ABSTRACT

Objective: This article aims to analyze how food banks in the state of Paraná, Brazil, contribute to meeting the Sustainable Development Goals (SDGs).

Theoretical framework: Reducing food waste is essential for reducing environmental, social and economic impacts and contributes directly to achieving SDGs 2 and 12. Food banks make a significant contribution to directing food that has no commercial value, but is suitable for human consumption, to the food and nutrition insecure population.

Method: The methods used were descriptive, bibliographical and a multiple case study, with semi-structured interviews with food bank managers.

Results and conclusion: The results show that SDGs 2 and 12 have been directly met. Specifically, in relation to targets 2.1 and 2.2, the practices seek to allocate food to people who are food and nutrition insecure (children, the elderly, hospitals and care homes). As for meeting target 12.3, there is a very intense movement by food banks to combat food waste, in order to increase food collection from donors, raise awareness among the population about the problems of food waste, support family farming with food purchases and, internally, develop minimum processing practices for food at an advanced stage of ripeness. Research implications: This study contributes by demonstrating the practices developed by food banks that come closer to the SDGs and favor the development of a fairer and more sustainable society.

Originality/value: This study proposed bringing SDGs 2 and 12 closer to the role played by food banks, adding value to scientific knowledge.

Keywords: Food Banks, Sustainable Development Goals, Food Waste, Food and Nutritional Insecurity.
expressivamente para direcionar alimentos sem valor comercial, mas adequados para consumo humano, à população em insegurança alimentar e nutricional.

Método: Os métodos empregados foram o descritivo, bibliográfico e estudo de múltiplos casos, com entrevistas semiestruturadas junto aos gestores dos bancos de alimentos.

Resultados e conclusão: Os resultados apontaram para o atendimento direto aos ODS 2 e 12. Especificamente, em relação às metas 2.1 e 2.2, as práticas buscam destinar alimentos às pessoas que se encontram em insegurança alimentar e nutricional (crianças, idosos, hospitais e casas de apoio). Quanto ao atendimento da meta 12.3, há um movimento bastante intenso dos bancos de alimentos em combater o desperdício alimentar, de forma a ampliar a arrecadação de alimentos junto aos doadores, conscientização da população sobre os problemas do desperdício de comida, apoiar a agricultura familiar com a compra de alimentos e, internamente, desenvolver práticas de processamento mínimo de alimentos em fase de maturação avançada.

Implicações da pesquisa: Este estudo contribui ao demonstrar as práticas desenvolvidas pelos bancos de alimentos que se aproximam dos ODS e favorecem o desenvolvimento de uma sociedade mais justa e sustentável.

Originalidade/valor: Este estudo propôs aproximar os ODS 2 e 12 com o papel desenvolvido pelos bancos de alimentos, agregando valor ao conhecimento científico.

Palavras-chave: Bancos de Alimentos, Agenda 2030, Desperdício de Alimentos, Insegurança Alimentar e Nutricional.

1 INTRODUCTION

Discussions and reflections about a fairer and more sustainable society, with more socially and environmentally responsible production and consumption patterns, have become the focus of countries' agendas through the advent of the 2030 Agenda (Elkington, 2001; Klarin, 2018). This agenda includes, in total, seventeen macro Sustainable Development Goals (SDGs), all of them with outcomes of 169 specific goals to be achieved by 2030 (Ardra & Barua, 2022).

As regards SDG 2: Zero Hunger and SDG-12: Sustainable Consumption and Production, the discussion is to promote quality food to eradicate hunger and poverty, as well as to contain food waste, which causes impacts on the environment (Filgueiras, 2017; Dou, Toth, & Westendorf, 2018; Notarnicola et al., 2017; Morone, Falcone, & Lopolito, 2019; Principato, Ruini, Guidi, & Secondi, 2019; Arora & Mishra, 2022). This sounds like a food paradox: on the one hand, there is food waste of approximately 30% a year, according to the Food and Agriculture Organization (FAO, 2021), while there are still people in need of food to survive.

A strategy developed in this direction and adopted by many countries is to target food with no commercial value, but still suitable for human consumption, for people in food and nutritional insecurity (Sundin, Bartek, Osowski, Strid, & Eriksson, 2023). Thus, the veins of the problem of the food paradox (Filgueiras, 2017; Berti, Giordano, & Mininni, 2021) can be partially solved.

For the destination of these foods to people in need and, at the same time, for the purpose of containing food waste, the food banks have emerged (Zainal, Mustaffa, & Othman, 2019; Tenuta, Barros, Teixeira, & Paes-Sousa, 2021, Nemes et al., 2021), which are considered the right arm of the government, as it cannot meet this social challenge in isolation. For a long time, food banks have been seen as just a bridge between donors and recipients of food, yet this
outlook has been changing. Currently, there are several studies that point to food banks as a social innovation to circumvent the food paradox (Baglioni, De Pieri, & Tallarico, 2016; De La Salle & Unwin, 2016; Thapa Karki, Bennett, & Mishra, 2021).

In this context, this study sought to analyze how the food banks of Paraná contribute to the fulfillment of the Sustainable Development Goals. This is an empirical study, carried out in the public and private food banks, located in the state of Paraná, in Brazil. The theoretical contribution of this study lies in bringing the practices developed by food banks closer to the SDGs, specifically on zero hunger and sustainable consumption and production. In practice, this study reveals the importance of food banks in meeting the SDGs (Hasnain, Orgut, & Ivy, 2021; Penalver & Aldaya, 2022; Sundin et al., 2023; Warshawski, 2023), amidst a Brazilian context that still faces high levels of food waste (Fao, 2015; Seab-Pr, 2019).

2 THEORETICAL FRAME

2.1 Food losses and food waste

Food losses and waste are a global problem. According to Fao and Odepa (2021), between a quarter and a third of the food produced is wasted every year, equivalent to 1,300 billion tons. It is estimated that this amount of food wasted could feed 2 billion people, or 27.7% of the world’s population.

This represents not only a missed opportunity for the economy and food security, but also a waste of all natural resources used for the cultivation, processing, packaging, transport and marketing of food (Fao, 2015).

According to the United Nations Environment Program (UNEP) report, Food Waste Index Report 2021, food wasted at home per capita is broadly similar across all income groups, demonstrating that its relevance is equivalent in high, medium-high and medium-low income countries (Unep, 2021).

Fao (2015), demonstrated a graph of the top 20 greenhouse gas (GHG) emitting countries and food waste. This data is evidenced in Figure 1.

Figure 1 presents a graph that aims to inform the amount of total GHG emissions that are emitted by the main emitting countries. Among the three countries that emit the most GHG, China holds the lead, followed by the United States and India. According to the data, if food waste were a country, it would be the third most emitting air (Fao, 2015).

Fao (2015) also scores the main foods in terms of air emissions (from production to consumption). The report shows that products have different carbon intensities. For example, plant production in Europe is more carbon intensive than plant production in Southeast Asia.
as Europe uses means of production that emit more of this gas into the atmosphere. Figure 2 shows a graph with these numbers.

![Figure 2](http://www.fao.org/3/a-bb144e.pdf)

**Figure 2** - Food and its contribution to carbon footprint and food waste


As can be seen, the carbon footprint and waste for some foods vary. For example, although fruit and tubers are not as emitting GHGs, they are significantly wasted. On the contrary, meat is low in waste, but significant in terms of air emissions, from production to consumption. The only foods that have the same proportion of waste and atmospheric emission are milk and eggs (Fao, 2015).

Despite the uncertainties of the data presented, it is suggested that a reduction of food losses and waste at global, national and regional levels would have a substantial positive effect on society's resources and in particular on climate change (Fao, 2015).

As far as waste in the field of consumption is concerned, the countries that most present this problem at the stage of household consumption are the United States of America, Australia, England and Italy. The per capita waste in Europe and North America is 95 to 115 kg per year. Latin American countries have a higher rate of post-harvest losses and the waste trend is also high (Embrapa, 2021).

Evidence points to the urgency of effective measures to contain food losses and food waste. According to Porpino et al. (2018, p. 17):

> [...] projections point to changes in consumption patterns, particularly in developing countries, that global waste tends to increase by 2030 to the equivalent of $1.5 trillion in food if urgent actions are not put in place.

Thus, the importance of efficient policies, at global, national and local levels, to contain food waste at all stages of the supply chain, is highlighted, in order to achieve Goal 12.3 of the SDGs, which is to halve food waste at the retail and consumption stage and food loss at the production stage (Porpino et al., 2018).

According to Fao et al. (2021), one of the ways to reduce the cost of food is through interventions in food supply chains, seeking to decrease losses and waste. This means adopting a coherent set of policies and investments in production, harvesting, handling, packaging, storage, transport, processing and marketing.

Another way to minimize food losses and waste is through policies that encourage consumers to change their attitude towards consumption, giving preference to healthier and more sustainable foods (Fao et al., 2021).

It is important to point out that data on food waste at a global level is still scarce, although efforts are being made to measure the problem. Most countries do not have robust data on how much food is wasted or lost, in which sectors this is most evident, and which foods are...
most lost or wasted. It is also possible to note the lack of data on the participation of the inedible parts of the food. This lack of data tends to undermine the efforts of government, companies and other institutions to target initiatives to combat this problem (Puma, 2021).

According to FAO (2015), Brazil is listed in the ranking of the countries that most waste food. According to data from the NGO Banco de Alimentos (2021), 27 million tons of food were wasted in Brazil in 2019. In per capita terms, 41.6 kg of food is wasted annually. According to the Department of Agriculture and Supplies of Paraná (Seab-Pr, 2019), "estimates indicate Brazil among the 10 countries that most waste food in the world, with a disposal of approximately 30% of all that is produced for human consumption and 15% of the total calories produced. This disposal generates an economic loss of US$ 940 billion a year".

According to Porpino, Lourenço, Araújo, & Bastos (2018, p. 14), "Brazilian families waste, on average, 353 grams of food per day or 128.8 kg per year. In per capita analysis, the waste is 114 grams per day, which represents an annual waste of 41.6 kg per person’. Among the most wasted foods are rice (22%), beef (20%), beans (16%) and chicken (15%). Among the foods with the lowest degree of waste are fruits and vegetables, both with a percentage of 4% in relation to the total (Porpino et al., 2018).

Porpino et al. (2018) found that the higher classes have a greater waste of vegetables than the lower income classes. Furthermore, it was found that Brazilian culture, just as in a large part of Latin America, is used to a greater volume of food on the table, which generates leftovers of food that are going to end up in the garbage. In addition, Brazil also has high post-harvest losses and significant consumer waste. This shows two characteristics of underdeveloped and developed countries. On the one hand, losses occur in the initial stage of the productive chain and in the outlets of production, and, on the other, the consumption culture of Brazilians is similar to that of developed countries, with food waste in the ambit of the consumer (Embrapa, 2021).

In relation to consumption, it was found that the Brazilian habit is to buy a lot of food due to the ease of access and the varieties available in the shops. This is associated with the quantities of purchases made “once a month”, in the preparation of meals and in the destruction of the leftovers, the latter being the preference for the "fresh" meal. The culture of storing food at home comes from high rates of inflation and from large supermarkets far from home. These are habits that are rooted in the culture of the Brazilian people (Porpino et al., 2018).

Belik, Cunha e Costa (2012), report that Brazil lacks accurate data on food losses and waste. The lack of systematic criteria and parameters makes it difficult to measure and analyze the problem. This corroborates studies conducted by Fao et al. (2021), which reafirm the lack of more accurate information on food loss and waste globally.

When considering the scenario of food losses and wastage, it reflects on the possibility of moving to a more sustainable food system, which also tends to contribute to the reduction of food and nutritional insecurity.

2.2 Food and Nutritional Insecurity

Contemporary society faces a challenge that has been discussed in the political agendas: hunger and food and nutrition insecurity, which plague a significant portion of the world's population. Peixoto (2018, p. 143) notes that ‘[...] food security is a concern in most developing countries, whose population is growing and natural resources (water, soil, energy, fertilizers) are limited’. The purpose of this section is thus to understand aspects related to hunger and food and nutrition insecurity in the current social context.

The information issued by the FAO seeks to accompany these two aspects so that actions are directed towards alleviating the problem on a world scale. Humanitarian aid and
development organizations increasingly need to understand and measure the food security of families to monitor and assess the impact of programs and make planning and targeting decisions (Wolfe, & Frongillo, 2001).

In the report by Fao et al. (2021), hunger is defined as an uncomfortable or painful physical sensation caused by insufficient consumption of calories in the diet. In this report, the term hunger is synonymous with chronic malnutrition and is measured by the Prevalence of Malnutrition (PoU). The PoU is an estimate of the portion of the population that lacks sufficient food energy to enjoy a healthy and active life (Fao et al., 2021).

As regards food and nutrition insecurity, this includes not only the lack of availability, access and use of food, but also perceptions, such as that food is insufficient, inadequate, unacceptable, uncertain or unsustainable (Wolfe, & Frongillo, 2001).

Food and nutritional insecurity is measured depending on what level of insecurity the home is affected. In order to better understand the food and nutritional insecurity ranges, the Brazilian Institute of Geography and Statistics (IBGE) points out three household classifications in relation to food and nutritional insecurity: severe, moderate and light (IBGE, 2020a). This categorization is set out in Table 1.

### Table 1 - Food and nutritional insecurity bands and their characteristics.

<table>
<thead>
<tr>
<th>Food and nutrition insecurity bands</th>
<th>Features</th>
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<tbody>
<tr>
<td>Mild insecurity</td>
<td>When concern appears about access to food in the future and the quality of food is already compromised. In this context, the inhabitants are already assuming strategies for keeping a minimum quantity of food available. To exchange food for one that is cheaper, for example.</td>
</tr>
<tr>
<td>Moderate insecurity</td>
<td>On the second level, with moderate insecurity, the inhabitants already have a restricted quantity of food.</td>
</tr>
<tr>
<td>Severe insecurity</td>
<td>Severe insecurity appears when the inhabitants have gone through severe deprivation in the consumption of food, which may go as far as hunger.</td>
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According to the report by Fao et al. (2021), no region of the world has been spared by hunger and/or food and nutrition insecurity. The high cost of healthy diets and the high levels of poverty and inequality in income distribution among the population continue to keep healthy diets out of reach of about 3 billion people (41.6%) in all regions of the world.

The report estimated that between 720 (10.0%) and 811 (11.3%) million people worldwide faced hunger in 2020 - up to 161 (2.2%) million more than in 2019. In addition, nearly 2.37 billion (33%) people did not have access to adequate food in 2020. This means an increase of 320 million (4.4%) people in just one year (Fao et al., 2021).

According to the Fao report (2021), hunger affects 21% of the population in Africa, compared to 9% in Asia and 9.1% in Latin America and the Caribbean. In terms of numbers, more than half of the world's undernourished are in Asia (418 million) and more than a third are in Africa (282 million). This same report also points out that out of 2.37 billion people facing moderate or severe food insecurity, half (1.2 billion) are found in Asia, one third (799 million) in Africa and 11% (267 million) in Latin America and the Caribbean (Fao, 2021).

It is estimated that nearly 12% of the global population suffered from severe food insecurity in 2020, representing 928 million people. That is 148 million more than in 2019. In the COVID-19 pandemic, that number increased and the PoU rose from 8.4 percent to about 9.9 percent in just one year (Fao et al., 2021).
Among the factors that have recently affected food security and nutrition, three main ones can be cited: conflicts, climate change and economic slowdowns, which are accentuated by the underlying causes of poverty and very high and persistent levels of inequality, in terms of income, production capacity, assets, technology, education and health (FAO et al., 2021).

According to data from FAO (2021), “in Brazil, hunger affects 14 million people. In the sale, the country wastes 22 billion calories, which would be enough to meet the nutritional needs of 11 million people and would reduce hunger by less than 5%.” Considering that in 2020 there were 211.8 million inhabitants in Brazil (IBGE, 2020b), hunger affects approximately 6.6% of the Brazilian population.

When considering these data, however, it can be said that hunger and food and nutrition insecurity are a challenge for contemporary society, requiring a series of measures that must be taken to alleviate the problem. Such measures include solutions that minimize food waste at the beginning and end of the food supply chain, as well as efficient mechanisms that contribute to ensuring that the whole population has access to quality food.

### 2.3 Sustainable Development Goals: Zero Hunger and Sustainable Consumption and Production

Awareness of the environmental unsustainability of anthropic actions along with social challenges such as poverty, hunger and inequalities stimulated, from the 1980s, discussions on sustainable development, being understood from a generational perspective of adequate care of the needs of the present and future (World Commission on Environment and Development [WCEAD], 1991). Since then, sustainability, in its environmental, social and economic dimensions, has been present in the discussions of governments, companies and global agendas (Elkington, 2001; Klarin, 2018).

The Millennium Development Goals (MDGs), set out in 2000, have highlighted these concerns. Representing 191 countries on the challenges of the new millennium, a total of eight MDGs and 21 targets have been set for the eradication of poverty and hunger, the promotion of universal primary education, gender equity, the reduction of infant mortality, maternal health, social welfare through the fight against diseases such as AIDS and malaria, environmental sustainability and global development partnerships, with a view to achieving them by 2015 (United Nations [UN], 2000; Mishra *et al.*, 2023).

While the MDG program was recognized as successful at the end of 2015 with good results in poverty reduction and education, for example, many countries did not reach the targets and progress was uneven. Because of this, policymakers sought to determine a new set of goals, reinvented on the basis of previous MDGs (Mishra *et al.*, 2023). The 2030 Agenda for Sustainable Development was then launched in 2015 with 17 Sustainable Development Goals (SDGs) and 169 related targets to be met by 2030 (Ardra & Barua, 2022).

The SDGs address global challenges to sustainability by presenting a plan for a more sustainable future for society. They establish fronts for action in the three dimensions of sustainability and aim, among other issues, to reduce poverty, inequality and hunger, combat environmental degradation and climate change and provide quality of life and prosperity for current and future generations (UN, 2015; Zainal *et al*., 2019; Hasnain *et al*., 2021; Arora & Mishra, 2022). It should be noted that the objectives are interlinked and the actions directed to one goal influence the reach of the others (Mishra *et al.*, 2023).

Targeting concerns related to food and nutrition insecurity and food losses and waste, SDGs 2: Zero Hunger and Sustainable Agriculture and SDG-12: Sustainable Consumption and Production and their respective targets 2.1, 2.2 and 12.3 are highlighted. Objective 2 consists of eight goals and aims to end hunger, achieve food security and promote sustainable agriculture.
(Arora & Mishra, 2022). Specifically, target 2.1 aims to combat hunger by ensuring access to safe, nutritious and sufficient food for children and people in vulnerable situations; and target 2.2 seeks to end all forms of malnutrition of children up to five years old and meet the nutritional needs of adolescents, pregnant and nursing women and the elderly (UN, 2015). In turn, SDG 12 is made up of 11 goals that are oriented towards the promotion of sustainable production and consumption patterns. In particular, target 12.3 aims at halving food waste in retail and consumption as well as in the production phase (UN, 2015; Ardra & Barua, 2022).

Since 2015, much work has been done toward the 2030 Agenda, however, progress toward change is still slow and uneven, notably in emerging economies where little or no results can be observed (Ardra & Barua, 2022; Sachs, Lafortune, Fuller, & Drumm, 2023). According to the 2023 Sustainable Development Goals Report, the COVID-19 pandemic and the War in Ukraine have put the Agenda’s expectations at risk by having an impact on food and energy crises. About 50% of the targets are making poor or insufficient progress and 30% are stagnant or in decline. This reality translates into the hunger targets, with around 9.2% of the world’s population facing chronic hunger in 2022 and 29.6% experiencing moderate or severe food insecurity, meaning they did not have regular access to adequate food. In addition, it is estimated that 45 million children up to 5 years old suffered from slimming and 148 million had stunted growth. Although millions of people are starving, the goal of reducing food waste and losses is also stagnant with 13.2% of food lost after harvest (UN, 2023).

Targeted policies with concrete and integrated actions and investments in technologies, infrastructure, education and monitoring are needed to overcome these challenges (UN, 2023). Changing global patterns of food systems and land use are important for achieving sustainability goals (Arora & Mishra, 2022), and innovative and sustainable agriculture plays an important role in improving food and nutrition security at the global level (Lima & Lemos, 2023). Specifically, in this reality, it is also argued that food banks can play a strategic role in facilitating the reintroduction of lost or wasted food into the supply chain, contributing to feeding people in more vulnerable conditions (Tenuta et al., 2021).

2.4 Food Banks in Combating Food and Nutrition Insecurity and Food Waste

Food banks are non-profit organizations responsible for collecting and distributing food to charitable organizations or directly to people in food insecurity (Bazerghi, Mckay, & Dunn, 2016; Zainal, et al., 2019; Tapia & López, 2020; Warshawsky, 2023). In addition to their orientation to fight hunger, they are directly related to preventing food waste by establishing themselves as storage and distribution sites for food suitable for human consumption, but which are not marketed by the producer or distributor because they are poorly packed or close to the expiration date (Penalver & Aldaya, 2022).

Although not profit-oriented, food banks operate like a company to manage resources with maximum efficiency (Tapia & López, 2020). According to Hasnain et al. (2021), three criteria are considered in the distribution of donated food: fairness, by seeking to distribute food proportionally to those who need it; effectiveness in seeking to make the most of donated food; and efficiency with directionality for minimizing operating and transportation costs.

Historically, St. Mary’s FoodBank is considered the first food bank in the world, founded by John Van Hengel in 1967 (Birth, 2020). When viewing a woman routinely searching for food in trash containers, Hengel suggested that there should be a place where discarded food was stored so that people could pick it up. So, in conjunction with volunteers, he organized the food fundraiser in supermarkets in Phoenix, the Arizona capital. Due to the success, the model soon spread to other states and became popularized worldwide with national food bank networks such as Red Food Banks in Argentina, Food Banks in Canada and Feeding America
Sustainable Development Goals and The Role of Food Banks in Fighting Hunger and Food Waste in the State of Paraná-Brazil

In the United States; and the Global FoodBanking Network, a worldwide food bank network that promotes food banks in more than 30 countries (Tapia & López, 2020). In Europe, the European Federation of Food Banks also stands out, being one of the largest food bank networks in the world that redistributed, in 2022, 876 thousand tons of food to 12.4 million people in 30 countries in Europe (European Food Banks Federation [EFBF], 2023).

In Brazil, food banks have also seen rapid expansion, with 217 active banks currently distributed in the country's 27 federal units with the highest concentration in the states of the Southeast and South (Tenuta et al., 2021). Generally speaking, its management takes place by means of two prevailing modalities: the public food banks, which are administered by municipal governments and represent 42.9% of the total, and the food banks Rede Mesa Brasil Sesc, which are operated and maintained by the Social Service of Commerce (SESC) and are equivalent to 41% of the total. Also evidenced are the food banks of civil society organizations (11.98%); and the food banks located within supply centers (4.15%). Most of these banks serve socially at-risk families and children, with the main partners being the commercial establishments that contribute, especially, to the donation of fruit and vegetables (Tenuta et al., 2021). It should also be noted that, by means of Decree n. 10.490 (2020), the Brazilian Network of Food Banks (RBBA) was established, which aims to bring together public and private food banks in order to strengthen their work in combating hunger and malnutrition and reducing food losses and waste.

Because of their work, food banks have been playing a strategic role in meeting SDG targets. According to Tenuta et al., (2021), food banks contribute to the reintroduction of wasted food into the productive and supply chains by fostering the fight against hunger and food insecurity of several vulnerable people and therefore relate directly to the results of SDG targets 2.1 and 12.3. Zainal et al. (2019) also describe how implementing the Food Bank Center in Malaysia contributes to the SDGs by ensuring access to food and contributing to the fight against hunger. The study by Sundin et al., (2023), in the same vein, when assessing sustainability in the donation of surplus food, through a Swedish case study, showed that food donation contributes to reducing food waste and is also important to reduce food insecurity and to provide healthier and nutritious food for beneficiaries. Tapia and López (2020) similarly highlight that food banks are solutions to promote the right to food and reduce food losses and waste. For Nascimento (2020), from the analysis of the Foz do Iguaçu food bank, food banks are important mechanisms for promoting the human right to adequate food, providing access and availability to that right.

In addition to the objectives linked to food insecurity and food waste, food banks are also considered important for the achievement of the other SDGs such as combating climate change (Warshawski, 2023). This is due to the fact that food waste generates greenhouse gas emissions, deforestation, biodiversity loss and resource consumption (Penalver & Aldaya, 2022). Vieira, Domingues and Matzembacher (2022), for example, when describing the functioning of a food bank in São Paulo highlight the contribution of food waste reduction actions to minimize the impacts of climate change and other environmental, economic and social issues of sustainability. Sundin et al. (2023) also show benefits in the three dimensions of sustainability, indicating that food banks favor environmental outcomes with saving resources and energy and add economic and social value, especially for the most vulnerable people. More specifically, Penalver and Aldaya (2022), while studying a food bank in Navarre (Spain), noted that the institution’s activities prevented the unnecessary use of about 3.2 million m³ of water, which can be linked to the SDG-6-oriented goals: Drinking water and sanitation. In addition, Hasnain et al. (2021) evidence the contribution of food banks to SDG-10 by reducing inequalities with equitable distribution of food to the poor.
On the other hand, studies indicate problems linked to food banks such as their limited ability to improve food security when quantities of nutrient-rich foods are insufficient (Bazerghi et al., 2016); and the structural weaknesses of the food system during critical periods such as the COVID-19 pandemic denoting low stocks, high costs, uneven distribution and fewer volunteers (Warshawsky, 2023). In addition, in Brazil, there is evidence of the practice of purchasing food to supplement stocks, which contradicts the main objective of obtaining food from losses and waste (Tenuta et al., 2021).

In general, however, food banks, as non-profit institutions serving a section of the population in socially vulnerable conditions, are important means of helping to combat hunger and food and nutrition insecurity on the one hand and of reducing food losses and waste on the other. Indirectly, means to achieve the other sustainability objectives are also demonstrated, given their relation to different social, environmental and economic issues and the interconnectivity between the targets.

3 METHODS

This study is characterized as descriptive, because it sought to understand the studied reality, its characteristics and its problems (Zanella, 2013). As for the procedures adopted, we used bibliographic research, documentary (comprising public and private reports issued by food banks) and case study. From this perspective, the application of a case study should not be confused and limited to a single object or fact in question. As Fachin explains (2006, p. 45), ‘depending on the purpose of the investigation, the number of cases may be reduced to one case element or cover numerous elements, such as groups, sub-groups, undertakings, communities, institutions and others’.

This study employed more than one unit of analysis, since it comprised the food banks located in the State of Paraná, characterizing itself as an investigation of multicases. Semi-structured interviews were carried out with the food bank managers of the five units of the Central Supply of Paraná (CEASA-PR), distributed in the municipalities of Curitiba, Londrina, Maringá, Cascavel and Foz do Iguaçu. In the private food banks managed by the Social Service of Commerce of Paraná (SESC-PR) the data collection was centralized with the regional management, in the city of Curitiba. The questions related to the study totaled fifteen open questions, listed in Table 2:

<table>
<thead>
<tr>
<th>Table 2 - Research issues</th>
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<tbody>
<tr>
<td>Research Issues</td>
</tr>
<tr>
<td>1) How does the food bank address hunger and poverty?</td>
</tr>
<tr>
<td>2) Is the social role of the food bank restricted to regulation or are there initiatives of its own to this end? If so, comment on them.</td>
</tr>
<tr>
<td>3) Is there a possibility of improving the social issue by the food bank? If so, what would be the ideal solution in this regard?</td>
</tr>
<tr>
<td>4) How does the food bank act in relation to food losses and waste?</td>
</tr>
<tr>
<td>5) How does the food bank act in raising awareness about food losses and waste?</td>
</tr>
<tr>
<td>7) Is there a possibility to improve the issue of PDA in the food bank? If so, what would be the ideal solution?</td>
</tr>
<tr>
<td>8) How does the bank interact with these actors regarding PDA?</td>
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**Source:** Research data (2022).

The analysis of the interviews was carried out with the help of the ATLAS.ti software that contributed to organizing the data and classifying it along with the SDGs. The research was approved by the Ethics and Research Committee, according to process n. 5.383.153, of 22/05/2022.

**4 RESULTS AND DISCUSSIONS**

The food banks of the State of Paraná, managed by CEASA-PR (public) and SESC-PR (private) show concern with the generation of food waste, which is demonstrated, by means of daily actions to increase the capture of food, which results in less waste, and expand its action to reduce food and nutritional insecurity (Bazerghi et al., 2016; Zainal et al., 2019; Tapia & López, 2020; Warshawsky, 2023).

The relationship between the actors of the food bank was highlighted as paramount for the actions to be directed in the direction of seeking, more and more, a reduction in food waste. This relationship is tightened and interacts, by means of networks created between food banks, donors and beneficiary entities, with the purpose of avoiding waste and leveraging food donations. This network mobilization allows for the raising of a larger volume of donations from potential donors.

In all the interviews, this relationship between food banks, donors and beneficiary entities was highlighted as a major partnership for the fulfillment of these banks' objectives. It is interesting to note that there is a distinction in the two modalities of food banks, as to the origin of the donations.

The public food banks collect food, mainly from permissionaries and farmers who market products within CEASA itself, in addition to the Paraná Direct Purchase. This partnership of public food banks with farmers is in line with SDG-2, which seeks to combat hunger, achieve food security and promote sustainable agriculture (Arora & Mishra, 2022; Lima & Lemos, 2023).

Private food banks collect food from local traders, such as supermarket chains, and collect food that is close to maturity or poorly packaged. This demonstrates the importance of public and private food banks in reducing food waste, which can occur in various sources of revenue (Penalver & Aldaya, 2022).

In addition, public and private food banks do not compete with each other, on the contrary, there is mutual help between them, deriving from the common goal they have in reducing food discards and contributing to access to quality food for the vulnerable population.

The exchange of knowledge, experiences and routines proved to be a consolidated practice in food banks, through courses offered to the general population for the integral use of food, diversification of revenues and awareness about food waste. On the other hand, there is mutual learning, from the exchange of knowledge about the use of food that emerges from the community itself.

In the context of food waste, the dominant way of dealing with food waste was directed towards its destination as disposal. Currently, the food surplus, which is able to be used for human consumption, is being targeted to help combat food and nutritional insecurity.

The current discussions are based on the social, economic and environmental problems that food waste entails (Filgueiras, 2017; Dou et al. 2018; Notarnicola et al., 2017; Morone et al., 2019; Principato et al., 2019). Culture is still a crucial facet for a food system that prizes...
less waste, and in Brazil, the spread of food waste among consumers is still incipient (Caisan, 2017).

In Brazil, food banks are important tools for food and nutrition security to fight against food waste (Paula et al., 2017). The actors of the food banks of Paraná exercise awareness among the beneficiaries, the population served and donors about the problem caused by food waste. This initiative consolidates itself, by means of courses that are offered, together with the entities and the population attended, on the integral use of food, and of courses that the community shares knowledge about food, such as recipes that instigate the use of non-conventional parts. On the other hand, raising awareness among donors is a daily task and, as reported, it is a process of changing their perception of food, which often takes a long time to be donated, in the expectation of selling the product, but when the sale does not take place, ends up not giving time to make the donation because the food can no longer be used.

Therefore, donor culture about food waste is a point that food banks seek to address most strongly. The change in food consumption behavior is the most prominent challenge, according to the case studies analyzed. Greater awareness of the impacts that food waste causes on society and the environment is needed, so that there is a structural change in society, a change in individual values and a look under the lens of responsibility in production and consumption, so that there are new perceptions about food waste generation, environmental degradation, food waste and access to adequate food for all.

The restructuring of the CEASAS food banks led to the modernization of industrial cuisine, which improved the technological arsenal for better use of food, which resulted in less waste. With this modernization, many foods that cannot be passed on in natura to entities due to the ease of spoiling, are minimally processed, vacuum packed and frozen to increase their shelf life, conserving their nutritional value.

Another alternative brought about by the modernization of the kitchen was the acquisition of equipment that transforms food into jellies, jams, jams, preserves, sauces amongst others. This is evidenced in Tenuta et al. (2021), which highlight food banks as important mechanisms for reintroducing wasted food that directly relates to the results of SDG targets 2.1 and 12.3.

Food and nutrition insecurity increased in the period of the COVID-19 pandemic due to the number of businesses that closed at that time, with painful consequences for the economy, such as rising unemployment. According to Nemes et al. (2021), the COVID-19 pandemic has impacted the global food system, affecting food security and nutrition, and has impacted the food chain from production to consumption. According to the authors, food banks felt this impact because of the demand for food and the need to modify its operationalization to meet the population in need. In certain regions, some food banks have seen decreases in donations, while elsewhere, donations have increased.

Therefore, the food banks, both public and private, showed their capacity to organize themselves to raise more food, to seek new partnerships and to innovate their working instruments, as occurred in the period of the COVID-19 pandemic, according to the interviewees' reports and in the documents analyzed. This ability of food banks to organize themselves in the face of unpredictable situations to contain food and nutrition insecurity and waste, as in times of public calamity, has already been pointed out in the literature (Belik et al., 2012; Galli, Cavicchi, & Brunori, 2020; Nemes et al., 2021) as a factor that elevates these entities to an important contribution to a more sustainable food system.

The practices pointed out in the case studies carried out, denote the importance of the food banks of the State of Paraná, to contain food waste and food and nutritional insecurity (Zainal et al., 2019; Nascimento, 2020; Tapia, & López, 2020; Tenuta et al., 2021; Sundin et al., 2023). They not only target food, but develop initiatives with society to raise awareness of
sustainable food consumption and the integral use of food. These practices demonstrate the important role of food banks in achieving SDGs 2 and 12. Thus, the food banks of the State of Paraná proved to be aligned with SDG-12: sustainable consumption and production and their respective goals 2.1, 2.2 and 12.3. Specifically, target 2.1 aims to combat hunger by ensuring access to safe, nutritious and sufficient food for children and vulnerable people. Goal 2.2 seeks to end all forms of malnutrition of children up to five years old and meet the nutritional needs of adolescents, pregnant and lactating women and the elderly (UN, 2015). In this sense, food banks carry out the destination of healthy and nutritious food for the beneficiary entities (nursing homes, children and adolescents' homes, hospitals and other social assistance centers) (Tenuta et al., 2021).

In turn, SDG 12 is made up of 11 goals that are oriented towards the promotion of sustainable production and consumption patterns. Specifically, target 12.3, which aims to halve food waste in the retail and consumption phase and food loss in the production phase (UN, 2015; Ardra & Barua, 2022). Through their actions, the food banks investigated demonstrated a diversity of initiatives to contain more and more food waste. These entities not only capture the food from the donors, but also, aim to make the most of the food that is already at an advanced stage of maturing, by investing in equipment and technical studies developed. Still, they seek to promote the awareness of the population for nutritious, sustainable and sufficient food, without waste.

5 FINAL CONSIDERATIONS

This study aimed to analyze how the food banks of the State of Paraná contribute to the fulfillment of the SDGs. For research, descriptive, bibliographic, multicase methods were used with semi-structured interviews. The results achieved showed that food banks directly meet SDGs 2 and 12, specifically targets 2.1, 2.2 and 12.3. Food banks aim to combat hunger by ensuring access to safe, nutritious and sufficient food for children and vulnerable people (target 2.1). Also, it seeks to end all forms of malnutrition of children up to five years old and to meet the nutritional needs of adolescents, pregnant and lactating women and the elderly (target 2.2). Various organizations receive food from food banks, such as nursing homes, children's and adolescent homes, hospitals and other social care centers.

As for SDG 12, in goal 12.3, food banks develop several initiatives to combat food waste, such as the development of nutritional techniques for foods at an advanced stage of maturation (jellies, jams, sauces, vacuum-packed foods), as well as the development of initiatives to raise awareness of the problem of food waste such as lectures, workshops, courses for the integral use of food, information booklets and community actions for less food waste.

Thus, this study sought to contribute in the theoretical line on SDGs 2 and 12, specifically to the achievement of the goals addressed. In practice, the results help demonstrate food banks’ initiatives to meet the 2030 Agenda and promote a fairer and more sustainable society.

This study presents limitations related to the actors researched, which was guided in the public and private food banks of the State of Paraná. In addition, the practices developed by food banks were linked only to direct service of the SDGs. It is suggested that new research be developed in order to encompass food banks of other Brazilian states and even to carry out a comparison of the practices developed for the achievement of the SDGs in food banks of other countries, as well as to deal with the fulfillment of the SDGs in an indirect way.
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