

Challenges And Opportunities In Reducing Food Losses And Waste In Brazil: The Role Of Public Policies For Sustainable Development

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Abstract:

Background: This Scientific Article Discusses The Issue Of Food Loss And Waste On The Planet, With An Emphasis On The Lack Of Studies In Brazil And The Need For Coordinated Actions To Tackle The Problem. The Thesis Points Out The Importance Of Public Policies To Encourage Food Loss And Waste Reduction At All Stages Of The Production And Distribution Chain, As Well As Training Programs, Fiscal Incentives, Support For Family Farming, Distribution Of Food To Vulnerable People, And Reverse Logistics. The Importance Of Public Awareness And Education Campaigns Is Also Highlighted, As Well As The Need For Effective Communication And Coordination Of Public Policies. Finally, The Article Highlights That Reducing Food Loss And Waste In Brazil Is Crucial For The Sustainable And Economic Development Of The Country, Bringing Economic, Social, And Environmental Benefits And Contributing To The Achievement Of SDG 12.3 Of The UN Agenda 2030.

Materials And Methods: This Article Employs The Systematic Literature Review (SLR) Methodology, Which Adheres To A Defined And Structured Guideline. This SLR Is Carried Out In Two Distinct Stages. The First Stage Requires Selecting Appropriate Keywords And Precisely Evaluating The Quality Of The Retrieved Documents Based On Predefined Criteria. The Second Stage Centers On Debating And Inquiring About The Conclusions Obtained From The SLR. Three Major Databases Were Used For This Study: Scopus, Scielo, And Google Scholar.

Results: This The Importance Of Public Intervention In Reducing Food Losses And Waste, As It Can Increase Productivity And Economic Growth, Improve Food And Nutrition Security, And Mitigate The Environmental Impacts Of These Losses. Public-Private Partnerships Are Crucial For Promoting Sustainable Goals And Reducing Food Waste Worldwide. All Of These Initiatives Can Contribute Significantly To Reducing Food Waste In Brazil, A Country With Million People Experiencing Food Insecurity. The Brazil Has Recently Returned To The Global Hunger Map And Food Insecurity, Is A Result Of The Inadequate Implementation Of Politics Public

Conclusion: It Is Unacceptable To Have A Food Loss And Waste, Considering That There Are Hundreds Of Millions Of People Experiencing Hunger. It Is Important For The Government To Take A More Active Role In Establishing Public Policies And Implementing Measures That Encourage The Reduction Of Food Losses And Waste At All Stages Of The Production And Distribution Chain. Reducing Food Loss And Waste Is Crucial For Brazil's Sustainable And Economic Development. Food Waste Represents A Significant Loss Of Natural Resources, Such As Water, Land, And Energy, As Well As An Economic Loss For Producers And Consumers. By Reducing Food Loss And Waste, It Is Possible To Increase Production Efficiency, Promote Sustainable Agriculture, Generate Jobs In The Food Production Chain, And Reduce Production And Consumption Costs.

Key Word: Food Loss And Waste. Brazil. Public Policies. Sustainable Development

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I. Introduction

Resulting of the advancement of the capitalist model and the consequent technological progress, humanity has been facing a threat to its own sustainability: resource scarcity and the inability to restore the environment. The current economic model has disregarded environmental and social limits, resulting in a range of issues such as social inequality, climate change, and limited access to basic conditions and citizenship. Given

this scenario, the adoption of public policies that promote sustainable development (Souza, 2018; Almeida, 2002; Sen, 1981; Zaro, 2018) becomes indispensable. In this sense, it is fundamental to implement measures of environmental responsibility in food production and consumption to reduce food losses and waste, ensuring food security (COMISSÃO, 1991; ONU, 2019).

In 2018, Brazil wasted approximately 41 million tons of food. This number represents approximately 30% of the total food production available for consumption in the country (EMBRAPA; FGV, 2018). In this context, a loss of about 15% of food in Latin America and the Caribbean is highlighted (FAO, 2014). Therefore, it is necessary to invest in solutions that reduce this waste, such as promoting good agricultural practices, stimulating food donation, and raising public awareness.

In summary, the article addresses food waste and loss, specifically focusing on initiatives aimed at achieving Sustainable Development Goal 12.3 of the 2030 Agenda. The reduction of food loss and waste can bring economic, environmental, and social benefits, including reducing the environmental impact of food production, alleviating hunger and poverty, and improving food security and nutrition for the population. Thus, the importance of reducing food loss and waste and utilizing public policies as a tool to achieve a more just and egalitarian future for present and future generations can be considered.

II. Material And Methods

This article employs the systematic literature review (SLR) methodology, which adheres to a defined and structured guideline. The SLR process encloses several stages, as well as planning the search strategy, recognizing target journals, setting up inclusion and exclusion criteria, managing the review, and registering the discoveries and perceptions (Tranfield et al., 2003). This SLR is carried out in two distinct stages. The first stage requires selecting appropriate keywords and precisely evaluating the quality of the retrieved documents based on predefined criteria. The second stage centers on debating and inquiring about the conclusions obtained from the SLR. The research embraced prominent journals specializing in food loss, and/or waste, nutrition, and sustainability to ensure the inclusion of adequate keywords. Three major databases were used for this study: Scopus, Scielo, and Google Scholar, following the approach defined by Mariani et al. (2018).

III. Result and Discussion

Sustainable development

Economic growth at any cost is considered indispensable for wealth progress in the current economic model, but according to Souza (2018), it fails to consider the environmental limitations resulting from the uncontrolled exploitation of natural resources. Sen (2010) argues that the objective of economic development should be to ensure political, economic, and social freedom. Sustainable development emerges as an alternative to promote economic growth based on solidarity in the social, environmental, and economic viability realms while respecting the needs of present and future generations (SACHS, 2008).

In the early 1970s, the importance of sustainable development was further deepened and discussed in various conferences, mainly those related to the United Nations (UN). In 1968, the Club of Rome was established with the aim of promoting discussions on the economic, political, and ecological components that form the global system. In 1972, the organization produced the document "The Limits to Growth," which stated that if the industrial society continued its growth trend at the time, the ecological limit would be reached in 200 or 300 years (CLUBE DE ROMA, 1968).

In 1987, the United Nations World Commission on Environment and Development released the Brundtland Report, also known as "Our Common Future," which defined sustainable development as meeting the needs of the present without compromising the ability of future generations to meet their own needs (COMISSÃO, 1991). After its release, national and international initiatives for sustainable development began to intensify. The Rio 92 conference, sponsored by the UN, resulted in the creation of relevant documents such as "Agenda 21" and the "Rio Declaration on Environment and Development," which reinforced the importance of sustainable development for the planet (IPEA, 2008). In the 2000s, the "Millennium Declaration" was drafted with the objectives of improving indicators of sustainable development through public policies and achieving the Millennium Development Goals (MDGs) by 2015 (ODM BRASIL, n.d.).

The UN's Agenda 2030 is the current global plan formulated to achieve sustainable development, comprising 17 Sustainable Development Goals (SDGs) and 169 universal targets. The initiative addresses topics such as environmental sustainability, poverty eradication, economic development, and good governance. Proposed in 2015, the Agenda involves 193 UN Member States and consists of four parts: the Declaration, the SDGs, Monitoring and Evaluation, and Implementation. The SDGs aim to guide national policies and international cooperation towards sustainable development, including issues of responsible consumption and production, highlighted by SDG 12 (ODS BRASIL, n.d.).

SDG 12 aims to ensure responsible consumption and production patterns worldwide to address the negative consequences of the current economic model, which prioritizes unchecked consumption and production

(ODS BRASIL, 2022). SDG 12 has eight targets to achieve more sustainable consumption and production, including the implementation of ten-year plans, sustainable management of natural resources, reduction of food waste, sound chemical usage, waste reduction, and sustainable practices for businesses and public procurement (IPEA, 2018). Target 12.3 is particularly important for ensuring responsible consumption, setting the objective of halving per capita global food waste, and reducing post-harvest losses by 2030 (ONU, 2019). Brazil has established targets 12.3.1br and 12.3.2br, which aim to reduce per capita food waste and establish a regulatory framework for food waste reduction in the country (IPEA, 2018).

Food Loss and Waste

The economic model based on hyperproduction and hyperconsumption generates negative externalities that threaten the environment's capacity to sustain economic activity. This model is rooted in the principles of traditional neoclassical theory and argues that resource depletion can be overcome through technological progress. However, there is a limit to economic growth imposed by the natural resilience capacity of the environment. According to Daly (2005), the finiteness of natural resources used as the foundation for productive activity results in a growth limit for the economic system. Furthermore, waste is generated and subsequently absorbed by the environment, whose absorption capacity is increasingly diminishing.

Since the 1990s, the issue of food waste has been a topic of discussion in the field of food studies (McMillan & Coveney, 2010). Global demand for food is projected to increase by 47% by 2050, particularly in low and middle-income countries (Gouel & Guimbard, 2019). Meeting these needs will require expanding cultivated land, increasing water consumption, and adopting advanced technology (FAO, 2009; Gazzoni, 2017). Reducing food waste is a means to ensure the sustainability of food systems by 2050 (Springmann et al., 2018). It was from 2017 onwards that the topic began to receive greater attention in the scientific community, primarily due to the growing contradictions between the areas of food waste and food insecurity up until then.

[...] the scientific debate in this area has transitioned from a small number of contributions in 2012 to becoming a topic of debate with an increasing number of research studies from 2017 onwards, with the year 2020 having the greatest impact. This has been helped by the growing importance of the significant contradiction at all levels and in all areas—food waste and food insecurity. It is estimated that one-third of all food produced worldwide is lost or wasted in a world where almost one billion people go hungry [71]. Reducing food loss and waste is key to creating a world with zero hunger and achieving the Sustainable Development Goals, especially SDG 2 (Zero hunger) and SDG 12 (Ensure sustainable consumption and production patterns) (SOLER; GEMAR; SANCHEZ-TEBA, 2021, p.14).

Food waste represents the inefficiency of our food systems (CAISAN, 2018). According to Embrapa (2018), waste occurs mainly in the final stages of the food supply chain, including distribution, retail, and consumer levels. Nellemann and Macdevette (2009) indicate that waste is present throughout the entire food supply chain, which could result in approximately 25% of global food production being wasted by 2050.

In 2019, 931 million tons of food were wasted globally, with 14% considered losses within the production chain (FAO, 2019) and 17% waste at the consumer level (UNEP, 2021). In Latin America, 15% of available food for consumption in the region is wasted throughout the production chain (FAO, 2016). Brazil, one of the world's largest food producers, wastes around 26.3 million tons of food annually, ranking among the top 10 countries with the highest food waste (ABRAS, 2019).

To address this issue, many countries have implemented public policies to reduce food waste, including specific laws. In Brazil, several bills have been presented in the National Congress, but only one has been approved and became Law No. 14.016/2020. Despite recently becoming more aware of the issue of food waste, Brazil faces challenges related to sustainable production and consumption, including climate change, intensive use of natural resources, and changing dietary habits. Thus, the 2030 Agenda and sustainable development have become essential for the country.

Reducing food waste is crucial to ensure food availability for present and future generations, especially in the context of a growing global population. According to FAO (2011), reducing losses and waste is the primary means to mitigate problems such as malnutrition, food shortages, and hunger, as measured by food security in countries. According to Leão (2013), the concept of food security gained strength after World War II (1939-1945), when a disagreement arose between international organizations advocating for access to quality food as a human right, such as FAO, and other institutions that believed that free markets alone would guarantee food security, such as the World Bank and IMF. The Universal Declaration of Human Rights, established in 1948, enshrined the human right to food, which is linked to the International Covenant on Economic, Social, and Cultural Rights (ICESCR).

The excessive consumption of material goods also affects food consumption worldwide, resulting in an excess of wasted food and a lack of food for others (FAO, 2021). Approximately one-third of food produced globally is wasted, which undermines the food and nutritional security of the population (SANTOS et al., 2020). In 2019, 3 billion people were malnourished, with adults and children lacking access to healthy nutrition mainly

due to the high cost of nutritious food (FAO, 2021). Hunger persists due to economic inequalities, and its eradication requires the implementation of public policies by the State, with the support of society and the market (TARREGA, 2022; HOHENDORFF, 2022). Additionally, according to Soler, Gemar, and Sanchez-Teba (2021, p.1):

The significant contradiction of food waste and food insecurity that preoccupies society today is growing increasingly important. It is estimated that one-third of all food produced globally is either lost or wasted. In a world where almost one billion people are hungry, reducing food loss and waste is critical to creating a world with zero hunger and achieving the Sustainable Development Goals by ensuring sustainable consumption and production patterns.

The reduction of food waste became a priority agenda at the 1974 World Food Conference, emphasizing the importance of international actions to reduce food losses (PARFITT et al., 2010). According to PricewaterhouseCoopers (2021):

It's important to distinguish between food waste and food loss. Waste occurs when food that is fit for human consumption is removed from the supply chain at distribution stages. Food loss is a result of inefficiencies in production and supply. Food waste is more likely to occur at the retail and consumer end of the supply chain. Food loss happens more so during earlier stages of the supply chain. Food loss from production to distribution forms a significant proportion of the total food loss and waste globally at about 76%. This is compared to consumer food waste, which is about 24%.

The impacts of food loss and waste are evident in three spheres: social, environmental, and economic. The rising costs of food can affect consumption and reduce household incomes, while the excessive exploitation of natural resources and greenhouse gas emissions affect the environment. Additionally, maintaining high stocks to mitigate losses can affect the competitiveness of companies and increase food disposal costs (ZARO, 2018).

Food losses occur due to different choices and patterns in infrastructure, supply chains, distribution, and agricultural structure, varying between countries. These losses generate negative environmental impacts, including the release of CO₂ into the atmosphere and the waste of scarce natural resources, while also impacting the food security of the poorest individuals, especially small-scale farmers who rely on subsistence consumption. Reducing food losses would have an immediate positive impact on the accessibility of food for these individuals (Parfitt et al., 2010). To reduce food insecurity, it is necessary to minimize the cost of food and invest in food production supply chain infrastructure (FAO, 2011). Preventing food loss also results in increased yield and financial gain for companies involved in the production chain (BAPTISTA, 2012).

On the other hand, food waste is a voluntary action by economic agents, which occurs most frequently at the end of the food chain, with destinations such as landfills, sewers, composting, or trash. Food waste occurs in both low and high-income countries, assuming different characteristics that require distinct measures and policies for mitigation (Zaro, 2018).

Reducing food waste can provide multiple benefits for climate action, food security, and the environment, becoming essential for greater economic efficiency and the promotion of more sustainable development in societies (UNEP, 2021). Greater legislation and enforcement are needed to ensure the efficiency of the process and promote waste reduction and losses worldwide, including specific guidelines on packaging, transportation, storage, and refrigeration for fruit and vegetable carriers. Furthermore, according to PricewaterhouseCoopers (2021):

Food waste is responsible for an estimated 6% of global GHG emissions, and this figure is likely to be higher in reality, as it excludes food lost on the farm. This highlights the need for ongoing innovation and investment in start-ups that address food loss at earlier stages, for instance, in the agricultural biotech industry. Notably, there are no start-ups at the processing stage, where R&D and innovation by companies around specific products will be required.

Around the world, approximately 54% of global food production is lost during production and storage stages, mainly in developing countries like Brazil. The losses are invisible to economic agents, and therefore, the statistics are not precise. The losses vary among producers, traders, and transporters (ZARO, 2018). In 2016, global food loss reached 13.8%, costing 400 billion dollars, with Sub-Saharan Africa experiencing the highest losses at 21.4% due to unfavorable climatic conditions for food preservation. The lowest losses occurred in Latin America and the Caribbean (12.3%) and Europe and North America (9.9%) (FAO, 2019; UNEP, 2021).

In 2020, it is estimated that 30% of produced food was lost or wasted in consumption, amounting to 1.3 billion tons, with 77 million tons in Latin America in 2020. Out of this volume, 28% was lost in the final production process, 22% during handling and storage, 17% in the distribution process, and 28% at the final consumer level (FAO, 2021). The economic cost of food waste amounted to approximately \$2.6 trillion in 2019 (FAO, 2019). On the other hand, this situation has a high environmental cost, contributing to greenhouse gas emissions: 8% to 10% of global emissions are associated with unconsumed food (PORTAL ODS, 2021).

Actions to reduce food loss and waste

In Europe, actions to reduce food waste include partnerships between companies and the government, the growth of startups in the circular economy, project leadership by specialized technicians, food banks, and punitive laws to incentivize retailers, among others. In the Netherlands, a circular economy platform with 25 partners involved supermarket chains and introduced upcycling practices, such as producing tomato soups from tomato ends and beers made from discarded apples and bread. In Denmark, the "Stop Wasting Food" initiative involves public agencies and the production sector to encourage innovative solutions and provide nutritional and behavioral education to society. There are also social supermarkets and ReFood labels for restaurants that incorporate actions to reduce waste. In France, supermarkets over 400 square meters are required to donate surplus food to charitable institutions, and the government has launched educational communication campaigns. In the United Kingdom, the "Love Food Hate Waste" campaign promotes behavioral change among consumers to reduce food waste (EMBRAPA, 2018). Such actions reduce the risk of losses and result in cost optimization in the production chain.

It is also very important to generate synergies that focus on extending the shelf life of the products, introducing preservation processes in the production line that reduce the risk of losses, as well as optimizing costs. The use of technology and fluid communication between all parties involved will increase productivity in the other stages of the supply chain, reducing food losses. The utilization of unavoidable losses by establishing donations for disadvantaged groups, for the production of by-products, or for use as feed on the farm makes the concept of circular economy interesting in this area (SOLER; GEMAR; SANCHEZ-TEBA, 2021).

In 2015, the European Union launched a circular economy plan to reduce food loss and waste, incorporating three actions in alignment with Sustainable Development Goal 12.3 of the 2030 Agenda: the development of a common methodology to measure food waste, the creation of a co-participatory platform to share results, and the adjustment of waste-related legislation to strengthen food donation for animal feed (EMBRAPA, 2018). In order for the fight against food waste to be effective, it is necessary to change operational, production, and consumption practices in the agri-food chain (ZARO, 2018). According to a 2018 report by the Boston Consulting Group, food loss and waste could reach \$1.5 trillion by 2030 without global actions. The majority of the projected increase is in Africa, South Asia, and Southeast Asia. To address this challenge, the global coalition "Food is never waste" was announced during the United Nations Food Systems Summit in 2021, and Brazil is one of the signatory countries (BCG, 2018).

Food loss and Waste in Brazil

Food waste is a problem that affects food security and the sustainability of the food chain, resulting in fewer resources for producers and increased prices for consumers (BENÍTEZ, 2022). Despite Brazil's abundant natural resources and high performance in agribusiness, food insecurity affected 55.2% of Brazilian households in 2020 (REDE PENSSAN, 2021; IPEA, 2004). The 2020 pandemic exacerbated the situation, resulting in indebtedness, income reduction, unemployment, and hunger for 19 million Brazilians (REDE PENSSAN, 2021). Approximately 26.3 million tons of food produced in Brazil are wasted annually (INSTITUTO AKATU, 2012), despite 14 million people experiencing hunger in the country (UOL, 2023). Globally, in 2020, 811 million people were affected by hunger, with a significant increase due to the pandemic (FAO, 2021).

Inadequate harvesting and mechanical problems during transportation are the main causes of food loss in Brazil (JUNIOR, SOARES, 2014). The intensity and type of damage faced by trucks vary according to the distance traveled and the transported product, which can be worsened by poor roads (only 12.4% of highways are paved in Brazil (CNT, 2022)), high speed, and lack of refrigeration (ZARO, 2018). In addition to infrastructure problems, the quality of food can be affected by waiting for loading at distribution centers, weather conditions during transportation, and the precariousness of loading platforms and storage chambers. The mixing of tropical fruits with temperate climate fruits can also lead to losses (ZARO, 2018). About 50% of annually discarded food consists of fruits and vegetables (EMBRAPA, n.d.).

Combatting food loss in Brazil involves long-term government infrastructure projects. Food loss is a serious problem that needs to be addressed at all stages of production to avoid additional costs for consumers. It is important to invest in solutions to improve the road infrastructure, reduce waiting times for loading, improve weather conditions, and ensure the quality of loading platforms and storage chambers (ZARO, 2018).

On the other hand, behavioral factors in Latin culture, especially Brazilian culture, such as the association of abundance on the table with status and hospitality, the habit of "it's better to have leftovers than run out," frugality not being a habit of the lower middle class, and a preference for fresh food contribute to this waste (Porpino, Parente, and Wansik, 2015). Income and age range also influence food consumption conditions, with low-income families consuming more rice and beans, while higher-income families consume more fruits and vegetables (IBGE, 2011; ZARO, 2018). Retail marketing strategies that encourage the purchase of larger packaging than necessary also contribute to food waste (ZARO, 2018).

It is estimated that an average of 128.8 kg per year or 41.6 kg per capita per year is wasted in the country (EMBRAPA, 2018). According to the Brazilian Association of Supermarkets (ABRAS), 1.8% of the sector's gross revenue, equivalent to R\$7.6 billion annually, is lost due to waste, representing 81% of the waste category. In the fruits, vegetables, and greens (FLV) section alone, Brazilian supermarkets annually waste an approximate amount of R\$1.3 billion, with tomatoes, bananas, oranges, leafy vegetables, and onions being the most wasted foods in terms of volume (ABRAS, 2021).

To reduce food losses and waste in Brazil, it is important to implement technological changes in food production and distribution and encourage changes in family habits, according to Embrapa (2022). To increase food supply without expanding the planted area, it is essential to improve process efficiency and reduce losses and waste through practices such as proper harvesting, efficient transportation, and appropriate infrastructure. However, the lack of appropriate legal frameworks for public policies aimed at mitigating the issue of food losses and waste is a challenge for the country to achieve increasingly sustainable consumption (ZARO, 2018).

Public policies to reduce food losses and waste

Public policies are essential for reducing food losses and waste and involve strategies that connect retail with food banks and popular restaurants, as well as encourage short food production and consumption circuits that value small farmers. The connection between cities and food has grown in importance during the pandemic and the climate crisis, providing an opportunity to create public policies that strengthen the food security and nutrition of citizens and reduce waste. Circular urban food systems are a focus of international discussions as a way to align circular economy strategies with the need to promote the supply of healthy and sustainable food in cities, which account for 80% of global food consumption. These policies are important for ensuring the food security and nutrition of populations and reducing food waste, which contributes to environmental protection and the global economy (CÂMARA LEGISLATIVA, 2018).

Actions to prevent food waste are associated with education and awareness initiatives, while actions to prevent losses are related to structural changes in the food chain (MESA BRASIL, 2020; PEIXOTO; PINTO, 2016). To engage and raise awareness about the issue of waste, it is necessary to create national campaigns involving partnerships between the public and private sectors (EMBRAPA, 2018). Reducing food losses is associated with promoting a more efficient agri-food chain, requiring the collaboration and participation of stakeholders to address the problem of global food insecurity and result in greater economic sustainability:

The supply chain of the agri-food industry is the key area where work should be conducted in order to effectively reduce food losses. Over the years, research has shifted from a focus on loss assessment and quantification, in conjunction with the application of environmental recommendations, to striving for appropriate, individualized management at each stage of the supply chain for each product in order to minimize losses in the agri-food industry. In addition to efficiently managing loss for reuse, this process must be carried out with a holistic vision to analyze the current situation. Said management must involve the collaboration of stakeholders throughout each stage of the supply chain in order for food waste to be considered as an element of food systems and to improve knowledge of the requirements demanded by end consumers. Reducing food waste is not only necessary to avoid the associated environmental impacts it causes or to solve the problem of global food insecurity, but it is also beneficial for the economic sustainability, public image and reputation of companies. (SOLER; GEMAR; SANCHEZ-TEBA, 2021).

According to the 1988 Federal Constitution, it is the responsibility of the federal government to promote agricultural production, organize food supply, protect the environment, and preserve fauna and flora (BRASIL, 1988). Furthermore, Constitutional Amendment No. 64 defines food as a social right, along with other rights such as health and housing (BRASIL, 1988). In Brazil, Law 11.346/2006 defines Food and Nutritional Security (SAN) as access to food in adequate quantity and quality, without compromising other essential needs (BRASIL, 2006). The practice of food donation is important to combat waste and hunger, but the legal responsibility of donors remains an obstacle. To date, only Law 14.016/20 has been approved, which encourages supermarkets to participate as food donors. Four main bills are currently being processed in the Federal Senate, representing the key measures of the National Congress in the fight against food waste in Brazil (PEIXOTO; PINTO, 2016).

Table 1. Bills in Progress for the Reduction of Food Waste.

Bill Number	Responsible	Objectives
PLS nº 503, of 2015	Senator Sandra Braga	To exempt the objective risk of food donor companies, incentivize food donations by increasing tax deductions on donated values, and only target companies that prefer to keep expired products on display for sale instead of donating them in a timely manner.

PLS n° 672, of 2015	Senador Ataídes Oliveira	Reduction of food waste by establishments such as industries, supermarkets, markets, restaurants, kitchens, fairs, produce markets, and similar ones, with a built area of over 200 square meters, which, within a maximum period of 6 months after the law comes into effect, have entered into contracts with social organizations dedicated to collecting and distributing food and meals or with companies dedicated to animal feed production and composting; exempting these establishments from civil and criminal liability resulting from any harm caused to the beneficiary by the consumption of the donated goods, provided that it does not involve intent and negligence.
PLS n° 675, of 2015	Senador Maria do Carmo Alves	National Policy to Combat Food Waste, presenting objectives and instruments for its implementation, and allowing for food donation, as provided for in the regulations.
PLS n° 738, of 2015	Senador Jorge Viana	Combating the voluntarily discarded food waste; expiration dates for sale and safe consumption; consumer education campaigns; and regarding establishments engaged in wholesale or retail food trade whose average gross annual revenue is equal to or higher than that of small businesses, which may donate industrialized, prepared, or fresh food items to charitable social assistance entities within the expiration date for sale that, for any reason, have lost their marketability condition, or outside of this period, as long as they are still in suitable conditions and within the safe consumption timeframe.

Source: Own elaboration. Peixoto; Pinto (2016).

Currently, about 45% of Brazilian supermarkets do not participate in food donation programs, despite Law 14.016/20 has removed the donor's civil liability. The Mesa Brasil program, by SESC, donates food that cannot be sold but is still suitable for human consumption (MESA BRASIL, 2020). The program involves the participation of 30% of supermarkets that donate food. In street markets, in the city of São Paulo alone, approximately 18,400 tons of food are wasted annually, not including unavoidable organic waste. A study conducted in 2022 by Unesp and the University of Borås (Sweden) indicates the possibility of urban collections to increase harvests, allowing NGOs and public food banks to collect surplus from street markets and direct it to social assistance institutions. The Banco de Alimentos, an NGO, operates in three pillars: urban harvesting, nutritional education, and awareness through lectures and workshops (BANCO DE ALIMENTOS, 2020). Both have had significant results in reducing waste and helping people in food-insecure situations. The most recent data from the Mesa Brasil Sesc São Paulo program indicates that in January 2021, 379,125.27 meals were donated by 495 donor companies, benefiting 181,853 people and serving 1,022 institutions (MESA BRASIL SESC SÃO PAULO, 2021).

It is important to mention that food banks are internationally recognized as a successful strategy for directing food that is still suitable for consumption, contributing to the food security of vulnerable populations. The inclusion of these food banks in the regulations should encourage their expansion throughout the country and increase food utilization. However, it is important for this issue to be considered by the Ministry of Citizenship, which coordinates social and environmental development policies, and by the Interministerial Chamber for Food and Nutritional Security (CAISAN), which aims to promote coordination among government agencies and entities responsible for Food and Nutritional Security and issue necessary regulations for the operation of the Brazilian food bank network (Ministério do Desenvolvimento Social, 2021).

The #SemDesperdício project, proposed by WWF-Brazil in partnership with Embrapa and FAO, provides educational tips and a content repository to raise awareness among Brazilians about food waste and change the eating and consumption habits of the population (SEM DESPERDÍCIO, 2020). The most recent report, from 2016-2017, presented impressive results, such as an average daily reach of 33,000 people, 162,000 video views, and 900,000 people engaged from October to November. The initiative has also gained international visibility in countries such as the United States, the United Kingdom, Portugal, and France.

New food apps like "Comida Invisível", "Appétit Delivery," and "B4Waste" are helping to reduce food waste in Brazil by connecting establishments with surplus food to consumers and NGOs in need (UOL, 2021). The "Loja Fruta Imperfeita," on the other hand, purchases aesthetically imperfect food from small producers and resells them, promoting conscious commerce (FRUTA IMPERFEITA, n.d.). "Connecting Food" redistributes food to a network of social organizations, "Comida Invisível" distributes food and aims to reduce greenhouse gas emissions, and "Food to Save" offers a 70% discount on products nearing their expiration date, redistributing surplus food (IFOOD, 2022). The company claims to have saved over 300 tons of food from landfills and avoided

750 tons of CO₂ emissions. It is estimated that 8 to 10% of greenhouse gas emissions are associated with food produced but not consumed (EXAME, 2021).

All of these initiatives contribute significantly to reducing food waste in Brazil, a country that currently faces around 33.1 million people experiencing food insecurity and 14 million in a state of food security. The country has recently returned to the global hunger map (UOL, 2020), and food insecurity is a result of the inadequate implementation of legislation. The FAO (2019, p.17) highlights the importance of public intervention in reducing food losses and waste, as it can increase productivity and economic growth, improve food and nutrition security, and mitigate the environmental impacts of these losses. Public-private partnerships are crucial for promoting sustainable goals and reducing food waste worldwide.

IV. Conclusion

It is unacceptable to have a food loss and waste on the planet, considering that there are hundreds of millions of people experiencing hunger daily and a growing population that will demand affordable food. Regarding losses during production, processing, storage, and transportation, it is important to adopt good practices. In combating food disposal, there are already several successful initiatives, especially in the field of donations, but they still have limited scale and impact due to legal restrictions that the propositions being processed in the National Congress seek to eliminate or reduce. For progress to occur, it is important for the government to take a more active role in establishing public policies and implementing measures that encourage the reduction of food losses and waste at all stages of the production and distribution chain. These include improving measurement methodologies, encouraging the development and use of technologies to reduce losses, connecting links in the production chain, disseminating good practices, and strengthening international engagement.

This can include training programs for farmers and producers, tax incentives for adopting more efficient technologies and practices in food production and storage, and the creation of policies to encourage food donation. Additionally, it is important to provide support to family farming, create food distribution programs for vulnerable populations, and encourage reverse logistics through selective food collection. The government can also work in partnership with non-governmental organizations, companies, and other stakeholders to promote public awareness campaigns and education about food waste, as well as to implement policies that promote the use of fresh and healthy food in schools, hospitals, and other public institutions.

Another important element is communication. To effectively address food waste, an adequate policy should include the creation of multimedia campaigns that enhance access through traditional tools and include new digital media and their key influencers. These campaigns should be continuous and comprehensive, aiming to raise awareness among the population about the importance of reducing food waste. Effective communication and coordination of public policies within CAISAN are also necessary, along with regulatory review to reduce food losses and waste.

Furthermore, besides being a social and environmental issue, reducing food loss and waste is crucial for Brazil's sustainable and economic development. Food waste represents a significant loss of natural resources, such as water, land, and energy, as well as an economic loss for producers and consumers. By reducing food loss and waste, it is possible to increase production efficiency, promote sustainable agriculture, generate jobs in the food production chain, and reduce production and consumption costs. Additionally, donating surplus food can benefit the most vulnerable populations, promoting food security and reducing poverty.

It is worth noting that reducing food loss and waste in Brazil is a multifaceted issue that requires coordinated actions on multiple fronts. Therefore, it is essential for the government, private sector, and civil society to work together to reduce food loss and waste. By doing so, Brazil can significantly contribute to achieving SDG Target 12.3 of the UN's 2030 Agenda, bringing economic, social, and environmental benefits to the country.

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