Analysis Of Food Waste Management In Brazilian Public Universities Restaurants

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Abstract. The generation of food waste grows as the demand for food increases, being linked to the entire food production chain. The incorrect disposal of waste generates liabilities for the whole society. This shows that initiatives to ensure proper management and treatment of waste must be developed. The present research, of exploratory and descriptive character, proposes a systematic analysis through a bibliographic research and case studies, to identify the treatment carried out to food residues in the Restaurants of Brazilian public universities. The methodological strategy included the use of questionnaires to federal public universities in the southeastern region of the country. The objective of the research is to analyze the management and treatment of these wastes or the lack of them. The theme is incipient and important for sustainability. The work proved to be relevant and innovative as it develops a systematic analysis of food waste management in a university restaurant that can be replicated to other public and private institutions.
Keywords: Sustainable management. Circular economy. universities.

1 Introduction

There is an imbalance that grows with the increase in consumption linked to the inability of the environment to generate resources at the same speed that it is withdrawn. (VIEIRA, 2018).

Due to this, there is an increase in concern related to the damage caused by man to the environment and some sustainable strategies are being suggested so that these impacts can be reduced. Thus, one of the concepts of sustainability became known as the form of development that meets the current needs of the population without compromising those of future generations. (WCED, 1987).

Hugé, Mac-Lean and Vargas (2018) state that the concepts that serve as the basis for decisions associated with sustainability are represented by the environmental, social and economic pillars.

With regard to waste, Ng, Yang and Yakovleva (2019) mention that for effective management with adequate social, economic and environmental impacts, an integrated, circular system that efficiently improves its performance is necessary.

Some approaches for planning this strategic system are pointed out in the literature and most of them indicate the circular economy. In the circular economy, there is a systemic management and waste from a process is recovered and turned into raw material for another production process, observing the benefits and impacts of the chosen method. (NG, YANG AND YAKOVLEVA, 2019).

The matter is important because it affects the image of those who do not promote the proper management of these wastes. (SRIJUNTRAPUN, 2018). This is the case of the city of Ayutthaya, in Thailand, which may have its registration as a World Heritage Site canceled for having generated in 2015 an amount of waste five times greater than the previous year and had an inadequate final destination for them since it was stored in the middle of the rice fields, without any kind of management and treatment. (SRIJUNTRAPUN, 2018).

Rajagopal, Bellavance and Rahaman (2017); Sales (2017); Sharma et al.(2020); Nanda and Berruti (2021) exposed gaps in the literature that justify the choice of the theme addressed in this study.

Given the above, we have the following research problem: Due to the relevance of the topic, how to develop a systematic analysis of food waste management in restaurants of federal universities in Brazil?

The development of the proposal for a systematic analysis of food waste management is relevant because it meets the gaps pointed out by the previous literature, where the treatment for this waste is important for the population and universities can contribute to this being developed in other sectors as well. . In addition to providing an understanding of the management of these wastes carried out in these universities and thus suggesting improvements.

The objectives of this study are based on the contents presented in the context: The general objective can be described by the development of a systematic analysis of food waste management in Brazilian public universities. In order to meet the general objective proposed in the present research, specific objectives are proposed: to identify in the scientific literature systems of food waste management; develop a questionnaire to capture data from Brazilian public universities located in the Southeast.

The originality of this work lies in the fact that few works were developed within Brazilian universities regarding waste, despite the country's own legislation for this.

The work is organized into five sections defined as: 1- Introduction, 2- Theoretical Framework 3- Methodology, 4- Results and Discussion, 5- Conclusion and 6- References. In the next section, Theoretical Framework, you can find the theoretical basis related to the topic. Section 3, Methodology, describes the methods used in the research. In section 4, you can find the research results and the discussion linked to these results. Subsequently, in section 5, the article concludes. And finally, in section 6, it is possible to find the references used in the work.

2 Theoretical Reference

2.1 Waste Management

In the Brazilian National Solid Waste Policy you can find guidelines regarding waste, its better management and the focus on integrated management. (BRAZIL, 2010). It is also mentioned about the shared responsibility of the generated residue. (BRAZIL, 2010).

Gifts in art. 6 of this same Policy, it is possible to find item VII that talks about the shared responsibility of the life cycle of products and in VIII that addresses the recognition of reusable and recyclable waste as a good that creates economic and social value. (BRAZIL, 2010).

In the document on the analysis of greenhouse gas (GHG) emissions, it is highlighted that the management of urban solid waste generated in the country has not been biologically, physically and energetically valued, since this waste has a large percentage of destination, landfills or dumps, ignoring alternatives such as recycling. (Albuquerque and Coluna, 2018).

And waste such as paper, plastic, metal, is often recycled and/or reused, which does not happen with organic waste, which is improperly deposited in the environment (SALES, 2017). However, the latter correspond to more than 50% of the waste produced in Brazil. (IPEA, 2012).

These organic residues, when placed in dumps or landfills, pass through the actions of bacteria that generate methane, which produce harmful effects on health and the environment, still considered a gas causing the greenhouse effect, with a capacity 28 times greater than that of CO2. (ALBUQUERQUE AND COLUNA, 2018).

Organic waste, due to its rapid decomposition, produces bad odors and attracts insects and vectors that contribute to the emergence of many diseases, however, these same wastes can be used as raw materials in another production line, reducing environmental impacts. (Yazid et al., 2017).

Due to this, Ng, Yang and Yakovleva (2019) highlight some methods used today in the treatment of these wastes, such as Anaerobic Digestion (AD), composting, incineration with energy recovery, landfills or incineration without energy recovery, the last two being less sustainable, therefore the least indicated.

It can be said that AD is viable because it reduces the emission of methane released into the atmosphere and the biogas generated is intended to replace fuels normally used in the kitchen or can be used as electricity. (RAJAGOPAL; BELLAVANCE; RAHAMAN, 2017).

Lim, Lee and Wu (2016) cite composting and vermicomposting as methods for treating this type of waste.

2.2 Food Waste Management in Universities

With the increase in consumption, there is a seriousness in environmental problems and despite actions taken to solve these issues, they were not successful due to the need for the involvement of hierarchical levels from top to bottom and the

engagement of all those involved within a organization, which also occurs in Higher Education Institutions (HEIs). (Srijuntrapun, 2018).

For Leal Filho et al. (2015), although there are considerable challenges to be solved, HEIs are important in the process of sustainable development as they form thought and opinion, presenting the possibility of intensifying creation and propagation. However, it is necessary that the people involved in these academic activities serve as a basis for the dissemination of knowledge and strengthening of these practices.

And to finance these sustainable changes in the HEIs, a stipulated budget is necessary and can use the resources of the administration itself, projects, governmental or private support or even voluntary work, which brings an institutional maturity when there is an initiative of the actors of these institutions to promote these practices. (HUGÉ; MAC-LEAN; VARGAS, 2018).

In Brazil, the demand for sustainability in public administration and environmental education at all levels of education are important factors for the State to develop sustainable actions and these actions are essential in HEIs due to their specificity in the development and dissemination of knowledge. (Almeida, 2015).

Waliczek, McFarland and Holmes (2016) mention the difference in attitudes depending on the level of information and the importance of this for the management and treatment of food waste, which is a type that most ends up in landfills, producing GHGs and with it climate change. .

An important action is the one presented in the MMA manual (2017), which talks about the work of Professor Paul Richard Momsen Miller from the Federal University of Santa Catarina (UFSC), which was called the UFSC method. It is a method of thermophilic composting in static windrows with passive aeration to the reality of the country made for organic waste management projects in different scenarios.

Paixão (2018) used the biodigestor to treat the waste generated by the restaurant at the Federal University of Pernambuco (UFPE), which was developed with a focus on process efficiency.

In Brazil there are 299 public higher education institutions. (INEP, 2018).

the art. 16 of Decree No. 5,773 (BRAZIL, 2006) places the Institutional Development Plan (PDI) as a document prepared and valid for five years, which aims to identify the Higher Education Institution (HEI), in what it concerns its philosophy, mission, guidelines, organizational structure and the academic activities it develops and/or intends to develop.

And in art. 16 of Decree No. 7,746 (BRASIL, 2012), points out that in public administration, Sustainable Logistics Plans (PLS) need to be created and used, and these are guided by Normative Instruction No. 10 (2012), prepared by the Secretariat of Management at the Ministry of Planning, Development and Management.

3 Methodology

Due to the exploratory and descriptive nature of the research, a qualitative study was carried out (Voss et al., 2002; Barrat et al., 2011), in which a priori theorization was used to frame the design of the work (Ketokivi and Choi, 2014). This approach

has provided a deeper understanding of the issues that define the barriers to implementing food waste management, generating insightful new discoveries for the body of knowledge. However, it is noteworthy that these findings cannot be generalized statistically. The methodological design comprised three main steps: (i) determination of the ecological environment, (ii) definition of selection criteria, (iii) questionnaires applied to managers of public universities in southeastern Brazil, interviews with specialists; and (iii) content analysis and formulation of propositions. These steps are detailed below.

The survey began in 2019 and was completed in 2020. The selection of managers who responded to the questionnaire was defined according to certain criteria.

First, the objective was to confront theoretical and practical perceptions about food waste management in universities, but it was found that the topic is still incipient within the academy, with few articles on the subject.

Subsequently, in contact with the universities in the sample, it was realized that it was necessary to know what was being carried out until the time of the research and then the barriers faced by institutions that perform some type of treatment and those that still do not.

In the Southeast Region, in 2016, are the three of the four Brazilian states (São Paulo, Minas Gerais and Rio de Janeiro) that generated the most greenhouse gases (GHG) in the waste sector. (ALBUQUERQUE; COLUNA, 2018).

In Brazil there are 299 public higher education institutions, 19 of which are federal public universities in the Southeast Region. (INEP, 2018).

Considering what was stated, the research was carried out with a sample of federal universities in Southeast Brazil, that is, 19 universities.

The focus of the study was university restaurants due to the large amount of food waste generated. At the university that does not have this type of restaurant, the research was carried out in an existing private restaurant.

Secondly, all the professionals involved must work in the waste management part of the university or in the management of university restaurants because they also need to know about the subject and what is done at the HEI they work. As the national culture and the socioeconomic context can imply different challenges for research and practice in food waste management, the expectation was to identify some variation in the interviewees' perceptions.

A questionnaire was sent to the servers of the universities that are linked to the theme, which correspond to an approximate number of 1 to 2 employees per institution. These employees are responsible for managing the restaurants or are responsible for supervising the contract with a private company that manages this or even servers assigned to a specific sector responsible for waste.

The purpose of the questionnaire used is to present what currently happens with food waste in these institutions, in addition to the possibility of obtaining additional and more detailed information about the techniques of use, perception related to the sector that works with the theme, and thus mitigating the impacts generated. and enhance the benefits that the treatment of these wastes can generate.

A bibliographic research was carried out in the Scopus database, between May and July 2019, seeking to identify articles related to the theme of adequate final disposal

or treatment of organic food waste. In the search engine, the keywords were used with the Boolean operators: final disposal or treatment of organic food waste (containing 12 results, 2 of which for analysis), management AND {organic food waste} (with 9 results, 1 of which for analysis), "organic solid waste" (with 57 results, 8 for analysis), strategic management AND food waste (with 18 results, with 2 for analysis), "FOOD WASTE" + "UNIVERSITIES" + "MANAGEMENT" (containing 51 results, 10 of which for analysis), highlighting that those that were selected were because they showed adherence to the research topic and also had the following search filters:

1. Year: 2015 to 2019;
2. Type of documents: articles and reviews;
3. Area of knowledge:
    - Energy;
    - Engineering;
    - Business, Management and Accounting.

In table 1, the authors and the subject of the articles selected for analysis were presented.

Table 1. Articles selected for the 2nd analysis.

Author	Subject
KNOOP, C.; TIETZE, M.; DORNACK, C.; RAAB, T. (2018).	Development of initial loads of nutrients and heavy metals during biogas processing.
SEPÚLVEDA, J. A. M. (2016).	What happens with waste in Colombia and the possibilities of use and recovery of this waste.
YEO, J.; CHOPRA, S. S.; ZHANG, L.; AN, A. K. (2019).	It determines through the Life Cycle Assessment the environmental impacts related to the decentralized technology of a type of compost ("Smart Food Waste Recycling" or S-FRB).
WIKANDARI, R.; TAHERZADEH, M. J. (2019).	Review of the theory and latest developments of anaerobic digestion of organic waste are reviewed and the principle, technology, benefits and drawbacks and factors that affect the effectiveness of each type of high cell density reactor are also presented.
ABDEL-SHAFY, H. I.; MANSOUR, M. S. M. (2018).	Valorization of urban waste.
DE ANDRADE, F. C.; DAL BOSCO, T. C.; MICHELS, R. N.; BRIGANO, C.; DOS SANTOS, E. L. (2018).	Evaluation of the efficiency in the stabilization of organic matter in the controlled and natural composting system.
YAZID, N. A.; BARRENA, R.; KOMILIS, D.; SÁNCHEZ, A. (2017).	Analysis of solid waste management using the solid state fermentation method.

RAJAGOPAL, R.; BELLAVANCE, D.; RAHAMAN, M.S. (2017).	Determination of the operational feasibility of one of the anaerobic digestion technologies, in this case the psychrophilic in a sequential batch reactor (PADSBR) using food residues.
SOUTO, L.M.M.; NOGUEIRA, V.; KOHLMAN-RABBANI, E.; DRUMMOND, A. R.; PERES, S. (2017).	Layout proposal for biodigesters in low-income communities
LIM, S. L.; LEE, L. H.; WU, T. Y. (2016).	Evaluation of the feasibility of composting regarding the recovery of nutrients from organic waste and its return to the environment.
CESARO, A.; RUSSO, L.; BELGIORNO, V. (2015).	Evaluation of the performance of the combined method of biodigestion and composting.
NG, K. S.; YANG, A.; YAKOVLEVA, N. (2019).	Sustainable waste management through synergistic utilization of commercial and domestic organic waste for efficient resource recovery and valorization in the UK.
LAINEZ, M.; GONZÁLEZ, J. M.; AGUILAR, A.; VELA, C. (2018).	The bioeconomy as a strategy.
GU, Y.; WANG, H.; XU, J., (...), TAN, J.; ZHI, X. (2019).	Sustainability in universities.
SRIJUNTRAPUN, P. (2018).	Participatory food waste management system.
KOIDO, K.; TAKEUCHI, H.; HASEGAWA, T. (2018).	Determines the emission of the fundamental energy and GHG demand for the production of biomethane in a university.
PANYAPING, K.; MOONTEE, P. (2018).	Investigation of the potential use of green waste as an accelerator for food digestion with different substrates in two neutralized anaerobic reactors.
HUGÉ, J.; MAC-LEAN, C.; VARGAS, L. (2018).	Analysis of organizational change processes towards sustainability.
AGUILAR-VIRGEN, Q.; TABOADA-GONZÁLEZ, P.; BALTIERRA-TREJO, E.; MARQUEZ-BENAVIDES, L. (2017).	Solid waste management in universities.
MU, D.; HOROWITZ, N.; CASEY, M.; JONES, K. (2017).	Environmental and economic analysis of a composting system.
WALICZEK, T.; MCFARLAND, A.; HOLMES, M. (2016).	Relationship between composting and environmental attitudes in universities.
TU, Q.; ZHU, C.; MCAVOY, D. C. (2015).	Renewable energy generation through waste in a university.
KAMYAB, H.; LIM, J. S.; KHADEMI, T.; (...), KEYVANFAR, A.; LEE, C. T. (2015).	Compost.

Source: The authors (2019).

It was later carried out on the Web of Science database, in July 2019, seeking to identify more articles related to the same topic. In the search engine, the keywords were used with the Boolean operators: "FOOD WASTE "AND "UNIVERSITIES" AND "MANAGEMENT", and the following search filters:

1. Year: 2015 to 2019;

In this first stage of the search, 7 results were found.

In the next step, after a careful reading of the title and abstract of these 7 articles, it was noticed that those that had adherence to the theme had already been found and analyzed previously.

Subsequently, a search in the CAPES Theses and Dissertations Catalog, still in July 2019, seeking to identify more articles related to the same topic.

In the search engine, the keywords were used with the Boolean operators: "food residues", and the following search filter:

2. Year: 2015 to 2019;

In this first stage of the research, 22 results were found.

In the next step, after careful reading of the title and abstract of these 22 articles, 2 articles were selected for analysis and are presented in table 2 below. As criteria for the selection of these articles, adherence to the research theme is considered.

Table 2. Articles selected for the 3rd analysis.

Author	Subject
SALES, JOSE CASSIO FERREIRA DE. (2017).	Evaluation of the metabolic stages of the anaerobic digestion process under different proportions in a Canadian-type digester.
VERAS, ROANI SIMÕES. (2018).	Composting food waste and pruning trees to reduce greenhouse gases.

Source: The authors (2019).

4 Results and discussion

As mentioned in topic 2.2, Food Waste Management in Universities, in order to develop a management system for a Brazilian public university, it is first necessary to look at its PDI and PLS, as these are where the plans made by the institution are present.

In table 3 below it is possible to find information about the PDI and PLS of these 19 institutions carried out by Souza et al. (2020). The letter “X” indicates that there is information regarding that row and column, the “-“ indicates that no information was found and the header of each of the columns indicates in which document the information was identified.

Table 3. Federal universities in Southeast Brazil and their verified Institutional Development Plans and Sustainable Logistics Plans

Universities	Do you have PDI?	Does the PDI include the waste theme?	Was the PLS found?	Does the PLS include the waste theme?
Federal University of Alfenas	X	-	X	X
Federal University of Itajubá	X	-	-	-
Juiz de Fora Federal University	X	X	-	-
Federal University of Lavras	X	X	-	-
Federal University of Minas Gerais	X	X	-	-
Federal University of Ouro Preto	X	X	-	-
Federal University of São Carlos	X	X	-	-
Federal University of Sao Joao del Rei	X	-	X	-
Federal University of Sao Paulo	X	-	X	X
Federal University of Uberlândia	X	X	-	-
Federal University of Viçosa	X	X	-	-
Federal University of ABC	X	-	X	X
Federal University of Espirito Santo	X	X	X	-
Federal University of the State of Rio de Janeiro	X	X	X	X
Federal University of Rio de Janeiro	X	X	-	-
Federal University of Triângulo Mineiro	X	X	X	X
Federal University of the Jequitinhonha and Mucuri Valleys	X	X	X	X
Federal Rural University of Rio de Janeiro	X	X	-	-
Federal Fluminense University	X	X	X	X

Source: Souza et al. (2020)

Souza et al. (2020) also presents the result of a search on the website of each institution with the objective of finding disclosure of what each university does regarding vaste. Table 4 below shows this result. And like the previous table, the letter “X” indicates that no information was found and the header of each of the columns indicates what type of information this is.

Table 4. Federal universities in Southeast Brazil and information about waste on their websites.

Universities	Does the site mention waste?	Does the website inform the type of treatment for food waste?	Does the site present research related to the topic?
Federal University of Alfenas	-	-	-
Federal University of Itajubá	-	-	-
Juiz de Fora Federal University	-	-	-
Federal University of Lavras	X	-	-
Federal University of Minas Gerais	X	X	X
Federal University of Ouro Preto	-	-	-
Federal University of São Carlos	X	-	-
Federal University of Sao Joao del Rei	-	-	-
Federal University of Sao Paulo	X	-	-
Federal University of Uberlândia	-	-	-
Federal University of Viçosa	-	-	-
Federal University of ABC	-	-	-
Federal University of Espirito Santo	-	-	-
Federal University of the State of Rio de Janeiro	-	-	-
Federal University of Rio de Janeiro	X	X	X
Federal University of Triângulo Mineiro	X	-	-
Federal University of the Jequitinhonha and Mucuri Valleys	-	-	-
Federal Rural University of Rio de Janeiro	X	X	X
Federal Fluminense University	X	-	-

Source: Souza et al. (2020)

We can highlight that little is said and planned within the PDI and PLS of the sample institutions regarding waste.

And according to the contacts made and from the 19 universities, there was a response from 17 of these.

Responses were received in the period from December 12 to January 16, 2020.

The first six questions of the questionnaire were to ensure that the profile corresponded to what was being sought, that is, servers responsible in some way for the destination of the food waste generated within the restaurants, which are the places that present the greatest amount in the production of this waste. The answers were positive to the objective of the research, but they will not be placed in the work so that we can guarantee the confidentiality of the respondents' identity.

The next questions are related to the topic of food waste management and are composed of a total of 23 questions, 10 of which are open (3 are not mandatory, they only complement the closed questions), 8 are closed and 5 contain the Likert scale.

Figure 1 below represents the question of the questionnaire to identify how this type of waste is managed in the universities in the sample.

Figure 1. Identification of food waste management

Figure 1 shows that 11 respondents state that the management of food waste in these universities is carried out by an outsourced company; 4 say they are mixed (between the university and outsourced company); 1 person says that the university where she works manages itself and the other was unable to inform.

This question was necessary to know who does this management first.

The researched literature does not mention about the management having to be carried out by the institution itself, but the PNRS (2010) speaks of shared responsibility, that is, whoever produced the waste has responsibility for its final destination.

Figure 2 below presents the question of the questionnaire to identify the type of treatment of food waste carried out at the universities in the sample.

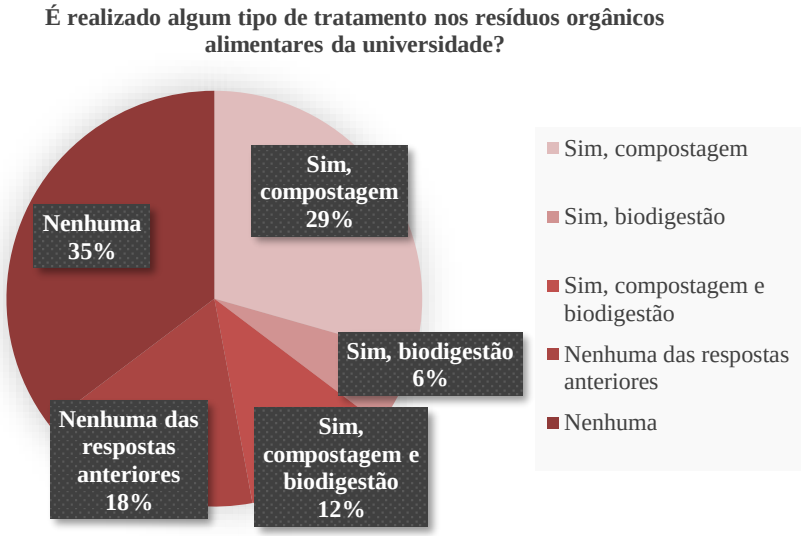

Figure 2 — Identification of the type of food waste treatment

Figure 2 shows the occurrence of some type of treatment for this type of waste in these institutions and which is the most used.

A total of 6 respondents report that no type of treatment is performed; 5 report that composting is carried out, one that the biodigestion process is carried out, two that the two previous treatments are carried out (composting and biodigester); and 3 that none of the aforementioned treatments is performed.

It can be noted that even with authors and legislation that deals with the need for waste treatment by their generators, 35% do not carry out any type of waste reuse.

Ng, Yang and Yakovleva (2019) also state that, for greater economic and environmental gain, an integrated, circular and developed treatment system is needed, so that these wastes do not end up in landfills.

Albuquerque and Coluna (2018) also mention that organic waste can be treated through composting or stabilization in anaerobic digesters, causing them to be used and have a smaller amount placed in landfills, thus generating less GHG.

The following table 5 aimed to know the average percentage of food waste generated that is treated:

Table 5. 14th question of the questionnaire

What is the average percentage of waste treated?		
Percentage of waste treated	Number of respondents	Percentage per respondent
0	7	46,6%
10	3	20%
20	1	6,7%
30	0	0%

40	0	0%
50	2	13,3%
60	0	0%
70	1	6,7%
80	0	0%
90	0	0%
100	1	6,7%
Total:	17	100%

Fonte: Os Autores (2020).

Table 5 above concerns the average percentage of waste that is treated, in which 8 people answered that 0%, that is, no food waste generated in the institution is treated; 3 people responded that 10% are treated; 2 answered the percentage of 50%; 1 answered that they are 20%, 1 another 70%, another answered that everyone is treated and another preferred not to answer.

With the current reductions in public funds in Brazil, it is important to search for public-private partnerships, projects and other external means that can generate resources and contribute to the correct management of food waste, with adequate treatment in each institution.

There is no discussion about the importance of education, even more so in a Higher Education Institution. Therefore, it is essential to involve the entire academic community in this search for knowledge and effective communication about what is correct or not, as well as about what is or is not done by the institution.

Although the literature does not talk about the need for the institution to do its own management or whether it is better that this is done with outsourced companies, we understand that part of the respondents, because they do not have the necessary knowledge, believe that when hiring an outsourced company, it becomes responsible for what is done with the waste, which is not true and this ends up showing the need to invest in education and, even if the choice is to hire an outsourced company for the work, that there is a construction of knowledge and technical capacity within the university itself, thus contributing to cost reduction.

We understand that the bureaucracy of the Brazilian public service ends up making some procedures difficult and that it is often more comfortable not to seek new actions. It is for this reason that the support of senior management is essential and that incentives are given by the same.

5 Conclusion

It is necessary to analyze with more emphasis the public sectors, because only creating laws and policies is not enough, there is a lack of investments for the contribution to the country to be effective.

The theme is important because it encompasses the 3 pillars of sustainability, economic, environmental and social.

The economic one because, despite the model chosen, what before seemed to be waste becomes raw material in another production process (concept of circular economy), which can generate energy and even biofertilizer that can be used in the institution itself, causing savings for the same, both with the cost of disposal that no longer needs to be done, and with the minimization of the cost of energy and biofertilizer generated.

The environmental one, because the institution is avoiding incorrectly discarding or paying an outsourced company, in which there is often no control over whether it is doing this discard in the best way, transforming the "garbage" into something new, providing it to enter the environment. in another production chain and abandoning the idea of a linear economy for another, of the circular type, where there is no longer any waste.

The social, because when you promote this type of action, mainly in a university, where there is a continuous rotation of people, you generate knowledge for the entire academic community and indirectly for outside it as well, contributing so that sometimes there are changes in the habits of these people.

The research deficiency was due to the fact that many universities do not have the necessary equipment for weighing and therefore we cannot obtain the amount of waste generated.

The research was relevant for contributions to the theory because today the management carried out in federal universities in southeastern Brazil is known and it is possible to suggest improvements. It was still possible to perceive that most of these universities still do not have a focus on this type of management.

Due to the importance of this management and to contribute to the practices, it is possible to suggest that each situation be analyzed individually so that the appropriate treatment is carried out for each location.

The recommendations for future research refer to a larger sample of Brazilian universities regarding the management of this and other types of waste and research by universities individually to analyze specific situations.

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