

# **How to reduce food waste in the B\_M company`s restaurant**

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## **Abstract**

*About a third of all food produced in the world is wasted. To reduce this unfortunate number, several companies are trying to do their part. The article analyzes the causes of food waste in the B\_M company restaurant, located in the Industrial Pole of Manaus, to propose actions to improve its environmental performance. The research is of an applied nature, with data collection and analysis using qualitative and quantitative approaches. The procedures involve case study, documentary and bibliographic research, and survey application, based on a questionnaire composed of 2 sections and nine questions, applied randomly at lunchtime with 300 employees. After analyzing the data, it was concluded that waste is related to the preparation and menu of meals, occurring effectively in the consumption phase, when 58% of respondents leave food scraps on the plate, due to the bad taste of the meals (81 %), not pleasant menu (41%) and for over-serving (25%). The main foods left on the plate are beef (34%), chicken meat (32%), rice (23%), beans (20%), and fish (20%). In the end, six suggestions were given to managers to reduce food waste at the restaurant.*

**Key-words:** Food waste; Restaurant; Meals.

## **1. Introduction**

Food waste is a perceived problem worldwide. But when it comes to restaurants, it becomes clear, as it has a financial and environmental impact. According to Bradacz (2013), modernity has brought strength to the restaurant sector since, due to the hustle and bustle of everyday life, thousands of people stopped eating at home and started to frequent restaurants because of the practicality that these places offer. In this way, restaurants now have a share of the responsibility to combat food waste.

Mariz and Watanuki (2019) say that food waste brings with it several other social, economic, and environmental problems. Therefore, restaurants must prepare nutritionally balanced foods and be economically efficient and environmentally responsible.

The waste of food for restaurants has an impact on society. Tackling this problem has benefits for everyone, as it directly affects the financial part of restaurants and communities.

Amorim (2012) states that improving resource management within the production process is the goal

of all organizations. As a result, restaurants seek efficiency in their processes by reducing waste, as it represents better yields. Grato et al (2016) state that food waste severely affects the financial side of restaurants, which is why they must seek measures to minimize these losses.

Given the above, this is a case study that took place at B\_M (fictitious name), a company in the Manaus Industrial Pole that has sectors of Integrated Management System (SGI), Specialized Services in Safety Engineering and Occupational Medicine (SESMT), Production Planning and Control (PCP), Purchasing, Accounting, Information Technology (IT), Warehousing, Manual and Automatic Insertion. They produce remote controls, cards, power supplies, and digital routers, the latter line being the flagship of the organization since in 2018 it represented 80% of the company's annual revenue.

In 1998 and 2010, respectively, B\_M was certified by ISO 9001 and ISO 14001, with the SGI being the sector responsible for actions related to these standards. Among them, there is the monitoring of the solid residues generated, as well as the correct final disposal of them.

The restaurant located in the company is outsourced, so all food preparation activities and waste disposal are the restaurant's responsibility. However, B\_M should inspect and collect evidence that the procedures are being carried out correctly and works with the restaurant to improve the organization's environmental performance.

The restaurant sends the WDC (Waste Disposal Certificate) to the B\_M monthly, which information on the amount of waste generated in the previous month is described, allowing the analysis of the waste rate in the restaurant. For example, between 2016 and 2018, the restaurant saw a 10.5% increase in food waste (Table 1), with about 9,490 kg of organic waste.

Table 1: Generation of organic waste between 2016 and 2018 (Kg) in B\_M

ITEM	2016	2017	2018	Increase of 2016 a 2018
Organic waste	2993.83	3150.57	3345.76	351.93 (10.5%)

Source: B\_M's SGI sector

So, the main research question is "how to reduce food waste in the B\_M restaurant?"

### 1.1 Objectives

The general objective is to analyze the causes of food waste in B\_M's restaurant to propose actions to improve its environmental performance.

The specific objectives are: identify the causes of food waste; identify great management practices for reducing food waste, and propose improvement actions to reduce food waste.

### 1.2 Importance of research for the company

Food waste reflects on financial costs. Pistorello, Conto, and Zaro (2015) state that energy and water costs are additional disadvantages of food waste, whose financial resources could be used in other areas.

Villan and Alves (2010) claim that restaurants that have a waste rate of up to 5% of the produced are classified as excellent, those that have losses between 5% and 10% are considered in good condition, between 10% and 15% regular and above 15% lousy. Thus, food waste is a matter of survival for restaurants, as it is unsustainable to maintain an enterprise with high losses.

On the other hand, it is necessary to comply with the applicable laws. For example, Law 12,305 / 10 - National Solid Waste Policy (PNRS) - created in 2010 to reduce the amount of waste in landfills and

landfills, determines that everyone involved in the product's life cycle is responsible for the waste generated. Therefore, restaurants are required to correctly dispose of all waste generated in their activities following federal law, through the rules of the state supervisory body.

And Bill 675/2015 establishes the National Policy to Combat Food Waste and provides other measures. The purpose of this law is to increase the use of food suitable for human consumption by reducing waste and expanding the recycling of food unfit for human consumption.

For Mori et al (2015), the preference of shareholders, customers, employees, and other stakeholders in business operations is more focused on organizations with competitive advantage internally and externally.

In this sense, the research is relevant, as it contributes by offering suggestions for improvements to reduce waste, cost while complying with current laws.

### 1.3 Relevance of research to Society

Around 870 million people go hungry every day in the world, which searches for strategies that reduce food waste increasingly relevant and urgent (PEIXOTO; PINTO, 2016).

Bueno (2019) states that food waste is a problem faced by several nations due to the high growth of the world population. Bueno argues that one-third of all food production in the world becomes food waste and that Brazil loses and discards about 26 million tons of food suitable for human consumption per year.

According to FAO (2018), the number of undernourished people worldwide rising from 804 million in 2016 to 821 million people in 2017, of which almost 22 million live in South America. However, Martins and Farias (2002) affirm that making food available to everyone is not enough to increase world production, also necessary to involve everyone in the production chain in the fight against waste.

The research contributes to the fight against a problem that is not only political and economic also ethical and moral, as there is hunger in the world, even with excess food. These situations occur in Brazil, Amazonas, and Manaus.

### 1.4 Relevance of research to academia

The theme belongs to the Industrial Engineering Sustainability area. In the last ten years, there are no topics in articles related to food waste in an industrial restaurant, newspapers, and Industrial Engineering events (Table 2), as well as in five banks of theses chosen at random (Tables 3).

Table 2: Search for "Food waste" in Industrial Engineering annals and magazines (2008 to 2019)

Sources	Nº of articles	Authors
Annals of ENEGEP	1	Mariz an Watanuki (2019)
GEPROS Journal (ISSN19842430)	1	Abbade (2019)
Management & Production Journal (ISSN0104530X)	1	Moraes et al., (2019)
Total	3	-

Source: Author

Table 3: Search for "food waste" in 5 Dissertation and Thesis Database (2003 and 2019)

Sources	Nº of articles	Authors
Database of Dissertations and Theses at USP	3	Baba (2008); Cseh (2019); Pires (2013)
Database of Dissertations and Theses at UFRJ	2	Oliveira (2016); Travessa and Silva (2017)
Database of Dissertations and Theses at UFRS	1	Dal'Magro (2004)
Database of Dissertations and Theses at UFSC	1	Bradacz (2003)
Database of Dissertations and Theses at UFAM	1	Amorim (2012)
Total	8	-

Source: Author

Thus, this article can contribute to the local academics to reflect on the subject and to stimulate new research on a little-explored theme in a region containing an Industrial Pole with hundreds of companies that have restaurants that may be generating food waste.

## **2. Theoretical Reference**

### **2.1 Definitions of food waste**

According to Brazilian Law 675 of 2015, food waste is the reduction and disposal of food intended for human consumption. That is still suitable for that purpose.

According to FAO, food waste is the amount of food intended for human consumption that not attended its purpose (FAO, 2016; FAO, 2011; FAO, 1986 apud ABBADE, 2019).

For Peixoto and Pinto (2016), food waste is the combination of the terms loss (unintentional refuse) and disposal (intentional refuse) of food.

Melo et al (2018) define the term as the intentional disposal of items suitable for human consumption. For the World Bank Group (2014), loss of food and food waste refers to edible parts of plants and animals intended for human consumption that is not ultimately consumed by people (THE WORLD BANK GROUP - TWBG, 2014 apud NASCIMENTO, 2018).

Based on these references, food waste is producing food suitable for human beings, but that is discarded as organic waste, still able to be consumed. In this research, food waste is specifically focused on the consumption phase, when the food is on the final consumer's plate.

### **2.2 Food waste around the world and in Brazil**

According to the UN (2013), the world wastes around 1.3 billion tons of food per year. With part of these foods, it would be possible to satisfy the nutritional needs of more than 800 million people.

For Peixoto and Pinto (2016), this very high waste causes damage to society, evidenced by economic losses, as supply is reduced and, consequently, product prices are increased. Food waste in the world is estimated to reach approximately \$ 750 billion every year.

According to Zanini (2013), world food production is more than enough to meet the needs of the entire world population, however, losses at different stages of the production chain, as well as in preparation and consumption, make this quantity produced not reach everyone. Identifying the causes of waste in the chain phases is one of the most difficult tasks, as several factors must be taken into account, including the country, the climate, the transport system, awareness, production systems, arable land, etc.

In Brazil, it can be a reflection of what happens in the world. Villan and Alves (2010) states that Brazil loses about R \$ 12 billion in food each year, enough to feed approximately 30 million people.

According to EMBRAPA (2016), Brazil is among the TEN countries that waste the most. Abade (2019), on the other hand, argues that Brazil is considered a prominent food producer with global potential, but still needs to improve its production efficiency, improving the logistics process and levels of waste. With the Brazilian transport system, one should invest mainly in the railway network, as it is a more efficient transport system than the road, which would reduce the time of distribution of food and consequently the losses in the transport phase.

On the other hand, Busato and Ferigollo (2018) state that one of the main causes of waste is the population's lack of awareness. Therefore, there must be respect and consideration across the planet about food.

### **2.3 Food waste in restaurants**

The control of waste is a factor of great relevance, as it is not only an ethical issue but also an economic one with political and social reflexes (ZANINI, 2013). Most restaurants are companies that seek financial gains, and food waste needs to be one of the most important issues for managers, as it affects costs, prices, and customer satisfaction. Thus, it is important to measure all forms of losses in an establishment to have real data that can help in eliminating the causes of financial losses.

According to Silvério and Oltramari (2014), the waste of food in a restaurant is evidence of a lack of quality and must be avoided through adequate planning, so that there is no excess production and leftovers.

Villan and Alves (2010), on the other hand, state that food waste in restaurants is caused by unhealthy habits and customs or flaws in production or administration.

A fundamental condition, for the good performance of Food Services, is the adequate planning of the volume of meals to be prepared, as it aims, among other aspects, to reduce or control food waste (SILVA JUNIOR; TEIXEIRA, 2008 apud PARISOTO; HAUTRIVE; CEMBRANEL, 2013).

### **2.4 Good practices for reducing food waste in restaurants.**

Restaurant managers need to know the root causes of food waste in their restaurants to use the most efficient tools in their cases. And great practices include the following preventive measures:

a) planning, organization, supervision, and awareness of employees can contribute to reduce this waste and the financial loss generated and also favor safe and tasty food for users (GRATÃO et al, 2016);

b) the continuing education of both employees and users of the restaurant is extremely important because if the meals are not pleasant for those who consume, awareness makes the individual serve a small amount on his plate just to avoid waste. According to Villan and Alves (2010), the development of training for employees on the most efficient way to serve the users of the establishment is a great action to avoid waste and financial losses;

c) planning the quantities produced and monitoring losses daily are good alternatives to reduce food waste (PISTORELLO; CONTO; ZARO, 2015). According to Zanini (2013), a good way to reduce waste in restaurants is to identify and replace foods with low acceptance and a high rate of the waste. That is, one must study waste and stop or reduce the production of food that is not being appreciated by users. Through the daily weighing of food scraps, it is possible to assess user satisfaction and waste, being able to readjust production planning, both qualitatively and quantitatively (SILVÉRIO; OLTRAMARI, 2014);

d) according to the American website WebstaurantStore <<https://bityli.com/qLclo>>, a good way to reduce waste in a restaurant is to do a food waste audit to find out how much is wasted and what type of waste is being produced. In this way, it is possible to find ways to reduce them;

e) while Sakaguchi, Pak, and Potts (2018) bring broader and strategic thinking. The authors claim that joint action between stakeholders is needed. Therefore, it is important to partner with other companies, government, or society so that there is a joint effort to fight food waste, particularly in restaurants.

### **3. Methodology**

The research is of an applied nature since it will offer practical contributions to the B\_M restaurant to improve its management over time. As for the objectives, the research is descriptive since it studied and described the characteristics of organic waste existing in the organization, without changing the values of the variables involved.

Regarding the way, the information will be collected and analyzed, qualitative and quantitative approaches were used. According to Dalvoro, Lana, and Silveira (2008), in the quantitative approach, data collection emphasizes numerical information that make it possible to verify the occurrence or not of the consequences, and then the approval or not of the assumptions. Regarding the qualitative approach, the same authors state that it works mainly with data that are not expressed in numbers or else the numerical information and the conclusions based on them play a minor role in the analysis.

Procedures involving case study, bibliographic research of articles, dissertations, and theses involving the topic were used to identify good practices for reducing food waste in the industry.

Also, documentary research (records, spreadsheets, waste inventory, destination certificates, etc.) was carried out with the sectors involved in the organization (SGI and restaurant sector).

For this, the research followed the following steps:

1st) to carry out bibliographic and documentary research: 01/12/2019 to 03/01/2020

2nd) to map the processes where organic waste is generated: 02 to 06/12/19

3rd) to develop the questionnaire for field interview: 11 to 12/13/2019

The data collection and analysis instrument was developed based on questions 1, 2, 14, 15, 19, 21, 22, 25, and 26 of the interview questionnaire developed by Zanini (2013) in his master's dissertation, which he studied ways to reduce food waste in a university restaurant. The questionnaire (Appendix A) used in B\_M, had 2 sections and 9 questions, with the first section focusing on collecting data on food waste, while the second section refers to the profile of the interviewee.

4th) to set the sample size and perform a pilot test: 12/16/2019

The population size is 997 employees who use the restaurant's services daily. So, using the online survey monkey calculator <<http://bit.ly/32DDzGF>> and taking into account a 90% confidence level and 4% error margin, the minimum sample size to be representative was 296 employees, which is why the goal was to randomly interview 300 employees who have lunch at the restaurant.

Once the questionnaire was prepared, a pilot test with 60 people was applied on 12/16/19 to check the level of comprehensibility by the respondents, and small adjustments were made to some questions to make them clearer at the time of the questionnaire. interview. Then the definitive test was started with the other employees.

5th) to carry out a definitive test with the remaining 240 employees: 17 to 20/12/2019

6th) to type and analyse the results: 12/23/2019 to 02/02/2020

The responses were typed on a Typeform platform <<http://bit.ly/2T70184>>, which allowed the creation of an electronic spreadsheet, the construction of the graphs for descriptive analysis of the data <<http://bit.ly/387xiV8>>.

7th) to write the article: 01/12/19 to 23/07/2020

8th) to defend the article, improve, and final delivery: between 07/23 to 08/26/20

9th) to translate the article into English and submit for international journal: 08/27 to 09/15/20



## 4. Discussion

### 4.1 Respondents Profile

In total, 300 employees were interviewed, with a technical tie between genders (51% = male; 49% = female). In terms of age, the predominant age group was between 21 and 30 years old with 53% of respondents, while the second age group (29%) was between 31 and 40 years old, the third age group was between 21 and 50 years old with 11% of respondents.

Regarding the educational level, Figure 1 shows the percentages of the last level of education among the 300 respondents, with the majority (67%) having complete high school, 16.7% as incomplete higher education, 11.3% have completed higher education, only 5% had until incomplete high school.

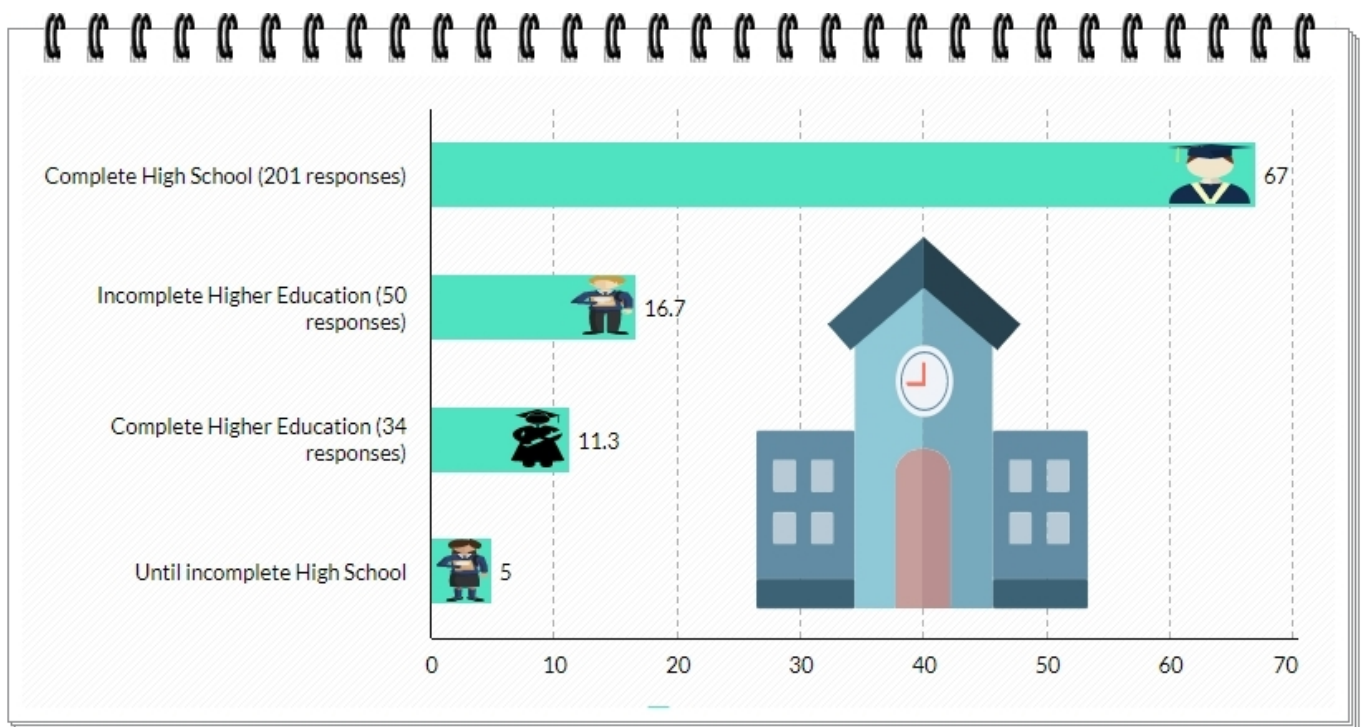


Figure 1: Last educational level of 300 respondents

Source: Author

### 4.2 Respondents' perceptions of food waste

Asked if they perceived food waste in the restaurant, the majority (94%) said yes, while only 6% answered that they did not perceive the problem.

When crossing the results to find out if there were differences in the level of concern between genders, age groups, and levels of education, it was found that to gender (Table 4), women are 5.05% below that of men.

Table 4: Perception by sex about daily food waste in the restaurant

Gender	No	Yes	Total
Female	7.79%	92.21%	154 (51%)
Male	2.74%	97.26%	146 (49%)
Total Result	-	-	300

Source: Author

Regarding the age groups (Table 5), all were also above 90%, with the age group between 31 and 40 years standing out, with more than 97% of them reporting that they perceived food waste.

Table 5: Perception by age about daily food waste in the restaurant

Age	No	Yes	Total (%)
21 to 30 yes	6.25%	93.75%	160 (53 %)
31 to 40	2.27%	97.73%	88 (29.3 %)
41 to 50	8.82%	91.18%	34 (11.3 %)
Up to 50	5.56%	94.44%	18 (6 %)
Total Result	-	-	300

Source: Author

When analyzed by the level of education (Table 6), the highest level of perception (97.06%) is among those who have completed higher education. Then come those who have completed high school, with 95.12%. Among those with incomplete higher education, the percentage is 92%. Finally, among those who have not completed high school was below 91%. Thus, those with a higher level of education have a better view of the problem.

Table 6: Perception per schooling about daily food waste in the restaurant

Last educational level	No	Yes	Total (%)
Until incomplete high school	9.09%	90.91%	11 (3.6 %)
Complete high school	4.88%	95.12%	205 (68.3 %)
Complete higher education	2.94%	97.06%	34 (11.3 %)
Incomplete higher education	8.00%	92.00%	50 (17 %)
Total Result →	-	-	300

Source: Author

### 4.3 Levels of concern about putting the right amount of food on the plate

When asked what was the level of concern about putting the appropriate amount on the plate, in order not to generate waste. 54% of respondents said they had a high or very high level of concern, 35% said they had an average concern and 10% said not to worry or have a very low concern.

When crossing the answers based on age, sex, and education, it was possible to find the following results (Table 7): concerning gender, the following was contacted that in both sexes, the average level of concern obtained a higher percentage, or that is, 35.71% for women and 34.93% for men. The percentage of women with concern at the High or Very High level was technically tied (54.55%) with the response of men (54.11%).

Table 7: Levels of concern with placing the appropriate amount on the plate (Gender)

Gender	Very high	High	Medium	Very low	None	Sub Total
Female (F)	24.03%	30.52%	35.71%	8.44%	1.30%	154
Male (M)	26.71%	27.40%	34.93%	8.22%	2.74%	146
Diference F-M	- 2.68%	3.12%	0.78%	0.22%	- 1.44	-
Total →						300

Source: Author

Regarding age (Table 8), it was found once again that the Middle level was the one that obtained the highest percentages in all age groups, as there was 35.63% among those aged 21 to 30 years, 32, 95% among those aged 31 to 40 years, 41.18% among those aged 41 to 50 and 33.33% among those over 50 years old. At the High or Very high level, the highlight was for the age group between 31 and 40 years old (59.1%). On the other hand, people over 50 had the highest percentage (16.7%) of no or low concern.



Table 8: Levels of concern with placing the appropriate amount on the plate (Age)

Age	Very high	High	Medium	Very low	None	Sub Total
21 to 30	23.75%	30.00%	35.631%	7.5%	3.13%	160
31 to 40	31.82%	27.27%	32.95%	6.82%	1.14%	88
41 to 50	17.65%	29.41%	41.18%	11.76%	0.00%	34
Higher than 50	22.22%	27.78%	33.33%	<b>16.67%</b>	0.00%	18
					Total →	300

Source: Author

Regarding the level of education (Table 9), it was found that individuals with complete higher education have the best levels of concern, as 73% of the responses in this group were divided into the High (32%) and Very High (41%) levels. Individuals who had not completed high school are those who had the least favorable results (18% High). Concerning the group with no (4%) or very low (10%) concern, those with incomplete higher education were those who had the worst result (14%).

Table 9: Levels of concern about putting the right amount on the plate (Education level)

Education	Very high	High	Medium	Very low	None	Sub Total
Until incomplete high school	0%	18%	73%	9%	0%	11
Complete high school	23%	30%	36%	9%	2%	205
Complete higher education	<b>41%</b>	<b>32%</b>	26%	0%	0%	34
Incomplete higher education	30%	26%	30%	<b>10%</b>	<b>4%</b>	50
					Total →	300

Source: Author

#### 4.4 Main reasons for respondents to waste drinks (juices)

Respondents responded if they usually left leftover drinks (juices) and if so, what would be the reasons for wasting this item.

In response, the majority (256; 85%) reported that they do not waste drinks, while only 15% (44) acknowledged that they do.

Regarding the reasons why 44 (15%) carried out this waste, the majority (72%) did not like the taste of the drink, 29% claimed an inadequate temperature, 4% stated that it would be due to the high amount of liquid in the glass, while 18% cited other reasons.

In comparison to Zanini's dissertation (2013), on which the creation of the form was based. The results of this same question were different, as 47% stated that the reason would be the excessive amount of liquid in the glass, 33% claimed that the reason was that they didn't like the taste and 20% said the reason was the inadequate temperature of the drinks. Respondents could choose more than one answer.

#### 4.5 Main reasons why respondents said they left food on the plate

Respondents were also asked whether they left food scraps on the plate during lunch and what the reasons for the waste would be. If the interviewee claimed not to leave food scraps, then they were asked what, in his / her opinion, would be the reasons for the other employees to waste. As a result, of the 300 respondents, 173 (58%) of them confessed to leaving leftovers on the plate, and 127 (42%) said they did not have such an attitude.

In the opinion of the 173 who said they wasted, the five main reasons for leaving food scraps on the plate were (Figure 2): the food taste was bad (81.5%), the menu is not pleasant (52.6%), little or very salty meals (22.5%), inadequate food temperature (20.2%) and excessive seasoning (15.6%).

In Zanini's dissertation (2013), 51% of the interviewees stated that the main reason for the waste of food in the restaurant of the Federal University of Santa Maria-RS was also the food taste was bad, but with a difference of 30% concerning this work.

In both surveys, the respondent could choose more than one reason.

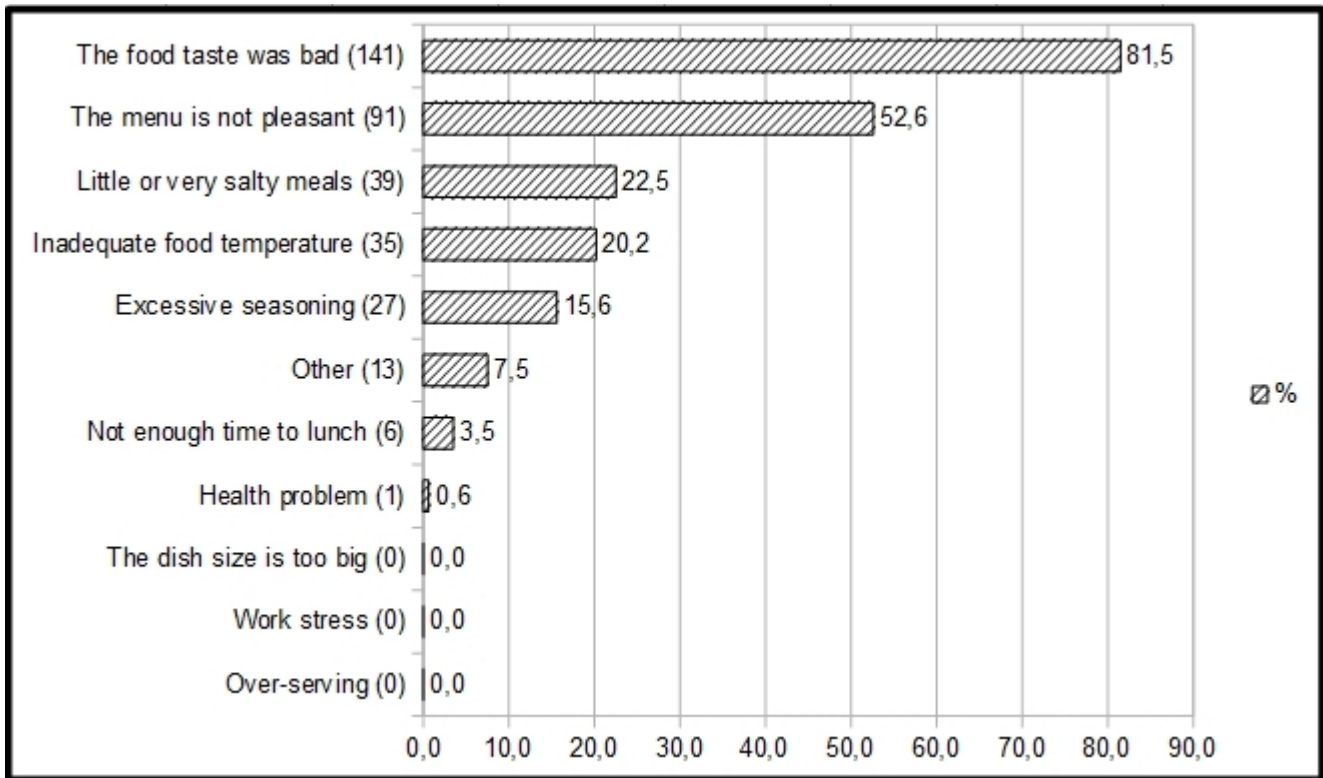


Figure 2: Main reasons for wasting food among those who claim to be wasting

Source: Author

**4.6 Main reasons why other employees waste food**

Based on the responses of 127 (42%) respondents who said they did not leave leftovers on the plate during lunch, but who gave their opinion on the reasons why other employees leave leftover food on the plate (Figure 3).

The food taste was bad (51.2%) is the main reason, followed by an unpleasant menu (45.7%), over-serving (27.6%), inadequate temperature (14.2%), and little or no food very salty (11%).

When joining the responses of the group that recognized (YES, Figure 2) that wasted food and the group that said that it does not (NO, Figure 3) and gave an opinion on the reasons why the other employees do so, it is clear that the reason "Serving yourself in Excess" was not recognized by any of those who waste food. This may represent that these employees consider that the problem is the company and not generated by them, while the employees who said they did not waste, believe the on the contrary, as can be seen in Figure 4.

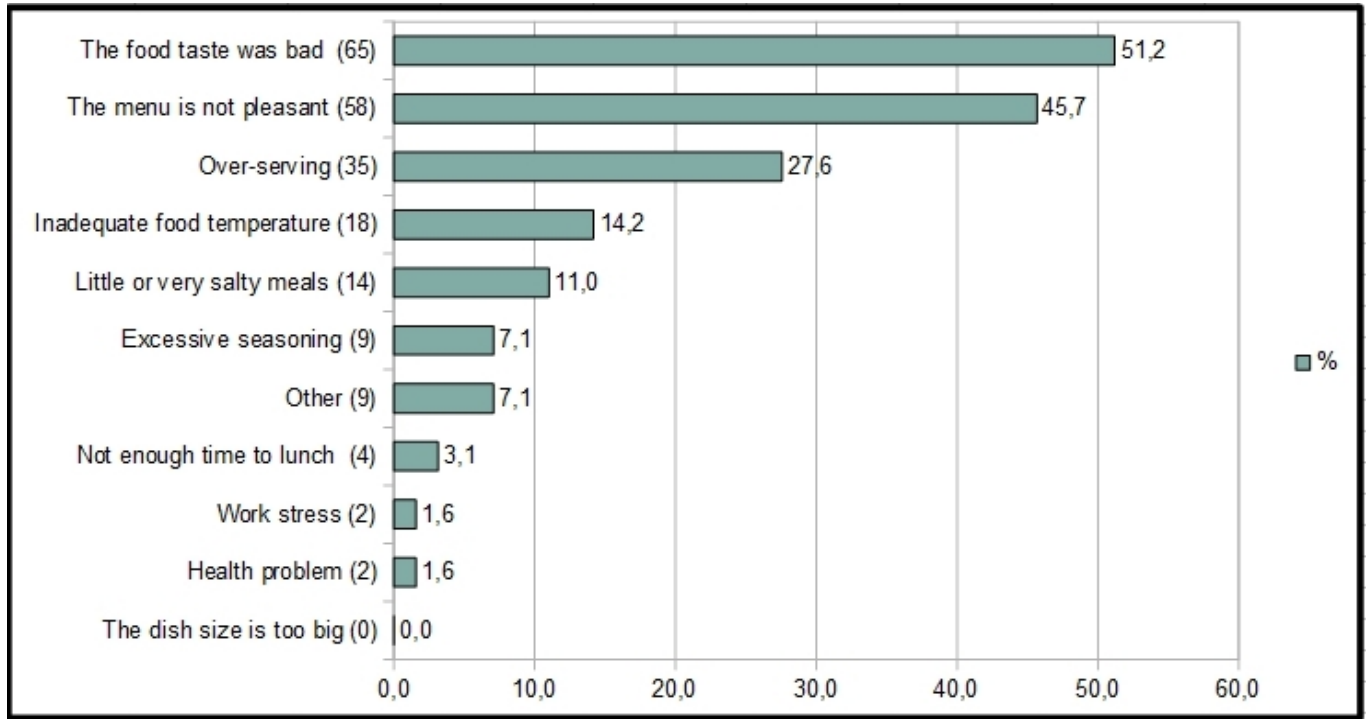


Figure 3: Main reasons for wasting food by other employees

Source: Author

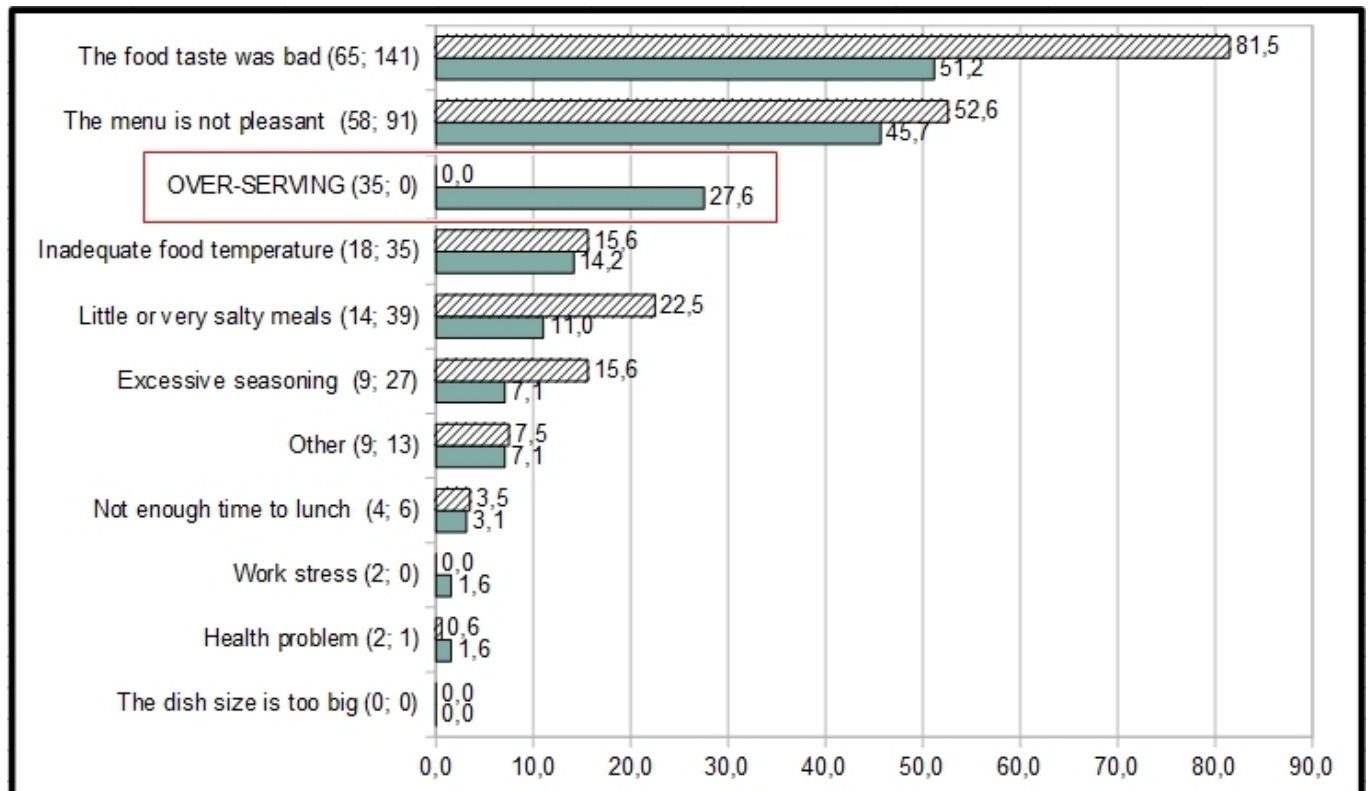


Figure 4: Difference in perception between the YES and NO groups about food leftovers

Source: Author

The other reasons followed almost the same order of classification, with only a difference between the percentages.

**4.7 Most wasted food**

The 300 interviewees responded to what foods they most wasted, even if rarely, during lunch.

Almost all answered the question (299), results in Figure 5 show that the most wasted are in this order: beef (34.1%); chicken (32.1%); rice (23.4%); beans (20.7%), fish (20.1%), that is, meat waste exceeds that of grains. More than once, respondents could choose more than one option.

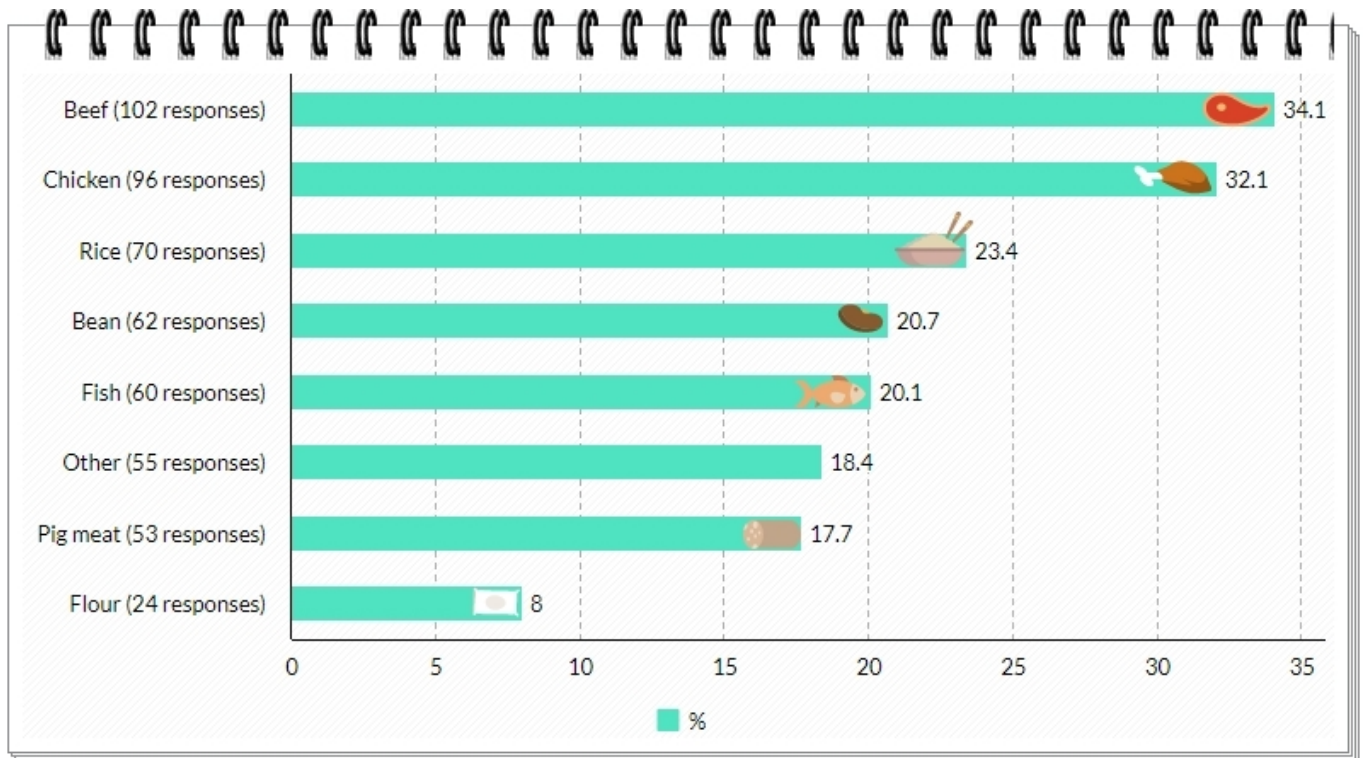


Figure 5: Main wasted foods

Source: Author

**4.8 Actions to reduce food waste**

The last question invited respondents to propose possible solutions to reduce food waste.

Among the 300 interviewees, 160 (53.3%) gave at least one suggestion, most cited were:

- a) preparation and improving the menu (23.1%);
- b) improve seasoning (17.5%);
- c) change the restaurant (10%);
- d) improve the taste (9%);
- e) make users aware (5%);
- f) improve service (3.75%);
- g) improving drinks (3.75%);
- h) offer a more varied menu (3.1%);
- i) serve in the appropriate amount (3.1%);
- j) improve the cooking of meat and chicken (2.5%);
- l) reduce oil (1.9%);
- m) produce healthier foods (1.9%);
- n) use two counters to reduce queue size and time (1.9%);
- o) put little food on the plate (1.9%), etc.

It was noted that the suggested improvement focused on the preparation of the meals, since most (81%) of the suggestions were focused on this phase of the process. However, it is worth noting that one-tenth of the respondents prefer to change service providers.

## **5. Conclusions and recommendations**

The general objective is to analyze the causes of food waste in the B\_M company restaurant, to propose actions to improve its environmental performance.

A questionnaire was applied to 300 employees interviewed at random, whose analysis of the data led to the following conclusions and recommendations:

a) waste is related to the preparation and menu of meals, occurring effectively in the consumption phase when people serve themselves and leave leftovers in the dishes;

b) the majority of the interviewees perceive that there is food waste in the restaurant. Men have a slightly higher perception about food waste compared to women employees between 31 and 40 years old, as well as having completed higher education also have a higher perception when compared to the others. However, the results indicate that there is no significant difference of opinion between genders with placing the appropriate amount of food on the plate. But employees over 50 years old, as well as those who have not completed high school or higher education incomplete, were those who had the lowest level of concern about putting the proper amount of food on the plate. Thus, it is recommended to build a participatory awareness program with employees, consisting of lectures, suggestion boxes, continuous assessment of satisfaction, presentation of results with corrective and preventive actions, as well as recognition of those who help to reduce waste;

c) about 15% of the interviewees waste drinks, due to the taste, the inadequate temperature, and the high amount of liquid in the glass. The results are different from the research conducted by Zanini (2013) in a university restaurant;

d) besides, a little more than half of the interviewees leave food scraps on the plate, due to the bad taste of the meals, unpleasant menu, salt level, temperature, and seasoning. It was also observed the possibility of waste due to the employee being over-served;

e) the good practices identified that can reduce food waste in the B\_M restaurant are:

e1) the proposal by Gratão et al (2016) which focuses on the planning, organization, supervision, and awareness of employees who prepare food and drink for employees;

e2) plan the quantities produced and monitor losses daily, replacing foods with low acceptance and with a high rate of the waste. In this sense, managers are recommended to analyze the suggestions for improvements proposed by customers, as well as create a dialogue channel with them to know the main reasons why they waste meat and grains in general;

e3) improving the phase of preparing meals, through better handling of spices, adoption of new gastronomic techniques, and adaptation of the menu to the preference of users;

e4) to carry out periodic audits on food waste, to identify the main wasted foods, changes in users' preferences, and to find improvements or worsens in the waste rates determined so far;

e5) make adjustments to strategies to combat waste whenever necessary;



e6) make use of automation systems to know which are the days and times with the highest flow of people, the most accepted and rejected dishes, the average consumption of each person, and also important information to assist the forecast of inputs for the restaurant.

The limitations of the research are: did not focus on the preparation of meals to know if the ingredients and seasonings are of good quality; the physical conditions of the work environment and emotional conditions of the restaurant employees were not verified. Because of this, it is recommended to conduct an organizational climate survey and/or others that are geared to the motivational and unhealthy part of restaurants.

**6. Appendix A – Questionnaire**

**SECTION 1: Reasons for food waste**

- 1.1 - Do you notice daily food waste in the restaurant?      a) yes                  b) no
- 1.2 - What is your level of concern with putting the proper amount of food on the plate?  
 a) None                  b) Very Low                  c) Medium                  d) High                  e) Very high
- 1.3 - Do you usually leave leftover drinks?      a) yes                  b) no
- 1.4 - If so, what is the main reason? (you can check more than one)  
 a) unpleasant taste      b) inadequate temperature      c) too much in the glass      d) Other
- 1.5 - Do you usually leave food scraps on the plate?      a) yes                  b) no
- 1.6 - If so, could you provide the main reasons?

a) the menu is not pleasant	b) I over-served myself	c) the taste of the food was bad
d) the temperature was inadequate	e) excessive seasoning	f) due to health problems
g) too little or too salty	h) the dish is too big	i) work stress
j) insufficient time for lunch	l) other	

1.7 - If not, what are the reasons the employees leave food on the plate?

a) the menu is not pleasant	b) I over-served myself	c) the taste of the food was bad
d) the temperature was inadequate	e) excessive seasoning	f) due to health problems
g) too little or too salty	h) the dish is too big	i) work stress
j) insufficient time for lunch	l) other	

1.8 - When you leave food, what are the foods usually?

- a) Beef                                  b) Pig meat                                  c) Fish                                  d) Chicken
- e) Rice                                  f) Beans                                  g) Flour                                  h) Other

1.9 - What actions would reduce food waste in the restaurant?

## **SECTION 2: Profile of Respondents**

2.1 Gender: a) Male b) Female

2.2 Age: a) < 20 b) 20 – 30 c) 31 – 40 d) 41 – 50 e) > 50

2.3. Last educational level

a) Until incomplete high school b) Complete high school

c) Incomplete higher education d) Complete higher education

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