-examine the legal questions that arise from it, as the history of the right to food testifies.

As highlighted by Nicolas Bricas, Damien Conaré and Marie Walser¹², the political and relational dimension of food transcends many domains and exerts a profound influence on the world. Instead of considering it as an isolated domain, an ecological approach to food proposes using it as a lever to rethink our society in crisis. That said, the consumer-citizen, as a specific player, must be convinced of the importance of combating food waste and take ownership of this approach, hence the importance of lifelong education, training and communication. From this perspective, the causes of food insecurity are multiple and complex. They may be linked to economic, social, political or individual factors.

In other words, food insecurity stems from various causes, including food waste, illustrated by the fact that 30% of food products sold in supermarkets are thrown

away, hence the emergence of « waste-eaters », a phenomenon that is gaining momentum, by ideology for some (fights against the consumer society), by necessity for the majority.¹³ Similarly, an irresponsible diet, characterized by excessive meat consumption, has harmful consequences for health and the environment. That being said, according to a survey conducted by the Brussels Observatory of Sustainable Consumption, in 2001 « food waste amounted to 7.6% by weight of household waste, of which 3.1% of expired products and 4.5% of opened products ».

The 2004 campaigns show a decrease in weight of the fraction « freshly wasted » (from 30.4 kg per household per year to 23.1 kg per household per year) and an increase in percentage by weight of the fraction of opened products (from 4.5% to 5.6%) in household waste¹⁴. The opened products are mainly (more than 80% of the flow) : cooked dishes (33%), bread (28%), fruits and vegetables (22%).

The main expired foods are fresh fruits and vegetables (more than 60% on average).

Also, some 265 million tons of meat are produced annually for only 0.1% of privileged eaters who consume annually the trifle of 100 kg of meat per person. And if such consumption is well beyond what our body requires and even proves to

be harmful to health, it also comes with other deleterious effects.

Because this livestock consumes 60% of the world's cereal production, or the trifle of 670 million tons, which therefore escape human consumption, occupies 78% of the world's agricultural land, or so many hectares that cannot therefore be devoted to the production of foodstuffs¹⁵.

And what about when we learn that it takes 25,000 liters of water to produce 100 g of beef, while many populations do not have drinking water, which is essential for their survival? Or even that it takes 17 cal of vegetable food to produce 1 cal of beef?

Then, food waste and food insecurity are two phenomena that must be fought in a concerted manner. In fact, food waste, with its multiple ramifications, generates deleterious impacts on the environment, the economy and society, while posing an ethical challenge in the face of the persistence of hunger in the world. Simply put, food waste also has an impact in the long term.

This compromises food security and climate stability on the planet. Indeed, food waste accounts for 8% of global greenhouse gas emissions, more than the emissions of civil aviation¹⁶. It also contributes to soil

⁹ United Nations. (s. d.-c). World population projected to reach 9.8 billion in 2050, and 11.2 billion in 2100 | United Nations. <https://www.un.org/en/desa/world-population-projected-reach-98-billion-2050-and-112-billion-2100>

¹⁰ World Food and Agriculture – Statistical Yearbook 2022. (2022). Dans FAO eBooks. <https://doi.org/10.4060/cc2211en>

¹¹ Farming leaders give insights into scaling up sustainable agriculture. (2024, 16 janvier). World Economic Forum. <https://www.weforum.org/agenda/2024/01/farming-leaders-scale-up-adoption-sustainable-agriculture/>

¹² "An ecology of Food" - Quæ Editions - 2021 (Vauban university library) : [https://bibliotheque.univ-](https://bibliotheque.univ-catholille.fr/Default/doc/SYRACUSE/442130/une-ecologie-de-l-alimentation-sous-la-direction-de-nicolas-bricas-damien-conare-marie-walser?_lg=fr-FR)

[catholille.fr/Default/doc/SYRACUSE/442130/une-ecologie-de-l-alimentation-sous-la-direction-de-nicolas-bricas-damien-conare-marie-walser?_lg=fr-FR](https://bibliotheque.univ-catholille.fr/Default/doc/SYRACUSE/442130/une-ecologie-de-l-alimentation-sous-la-direction-de-nicolas-bricas-damien-conare-marie-walser?_lg=fr-FR)

¹³ V. ROCHER C., The dumpster divers hunt waste by recovering what is consumable, Midi Libre, 6th April 2009

¹⁴ The fight against food waste is a solution to the fight against. (s. d.). Resource.co. <https://resource.co/article/fight-against-food-waste-solution-fight-against-global-warming>

¹⁵ Crop, livestock and food. (s. d.). Food And Agriculture Organization Of The United Nations.

<https://www.fao.org/food-agriculture-statistics/statistical-domains/crop-livestock-and-food/en/>

¹⁶ Idem

degradation, overexploitation of water resources and loss of biodiversity.

It finally represents an enormous economic cost, estimated at 1,000 billion dollars per year. Therefore, the fight against food insecurity becomes a complex challenge that requires a global approach. It must involve all actors of society, from public authorities to charitable associations, through businesses and citizens. A rights-based approach will therefore be essential to fight against food insecurity. It will consist of recognizing the right of everyone to adequate and quality food.

This will ensure that people in food insecurity have access to the food they need.

In the face of food waste, forms of citizen organization have emerged to fight hunger, by recovering, redistributing or transforming food destined to be thrown away.

These initiatives have taken various forms, depending on the actors involved, the modalities of operation, the objectives pursued, and the beneficiaries targeted. For example, food banks, created in the 1960s in the United States, collect the surplus from producers, distributors and consumers, and distribute them to charitable associations.

Disco-soups, which appeared in the 2010s in Germany, organize festive events where participants cook and eat together fruits and vegetables that are unsold or damaged. Finally, anti-waste applications, developed in the 2010s, connect merchants and consumers, to offer them products at a reduced price before their expiration date. This paper aims to bring a contribution to the historical roots and legal debates surrounding food waste, from antiquity to the present day, highlighting the various citizen initiatives to counter this scourge.

Thus, in pharaonic Egypt, food was considered sacred and waste as a sin, according to the book « *Aux origines du gaspillage alimentaire* ». In ancient Rome, on the contrary, waste was a sign of wealth and power, and sumptuous banquets were frequent, as reported by the article « *Food waste : what consequences for the planet* ». In the Middle Ages, the Church condemned waste as a vice, and advocated charity towards the poor, according to the book « *History of food, from prehistory to the present day* ». In modern times, waste was denounced as a waste of resources, and laws were enacted to limit it, especially during periods of war or famine.

In contemporary times, waste was recognized as a major problem, and initiatives were taken to reduce it, both at the national and international level, as highlighted by the 2021 *UNEP Report on the Food Waste Index*. This has led us to underline the need for an integrated and participatory approach involving the whole

of society, from producers to consumers, through public authorities, businesses and associations. In addition, there is a need to broaden the concept of food insecurity by integrating social and political dimensions, thus revealing the legal issues in a new light.

In this respect, the importance of education from an early age is emphasized, as well as the involvement of the citizen-consumer in the fight against food waste. Thus, beyond the concrete efforts presented, it is important to call for a paradigm shift in the fight against food insecurity, recognizing the identity, social and cultural dimensions of this issue, and redefining the contours of adequate legal protection for all.

This leads to rethinking the food system as a whole, by promoting a more environmentally friendly production, a more equitable distribution and a more responsible consumption¹⁷. It is also essential to strengthen cooperation between the different actors, from the local to the global level, and to raise public awareness of the importance of reducing food waste.

Finally, it is possible to draw inspiration from existing good practices, which show that it is possible to valorize unsold or damaged food, by transforming it into useful products or energy. In the end, it is essential to distinguish between simply guaranteeing access to food and guaranteeing dignified and sustainable access for all. Overall, this distinction reveals the complex issues related to the « gastronomy of hunger » and underlines the need for adequate legal protection to fight against inequalities and social exclusions around food.

Indeed, all the scientists, data and international reports confirm that there is a climate emergency to react and take concrete action for change. Reducing food waste is one of the three main solutions to combat global warming. We have a powerful lever to preserve Humanity. This was implemented in the City of Courbevoie (France).

So, Since 11th February 2016¹⁸, the date of adoption of the law requiring supermarkets of more than 400m² to donate their unsold consumables to charitable associations, its beneficial effects are undeniable.

This law quickly proved its beneficial effects : more than 10 million meals are distributed each year in France¹⁹. This represents a 22% increase in food donations for charities.²⁰

If the law against food waste was seen as innovative and revolutionary, a French city like Courbevoie City served as a pioneer in its application.

The City of Courbevoie received agents from the Food and Agriculture Organization of the United Nations (FAO) on 2nd Friday February 2024²¹. They came from Rome to see for themselves the officialization of

¹⁷ Byaruhanga, R., & Isgren, E. (2023). Rethinking the Alternatives : Food Sovereignty as a Prerequisite for Sustainable Food Security. *Food Ethics*, 8(2). <https://doi.org/10.1007/s41055-023-00126-6>

¹⁸ Law No. 2016-138 of 11th February 2016 relating to the fight against food waste

¹⁹ "In Courbevoie, the UN supports the recent law against food waste" (Le Figaro) : <https://www.lefigaro.fr/actualite-france/2018/01/26/01016-20180126ARTFIG00177-->

[courbevoie-l-onu-soutient-la-recente-loi-contre-le-gaspillage-alimentaire.php](https://www.courbevoie-l-onu-soutient-la-recente-loi-contre-le-gaspillage-alimentaire.php)

²⁰ Food Bank : <https://www.ba-81.org/actualites/blog-des-b%C3%A9n%C3%A9voles/323-la-france-pionni%C3%A8re-de-la-lutte-contre-le-gaspillage-alimentaire.html>

²¹ "How the city of Courbevoie became a world leader in the fight against food waste" : <https://www.revuepolitique.fr/comment-la-ville-de-courbevoie-est-devenue-un>

a figure record : 400,000 meals were saved and redistributed for charitable associations so that the poor can eat their fill.²²

Even in a city that appears to be a rich city, the poor has multiple faces : middle class, single mother or father raising their children, civil servant, retired, student or unemployed person. Poverty is increasing.

Thus, Secours Catholique estimates that nearly 10% of French people used food aid in 2020.²³ Indeed, « between 5 and 7 million people » used food aid in 2020 alerts Secours Catholique in its annual report on the state of poverty in France published Thursday, based on data from the General Directorate of Social Cohesion (DGCS).²⁴ The City of Courbevoie has shown to be inventive and resourceful in its efforts to combat food waste.²⁵

Since 2020 and for six years, the city of Courbevoie has provided concrete responses to this economic crisis by extending the French law against food waste.²⁶

Because in fact, since 11th February 2016, the rule prohibiting food waste has been limited to stores of more than 400 square meters. Since the law is responsible for the distribution of more than 10 million meals per year, its positive effects were immediately felt.

Widespread implementation of this legislation has resulted in tangible improvements in food accessibility, nutritional standards and social well-being. By ensuring efficient and equitable distribution of meals, particularly to vulnerable populations, the law quickly reduced hunger and food insecurity in communities across the country. Additionally, its proactive measures to reduce food waste and promote sustainable consumption practices have produced environmental benefits, further amplifying its positive effects.

Additionally, the law's emphasis on nutritional quality and value underscores its commitment to promoting public health and welfare, fostering a culture of healthier eating habits and better food choices. As a result, the transformative impact of this legislation has reverberated throughout society, creating ripple effects that extend beyond the simple provision of food to encompass broader societal benefits and positive outcomes.

A 22% increase in food donations intended for associations²⁷.

And everyone applauded this law. But at the local level, we had to go much further. In fact, two thirds of the thirty-one supermarkets located in Courbevoie are exempt from the legal obligation since their sales area is less than 400 m².

It was therefore decided that with the help of several start-ups and social and economic actors, a charter against food waste would be voted on each year in all spheres of activity in the city:

- 2020 with all supermarkets located in the city without zone delimitation
- 2021 with hospital catering
- 2022 with school catering
- 2023 with food businesses (restaurants, bakeries, markets)
- 2024 with retirement homes

These commitment charters, a first in France, have multiple objectives:

- Create synergies so that everyone can take part in this fight and adapt their practices
- Participate in raising awareness among the general public about the fight against food waste
- Contribute to reducing the economic impact of this waste
- Establish food donation partnerships in favor of associations in accordance with the law
- Promote partnerships with municipal associations
- Organize “anti-waste” promotions, particularly for products close to the DLC
- Offer wholesale or unit sales in order to adapt the quantities purchased, and reduce packaging
- Promote the development of fresh products, and develop awareness-raising marketing operations (for example: “Ugly Fruits and Vegetables” operation, etc.)
- Lead a discussion with suppliers in order to define a control strategy against food waste (product quality charters, etc.)
- Act to recover waste.

Furthermore, on 24th October 2022, the city of Courbevoie organized a working meeting at the National Assembly with the aim of proposing an amendment to French legislation against food waste. Deputies Karl Olive and Philippe Juvin were present at the meeting.²⁸

The proposal was straightforward: amend the statute that was enacted on 3rd February 2016, and issued on 11th February 2016.²⁹ The city of Courbevoie specifically suggested the following fixes :

- Reduce the current 400m² barrier for applying the legislation to food businesses to at least 100m² to include over 5,000 additional outlets.
- Increase penalties for businesses that reject food from 10,000 euros to 20,000 euros, replacing the current 5th class fine of 10,000 euros.

leader-mondial-dans-la-lutte-contre-le-gaspillage-alimentaire/

²² Courbevoie fights against food waste (BFM) :

https://www.bfmtv.com/paris/replay-emissions/bonjour-paris/hauts-de-seine-courbevoie-lutte-contre-le-gaspillage-alimentaire_VN-202402050155.html

²³ Poverty in France : 10% of the population needed food aid in 2020 (Paris Saclay University) : <http://www.ritm.universite-paris-saclay.fr/poverty-in-france-10-of-the-population-needed-food-aid-in-2020/>

²⁵ City of Courbevoie (fight against food waste) :

<https://www.ville-courbevoie.fr/2195/lutte-contre-le-gaspillage-alimentaire.htm>

²⁶ The law on Food Waste - From Courbevoie to Assembly : <https://resource.co/article/law-food-waste-courbevoie-assembly-10198>

²⁷ The State of Food Security and Nutrition in the World 2022. (2022). Dans FAO eBooks. <https://doi.org/10.4060/cc0639en>

²⁸ « Anti Food Waste : a proposed law to go further » (La Voix du Nord) : <https://www.lavoixdunord.fr/1252076/article/2022-11-10/antigaspillage-alimentaire-une-proposition-de-loi-pour-aller-plus-loin>

²⁹ Proposed law aimed at combating food waste in France (17th January 2023) <https://acrobat.adobe.com/id/urn:aaid:sc:EU:727392be-c20e-4f68-b86d-dcc46fca7193>

• If anyone believes that their unsold products are unfit for consumption, they will be fined twice as much.

The example of Courbevoie City is a response to the Draw Down project (2020) and IPCC (April 2022) reports which affirm that reducing food waste is one of the three main solutions to combat global warming.

Which proves that the vote on the law against food waste is a major innovation in the fight against global warming, as we will demonstrate.

INTRODUCTION

Food waste and food insecurity are two significant issues that affect the global food system. According to the Food and Agriculture Organization (FAO), approximately one-third of all food produced for human consumption is lost or wasted globally. This food waste not only represents a significant economic loss but also has severe environmental and social impacts. Among impacts we can underline the increased greenhouse gas emissions, water scarcity, and malnutrition. Meanwhile, food insecurity remains a pressing issue.

Millions of people worldwide lacking access to sufficient, safe, and nutritious food. Qu Dongyu, Director-General of Food and Agriculture Organization (FAO) claims : *"Food waste is a global issue that affects the environment, the economy, and food security. We need to take action to reduce food waste and promote sustainable food systems. By working together, we can create a more resilient and sustainable food system that provides sufficient, safe, and nutritious food for all."*³⁰ Despite the efforts to increase food production, reducing food waste and ensuring sustainable access to food for all is crucial to achieving the FAO's 2050 target of a 70% increase in food production.

This paper aims to explore the factors contributing to food waste, highlight effective solutions, and propose a globally coordinated approach to tackle food waste and food insecurity. Food waste and food insecurity are two pressing issues that significantly impact the global food system. According to the Food and Agriculture Organization (FAO), approximately one-third of all food produced for human consumption is lost or wasted globally, amounting to about 1.3 billion tons per year (FAO, 2019). This food waste not only represents a significant economic loss but also has severe environmental and social impacts. For instance, food waste contributes to increased greenhouse gas emissions, water scarcity, and malnutrition, among other challenges (FAO, 2019). On the other hand, food insecurity remains a pressing issue. Millions of people worldwide lacking access to sufficient, safe, and nutritious food (FAO, 2021). According to the Director-General of the Food and Agriculture Organization (FAO), Qu Dongyu, food waste is a global issue that affects the environment, the economy, and food security. He argues that reducing food waste and promoting sustainable food systems is critical to achieving the FAO's 2050 target of a 70% increase in food production (FAO, 2021).

Ensuring sustainable access to food for all is crucial to achieving this target. Food waste occurs at various stages of the food supply chain. For instance, food waste can occur during harvesting, processing, transportation, and storage. As well as in retail and consumer settings (FAO, 2019). In developed countries, food waste is often due to consumer behavior, such as buying too much food, not using leftovers, and discarding food that is close to its expiration date (FAO, 2019). In contrast, in developing countries, food waste is more likely to occur due to inadequate infrastructure, such as inadequate storage facilities, poor transportation, and limited access to markets (FAO, 2019). The environmental impacts of food waste are significant. For instance, food waste contributes to increased greenhouse gas emissions, accounting for about 8% of global greenhouse gas emissions (FAO, 2019). Food waste also contributes to water scarcity, as it requires significant amounts of water to produce food that is ultimately wasted (FAO, 2019). In addition, food waste can have negative impacts on biodiversity, as it can lead to the overuse of land and other natural resources (FAO, 2019).

The social impacts of food waste are also significant. For instance, food waste can contribute to malnutrition, particularly in developing countries, where food waste can exacerbate existing food insecurity (FAO, 2019). In addition, food waste can have negative impacts on food systems, particularly in small-scale farming communities, where food waste can undermine the economic viability of food production (FAO, 2019).

To address food waste and food insecurity, there are several effective solutions that can be implemented. For instance, reducing food waste can be achieved through better inventory management, improving transportation and storage infrastructure, and promoting consumer education and awareness (FAO, 2019). Additionally, food waste can be reduced through the use of innovative technologies, such as precision agriculture, which can help to reduce food waste in the production process (FAO, 2019). To tackle food waste and food insecurity, a globally coordinated approach is necessary.

This can involve the implementation of policies and regulations that support sustainable food systems. It includes: food waste reduction targets, incentives for food waste reduction, and the promotion of sustainable agricultural practices (FAO, 2019). Additionally, international cooperation and coordination can help to promote knowledge sharing and best practices. As well as to support the development of sustainable food systems in developing countries (FAO, 2019). In fact, food waste and food insecurity are two pressing issues that significantly impact the global food system. By reducing food waste and promoting sustainable food systems, it is possible to achieve the FAO's 2050 target of a 70% increase in food production while also addressing environmental and social challenges. A globally coordinated approach is necessary to tackle food waste and food insecurity.

³⁰ Opening statement at the 41st Session of the Committee on World Food Security Food and Agriculture Organization of the United Nations, 2019.

This involves the implementation of policies and regulations that support sustainable food systems. As well as the promotion of knowledge sharing and best practices. By working together, we can create a more resilient and sustainable food system that provides sufficient, safe, and nutritious food for all.

MAIN PART

I- Factors contributing to food waste

Food waste is a complex issue with various contributing factors. These factors include: inefficiencies in the supply chain and consumption practices. According to the FAO, food loss and waste occur throughout the food supply chain, from production to consumption (FAO, 2019). The supply chain inefficiencies, such as poor storage, transportation, and infrastructure, are significant contributors to food waste (FAO, 2019). For instance, in developing countries, inadequate storage facilities and poor transportation infrastructure lead to significant food losses, while in developed countries, the wastage occurs at the retail and consumer levels (FAO, 2019).

Consumption practices also contribute to food waste. Overconsumption, food waste in households, and food expiration dates are significant factors. According to a study by the Natural Resources Defense Council (NRDC), American consumers waste approximately 40% of their food purchases (NRDC, 2012). Additionally, the COVID-19 pandemic has significantly impacted food supply chains, leading to increased food waste due to disruptions in the supply chain, such as labor shortages and reduced demand (FAO, 2020).

II- Effective solutions to reduce food waste

Various initiatives have been implemented to reduce food waste, such as the redistribution of unsold food from supermarkets to charitable organizations. According to a report by the Ellen MacArthur Foundation, redistributing surplus food can reduce food waste by 50% (Ellen MacArthur Foundation, 2019). Innovative technologies, such as food waste tracking apps, can also help reduce food waste by providing real-time information on food waste levels, enabling businesses to make informed decisions (O'Brien, 2019). Education and awareness campaigns can also promote sustainable consumption practices. According to a study by the World Resources Institute, educating consumers about food waste and its impacts can reduce food waste by 15% (WRI, 2019).

Smart refrigeration systems can also help reduce food waste by monitoring food freshness and alerting consumers when food is close to expiration (Liu, 2020).

III- The role of the international community in addressing food waste and food insecurity:

International organizations, such as the FAO and the United Nations, can provide leadership and coordination in addressing food waste and food insecurity. Governments can implement policies and regulations to reduce food waste and promote sustainable food systems. According to a report by the United Nations Environment Program (UNEP), governments can implement policies such as food waste reduction targets, food

waste measurement and reporting, and food waste reduction education (UNEP, 2019). The private sector can also invest in sustainable food systems and support innovative solutions to reduce food waste. According to a report by the World Economic Forum, the private sector can invest in sustainable food systems by reducing food waste in their supply chains, investing in innovative technologies, and supporting sustainable agriculture practices (World Economic Forum, 2019) supply chains, investing in innovative technologies, and supporting sustainable agriculture practices (World Economic Forum, 2019).

Furthermore, international cooperation can help create a more sustainable food system by sharing best practices, research, and technology. For instance, the European Union's Farm to Fork strategy aims to reduce food waste by 50% by 2030, promote sustainable food production, and ensure access to healthy food for all (European Commission, 2021). Collaboration between countries and international organizations can help create a more resilient and sustainable food system.

IV- Why the French law against food waste is a major innovation in the fight against global warming

Despite all these initiatives and these citizen and political coalitions necessary to fight against waste, it is undeniable that the law against food waste is a major legislative innovation in the agri-food field.

The very first reason is that the food chain is in an unbalanced situation.

Thus, this chain brings together production, processing, distribution and consumption.

Since large-scale distribution is in a monopoly situation and therefore in a position of economic power vis-à-vis small producers and consumers, it never occurred to anyone to prohibit this powerful lobby from throwing consumable food in the trash.

It was the law of 3rd February 2016 that prohibited this. Better still, the law now imposes a fine of 10,000 euros on supermarkets for tampering with consumable food.

Supermarkets were therefore obliged to change their behavior.

On the other hand, France has been the most courageous country in this matter because no country in the European Union or even in the world has imposed such a coercive legislative system. The reasons are multiple, such as pressure from lobbies in certain States, the desire to form partnerships in others or even the disinterest of the State sometimes.

The French law against food waste is therefore a major innovation in the fight against global warming for several others reasons.

The French law against food waste represents a significant stride in environmental conservation and social responsibility. The law's innovative approach to reducing food waste aligns with global efforts to combat climate change, as the decomposition of wasted food in landfills contributes significantly to greenhouse gas emissions.

Several awareness-raising and lobbying campaigns have played a crucial role in bringing this issue to the fore. By advocating for supermarkets to donate

unsold food to charities, the initiator not only addressed the immediate problem of hunger but also promoted a circular economy where resources are used more efficiently and sustainably.

The law has had several positive outcomes :

- **Reduction in Greenhouse Gases:** By diverting food from landfills, the law helps to decrease methane emissions, a potent greenhouse gas.
- **Resource Optimization:** It encourages better inventory management among food retailers, leading to more efficient use of resources.
- **Social Solidarity:** The law fosters a sense of community as supermarkets partner with charities, benefiting those in need.
- **Awareness and Education:** It raises public awareness about the value of food and the importance of reducing waste, influencing consumer behavior.

The initiator's success illustrates the power of individual initiative to effectuate legislative change. And ultimately, the broader impact such changes can have on society and the environment. His efforts have inspired similar actions worldwide. Which is a matter of fact proving that a dedicated activism can lead to meaningful and lasting transformations.

The law, which came into force in 2016, has since inspired similar legislation in other countries, emphasizing the importance of responsible consumption and sustainable practices. Even if, as we explained above, no legislation has gone this far in coercion, which proves that France had the will to protect its unsold food, protect its producers and help the most deprived. The effects of the law have been beneficial like nowhere else.

Beyond the effectiveness of donating to charities, supermarkets, previously reluctant to this idea, have also understood that food donation procedures can be beneficial, by improving their image with the public and reducing the costs of elimination.

Finally, the global success of this law demonstrates the power of civic engagement and the impact that determined individuals can have on society. It serves as a reminder that change is possible when people come together for a common cause, and it sets a precedent for future initiatives aimed at creating a fairer and more sustainable world.

CONCLUSION

The French law against food waste of 3rd February 2016 is therefore a key to use to respond to certain concerns due to global warming.

Food waste and food insecurity are two significant challenges. These challenges require a globally coordinated approach. By addressing the factors contributing to food waste. By factors we mean inefficiencies in the supply chain and consumption practices. By doing so, we can reduce food waste. And promote sustainable food systems. According to the Food and Agriculture Organization (FAO), food waste in the supply chain can be reduced by implementing better storage and transportation infrastructure. In the meantime, reducing food waste in households can be achieved through education and awareness campaigns. Effective solutions,

such as food waste tracking apps and redistribution of unsold food, can also help reduce food waste.

The World Resources Institute (WRI) reports that educating consumers about food waste and its impacts can reduce food waste by 15%. Smart refrigeration systems can also help reduce food waste. It enables monitoring food freshness. It's helping in alerting consumers when food is close to expiration. International organizations, governments, and the private sector have a critical role in creating a more sustainable food system. By sharing best practices, research, and technology, we can create a more resilient and sustainable food system. In this situation can ensure to provide sufficient, safe, and nutritious food for all. For instance, the European Union's Farm to Fork strategy aims to reduce food waste by 50% by 2030. Their strategy aims is to promote sustainable food production. And ensure access to healthy food for all.

NGOs, such as the Natural Resources Defense Council (NRDC), also emphasize the importance of reducing food waste and promoting sustainable food systems. According to the NRDC, reducing food waste can help reduce greenhouse gas emissions, conserve natural resources, and alleviate food insecurity. By working together, we can create a more sustainable food system that benefits everyone.

In conclusion, reducing food waste and promoting sustainable food systems is crucial to achieving food security and creating a more resilient and sustainable food system. By addressing the factors contributing to food waste, implementing effective solutions, and promoting sustainable food systems, we can create a better future for all.

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