

Gestão sustentável de resíduos alimentares em universidades federais: uma análise documental de estratégias no Sudeste Brasileiro
Sustainable management of food waste in federal universities: a documentary analysis of strategies in Brazilian Southeast
Manejo sostenible de los residuos alimentarios en las universidades federales: un análisis documental de las estrategias en el Sureste Brasileño

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Resumo

Devido ao aumento do consumo e o descarte inadequado de resíduos, causando danos ambientais para as presentes e futuras gerações, faz-se necessário a mudança de uma economia linear para uma economia circular, onde o que é “lixo” em um processo produtivo vira matéria-prima no outro. Este artigo tem o objetivo de identificar estratégias usadas para a gestão de resíduos alimentares dos restaurantes universitários, em instituições públicas de ensino superiores brasileiras. Foi escolhida uma amostra das 19 universidades federais do Sudeste brasileiro. Os dados sobre a gestão de resíduos de resíduos alimentares dessas

Instituições foram levantados nos Planos de Desenvolvimento Institucional, Planos de Logística Sustentável e website das Instituições. A pesquisa mostrou que apesar de 73,68% da amostra falarem sobre resíduos em seu Plano de Desenvolvimento Institucional e ou Plano de Logística Sustentável apenas três universidades divulgam em seus sites informações sobre tratamentos e/ ou pesquisas realizadas por elas no âmbito da gestão de resíduos alimentares. Os dados apontam a necessidade de se tecer políticas e estratégias institucionais para o tema.

Palavras-chave: RSU; Resíduos alimentares; Resíduos orgânicos; Gestão universitária; Gestão pública.

Abstract

Due to increased consumption and inadequate waste disposal, causing environmental damage for present and future generations, it is necessary to change from a linear economy to a circular economy, where what is “garbage” in a production process becomes matter press on the other. This article aims to identify strategies used for the management of food waste in university restaurants, in Brazilian public higher education institutions. A sample of 19 federal universities in southeastern Brazil was chosen. The data on the management of food waste residues from these institutions were collected in the Institutional Development Plans, Sustainable Logistics Plans and the Institutions website. The research showed that despite 73.68% of the sample talking about waste in their Institutional Development Plan and or Sustainable Logistics Plan, only three universities disclose on their websites information about treatments and / or research carried out by them in the scope of waste management food. The data indicate the need to weave institutional policies and strategies for the theme.

Keywords: MSW; Food waste; Organic waste; University Management; Public Administration.

Resumen

Debido al aumento del consumo y la eliminación inadecuada de los desechos, que causan daños ambientales para las generaciones presentes y futuras, es necesario cambiar de una economía lineal a una economía circular, donde lo que es "basura" en un proceso de producción se convierte en materia de presión sobre el otro. Este artículo tiene como objetivo identificar estrategias utilizadas para el manejo del desperdicio de alimentos en restaurantes universitarios, en instituciones públicas de educación superior de Brasil. Se eligió una muestra de 19 universidades federales en el sureste de Brasil. Los datos sobre el manejo de los residuos de desperdicios de alimentos de estas instituciones se recopilaban en los Planes de

Desarrollo Institucional, Planes de Logística Sostenible y el sitio web de las Instituciones. La investigación mostró que, a pesar de que el 73.68% de la muestra hablaba de desechos en su Plan de Desarrollo Institucional o en el Plan de Logística Sostenible, solo tres universidades divulgan en sus sitios web información sobre tratamientos y / o investigaciones realizadas por ellos en el ámbito de la gestión de desechos de alimentos. Los datos indican la necesidad de tejer políticas y estrategias institucionales para el tema.

Palabras clave: RSU; Desperdicio de alimentos; Desperdicio orgánico; Gestión universitaria; Gestión pública.

1. Introduction

Abdel-Shafy (2018) mentions that with an increase in population and urbanization, the development of the economy and a higher standard of living, there is an increase in the generation of municipal urban waste (MSW). This management has a direct influence on the way in which landfill incineration and other forms of waste disposal are created and regulated. Thus, the absence of a standard that establishes an effective system, favors the occurrence of a significant amount of waste that is deposited in socially vulnerable regions without treatment (Moyers, 1991).

In the case of solid food waste and even in a generalized way, its generation represents a complex problem to be tackled by the public authorities and civil society, since it causes impacts to the environment that can affect public health and even planning issues, being significant to raise and discuss the actions used in public management in order to better manage the materials discarded by human activities.

Borges *et al.* (2019) demonstrated that public awareness and training actions for employees of food and nutrition units, an establishment organized to provide balanced meals and in accordance with adequate dietary and hygienic standards, in public universities can significantly reduce the amount of food that was wasted on these. However, not all higher education institutions develop actions like these, and it is necessary to identify which actions are taken by universities so that it is possible to evolve in the goal of reducing waste.

Silva *et al.* (2019) states that small changes in daily life and some simple everyday actions can influence a community that is not aware of environmental and social concepts to adopt and demand from organizations and people with whom they relate the adoption of sustainable practices.

This study was developed methodologically based on documentary analysis as the

main source of research data, where the institutional development plans (PDI) and sustainable logistics plans (PLS) of the federal universities in the Brazilian southeast region were mined, and an exploratory reading was carried out for the selection of data based on criteria.

The application of the method in this work was intended to identify the strategies that are being used for the management of food waste in university restaurants, in public institutions of higher education in Brazil, with a focus on the southeast region and federal universities, and considering Brazilian legislation, which shows that this type of management in universities is of paramount importance.

2. Theoretical Background

It is known that the usual practice of dumping garbage in undue places has been decreasing, possibly due to the increasing exposure in the media, such as television or social networks, which reinforce the perception about the connection between local and global problems and about the economic problems that can be generated.

It is possible to find as one of the responses to the demand for good practices of waste management, the concept of circular economy (CE), which is not new, in contrast to the economic paradigm it is already institutionalized in different ways when replacing the rate of interest rates, reuse at a recycling rate, replacing production reduction by recovering products from materials (Barboza et al, 2019).

The first ones that are concerned with the biological flows used, have a goal of 51% treatment of municipal waste since 2008, whereas the recycling of municipal solid waste from Americans, which should be avoided, has a rate of 33% in the last decade, while landfill use is at 53% (Sakai *et al.*, 2011; Kollikkathara *et al.* 2009; EPA, 2016).

Korea's goal is to reduce 61% of municipal waste and water and sewage treatment, although a simple process is used when compared to other countries, but they have been intelligently adapted according to local reality, improving efficiency and resources of operating systems (Reike et al., 2018). In this way, it was possible to seek the achievement of other indicators such as the reduction of greenhouse gas emissions, the reduction in the use of incinerators, in the water body, in the case of domestic sewage.

China, through an institutional plan, sets a target for the four main cities Beijing, Shanghai, Tianjin and Dalian as a result showed a 34% reduction in the rate of solid waste (SU et al. 2013). Although, in the early 1980s the world's largest importer of garbage, currently the processing of solid waste has guaranteed the country a cheaper source to

produce products for its economy, but the real data on reuse is limited, the main activity adopted was the reducing the use of plastic in Chinese daily life (Gosh et al., 2016).

The European community has in Germany, Denmark, the United Kingdom and the Netherlands countries that work with a profile of prevention in the generation of waste and recycling (Eukn, 2015).

According to the European Environment Agency (EEA), the Netherlands achieved the recycling of 50% of urban waste in 2010, with almost 0% of participation in landfills (Milios, 2013). Thus, the waste management strategy is segmented into household waste, recycling and incineration, and mainly in monitoring the behavior of the waste consumed, which is the weakest link in the management chain (Goorhuis et al., 2012; Bergsma et al., 2014; Schut et al., 2015).

In this way, consumers in the wealthiest countries in the Northwest and Central Europe produce twice as much waste when compared to the countries in Eastern Europe, as an example we have Switzerland and the Netherlands that reach close to 0% landfill use, while Bulgaria, Turkey, Lithuania, Latvia and Croatia still land 80 to 100% of their urban waste (EEA, 2013). Therefore, instead of reducing or updating the quantities used to favor the circularity of products, this is still not the rule (Blomsma & Brennan, 2017).

The environmental issue was addressed in several conferences and documents, such as the Club of Rome, the Stockholm Conference, the “Our Common Future” Report, ECO 92, the Kyoto Protocol, among others, in order to seek guidelines that are sustainable for the world (Gonçalves et al., 2019).

In Brazil, this incorrect disposal has also been increasing, even with the creation of laws that aim to contribute to a better practice in this respect, which is the case of Law No. 12,305, of the National Solid Waste Policy (PNRS) (Brazil, 2010) which contains guidelines regarding waste, with a focus on integrated management and better management of this waste, with the priority of reducing, not generating, reusing, recycling and treating them.

Still in Brazil, Article 225 (Federal Constitution, 1988) states that everyone has the right to an ecologically balanced environment, a common use of the people and essential to a healthy quality of life, imposing on the public authorities and the community the duty to defend and preserve it for present and future generations.

However, the Brazilian Association of Public Cleaning and Special Waste Companies (Abrelpe, 2019), presents that in 2018 it had a generation of solid urban waste (MSW) in the annual total of almost 79 million tons in the country, with the collected amount of 72,7

million tons, that is, 6.3 million tons of waste were not collected and, consequently, were improperly disposed.

The final disposal of this collected waste also showed that the inadequate disposal continued to be carried out by 3,001 municipalities in Brazil, which sent 29.5 million tons of waste, corresponding to 40.58%, to controlled dumps or landfills, which do not have the measures necessary to protect the environment from damage and degradation.

Brazilian standard NBR 10004 of the Brazilian Association of Technical Standards (ABNT, 2004), defines solid waste as being those residues in the solid and semi-solid states that result from community activities of industrial, domestic, hospital, commercial, agricultural, service and sweeping origin. Included in this definition are sludges from water treatment systems, those generated in pollution control equipment and installations, as well as certain liquids whose particularities make their release into the public sewer or water bodies impossible, or require, for this, technically and economically unviable solutions in view of the best available technology.

According to Oliveira et al. (2019) it is very important to pay attention to the legal parameters. According to the authors, management strategies should focus on at least ensuring compliance with the laws in order to mitigate misconduct and ensure the organization's reputation.

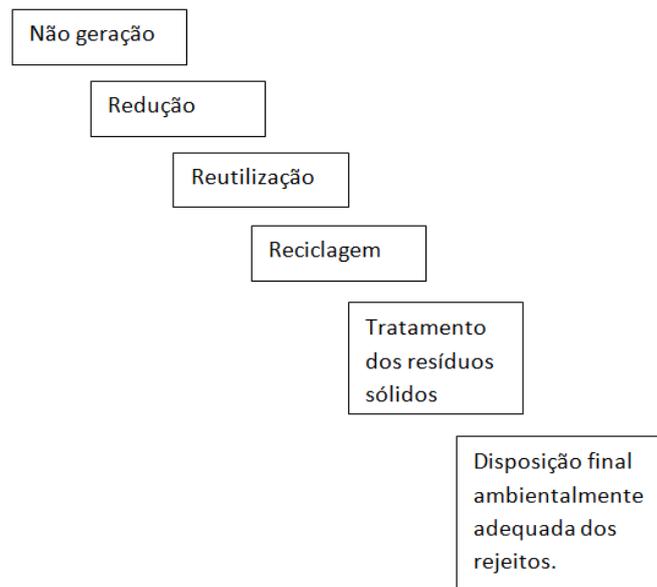
Thus, the literature presents an increasing and significant amount on waste management and recycling, which for decades has increased people's awareness, which generates answers to fill the gaps between the current legislation and the applicability of the action. As a result, companies or people who are in more isolated regions themselves adopt other political measures, and volunteering to contribute to the management and recycling of waste by companies (Bergsma et al., 2014).

Sales (2017) mentions that in a high number, waste such as paper, plastic, metal, for example, in Brazil undergoes recycling and / or reuse, which does not happen with the organic fraction, which is deposited in an inappropriate manner to the environment .

Organic waste, when placed in landfills or landfills, undergo the actions of bacteria that generate methane, a process called methanization, which cause harmful effects to health and the environment, and it is also considered a greenhouse gas, with a capacity of 28 times higher than that of CO₂ (Albuquerque & Coluna, 2018).

PNRS presents in Article 7, as one of its objectives, the priority in the management and management of waste that are placed in Figure 1.

Figure 1. Priority in the management and management of solid waste in the PNRS.



Source: Adapted from PNRS (2010).

Figure 1 shows the order of priority according to PNRS, with the highest priority being the non-generation of waste and the last and not least the environmentally appropriate final disposal of the waste.

Lainez et al. (2018) mention that in order to supply the demand of a growing population, the use of renewable resources is important considering the availability and need for water, land and energy.

Yazid et al. (2017) also state that organic waste according to rapid decomposition generates bad odors and thus attracts insects and vectors that end up contributing to the emergence of many diseases, however the same residues can be used as raw material in another production line, reducing environmental impacts.

Even so, the final destination is widely used in landfills, needing large space generating many costs, causing environmental impacts and needing other ways that can treat and add value to the waste, making these no longer their final destination (Veras, 2018).

According to Ng, Yang & Yakovleva (2019) the methods currently used in the management of organic waste are anaerobic digestion (AD), composting, incineration with energy recovery, landfills or incineration without energy recovery, the latter two being less sustainable, so the least indicated.

According to Ludolf *et al.* (2019) the term sustainability assumes meanings according to different scientific areas, which has become very important in the current times.

But Freitas (2016) define sustainability as a constitutional principle that determines, with direct and immediate effectiveness, the responsibility of the State and society for the solidary implementation of material and immaterial development, socially inclusive, durable and equitable, environmentally clean, innovative, ethical and efficient, in order to ensure, preferably in a preventive and cautious way, in the present and in the future, the right to well-being (p. 49).

Weetman (2019) states that the planet provides all the resources we need and that these resources are often finite or restricted due to the speed of their renewal and that this speed is not in line with the speed with which the population grows and consumes for that reason the need for a circular economy that has “zero waste” as a principle, and in the case of food, at the end of its use, it must be transformed into organic compounds, energy or be reused.

It is perceived that the relationship between the country's level of development and the low practice of EC concepts is based on the lack of national wills for waste management policies with clear rules (Diaz, 2017).

Ng, Yang & Yakovleva (2019) state that the circular economy presents the concept of maintaining the value of materials and products for as long as possible, providing that their life cycles become closed, making the waste of a process to be treated and become raw material for another productive process generating economic, social and environmental benefits.

Villela Garcia & Gomes (2016) emphasizes the fact that sustainability is not neutral when it comes to social relations, as these produce impact and possible environmental solutions.

The Center for Studies and Promotion of Group Agriculture (Cepagro) as a strategy produced technical materials, as is the case of the Technical Composting Bulletin for Yards and the manual “Domestic, community and institutional composting of organic waste: guidance manual”, being the latter developed with SESC / SC and the Ministry of the Environment (Ruas & Schommer, 2020).

Valle & Utta (2018) in their research mention about the waste that the population generates continuously and again about the disposal of these inappropriately and that due to this they did a job that aimed to sensitize the students of a public school in São Paulo Luís - MA, stressing the importance of recycling based on the composting process in the reuse of organic “garbage”, placing the importance of environmental education (EA) actions on a continuous basis with the community.

The authors also talk about the importance of AE, in all its teaching levels and its continuous process for the construction of students' critical thinking, showing a greater probability of these convictions being in their daily lives, as well as the dissemination of this knowledge, in addition to the involvement from the whole community, which in the case of this research showed good acceptance, positive experience and interaction involving teachers, employees and students, and being a method of easy application and low cost (Valle & Utta, 2018).

De Andrade et. Al. (2018) mentions that the composting method makes the organic matter more stable and also eliminates pathogenic substances, taking into account some biological factors, transforming the waste into a compound capable of being mixed and generating value for the soil .

In Malaysia, the population has faced problems in the sustainable management of waste due to the large number generated, it is placed on composting as a treatment method with many benefits for one of them, in this case the organic that is classified as solid urban waste (MSW) (Kamyab *et al.*, 2015).

Almeida (2015), emphasizes the importance of sustainability in the Brazilian public sector and environmental education at all levels of education because, according to him, higher institutions have a great impact on the development and dissemination of knowledge.

Leal Filho *et al.* (2015) also considers that Higher Education Institutions (HEIs) are essential for sustainable development because they present themselves as trainers of thought and opinion, and also intensifying development and propagation, being relevant that the academic population serves as a basis for the dissemination of knowledge and for these practices to be strengthened.

According to Mu *et al.* (2017) a survey was carried out at Kean University in New Jersey to ascertain the environmental and economic implications of a composting system, resulting in the contribution to sustainability, which is the case of reducing greenhouse gases (GHG) which occurs when the final destination of the waste is no longer landfills.

Veras (2018) says that in composting there are also disadvantages such as bad smells, which attracts unwanted animals and also mentions that if the technique is not carried out correctly, it will end up with a poor quality compost etc.

Lim, Lee & Wu (2016) state that although there are disadvantages in the treatment of composting, they are still more sustainable methods than the landfill, because they reduce the generation of GHGs, have reduced costs involved in the process, low technical complexity, etc.

The Ministry of Regional Development (2015) places biogas as being a renewable energy source that presents itself as a great alternative for the national market. All organic waste, such as food waste, fruits and vegetables, industrial waste of animal and vegetable origin and animal manure, undergoes the actions of bacteria that decompose these materials and generate gases, mainly carbon dioxide and methane, which, when not used, are released into the environment, contributing to the increase in greenhouse gas emission rates. This decomposition can be carried out in a controlled manner, enabling the generation of energy, through the use of methane, present in large concentrations in biogas.

Cesaro, Russo & Belgiorno (2015) present anaerobic digestion as a popular method used in the recovery of organic waste, generating biogas, which is a renewable energy source and can still be produced as biofertilizer.

Gu *et al.* (2019) promoted a study that took place at Keele University in England, stating that higher education institutions can contribute to the development of global sustainability through education, research and actions within it, one of their suggestions was for example the collection of food waste for treatment using anaerobic digestion (AD).

The work of Tu, Zhu & McAvoy (2015) the work of the authors aims to analyze the implementation of three projects for the transformation of waste at the University of Cincinnati, improving sustainability, one of which is the food waste for biogas, indicating a result capable of “replacing 12.767 m³ of natural gas per year of 146 tons of food waste” and having a return time of the invested value of 74 months and the minimization of greenhouse gases was 11.36 tons of CO₂ per year.

Veras (2018) in his research at the Federal University of Ceará aimed to study the composting method using organic waste (leftover food and tree pruning), where he finds that this form of treatment minimized GHGs and proved to be efficient and suitable for small communities.

Sales (2017) carried out in his study at the Federal University of Campina Grande (UFCG) the appreciation of the action of the stages in the AD process, especially of the swine manure mixed with the food residues in the biodigester, where good substrates were produced.

According to Wikandari & Taherzadeh (2019), DA technology has disadvantages such as the retention time in bioreactors, which is approximately 20 to 60 days, the fact that it requires large bioreactors, if the raw material (organic waste) is not separated from other residues it can generate a poor quality compost.

3. Material and Methods

According to INEP (2018), there are 299 federal public institutions of higher education in Brazil, with 110 federal institutions and 63 universities. Of these, we chose to adopt as a sample, all 19 Federal Universities in Southeast Brazil, this choice being made for convenience and justified by the fact that it is the most populous region in the country and where the authors are located.

The study was developed through bibliographic and documentary research, and the Institutional Development Plan (PDI) and Sustainable Logistics Plan (PLS) (when they had them), were the main documentary sources of information. These were retrieved directly from the institutions' websites, from which information was also found on their pages and which was not found in the documents referred to.

Article 16 of Decree No. 5,773 of May 9 (2006) defines the PDI as being elaborated for a period of five years, it is the document that identifies the Higher Education Institution (IES), with regard to its work philosophy, the mission it proposes, the pedagogical guidelines that guide its actions, its organizational structure and the academic activities it develops and / or intends to develop.

Article 16 of Decree No. 7.746 (2012) states that the PLS Sustainable Logistics Plan must be created and executed in public administration, which must be guided by Normative Instruction No. 10 (2012), prepared by the Management Secretariat of the Ministry of Planning, Development and Management that presents policies as means of planning with the focus and responsibilities established, actions, goals, deadlines and tools to monitor and evaluate, which allows the public sector to determine sustainable actions and organize expenses and processes.

The documentary investigation took place between the months of April and September 2019, where exploratory readings of the documents were carried out, in order to make a selection of relevant data for later organization, according to the inclusion criteria that intended to identify which institutions have PDI, PLS, deal with waste management and specifically food.

The presentation and discussion of the results were made based on tables to highlight the findings of the search, which were discussed based on the theoretical framework on solid waste management and management of public organizations.

In the aspect of the classification of the research in relation to its objectives, the present study is defined as an exploratory research, developed from a bibliographic and documentary research followed by analyzes, which seek to provide greater familiarity with the problem, seeking to explain the object studied and demonstrate, through the evaluation carried out, that its application of the proposal is feasible, as shown by Pereira, Shitsuka, Parreira and Shitsuka (2018).

4. Results and Discussion

4.1 Data analyzed

Table 1 below consolidates the findings identified in each of the institutions. The letter “X” indicates that there is information on Food Waste Management and the header of each of the columns indicates in which document the information was identified.

Table 1. List of PDI and PLS by universities.

| Universities | Have a PDI? | Talking about waste in PDI? | Have a PLS? | Talking about waste in PLS? |
|----------------------------------------------------------|-------------|-----------------------------|-------------|-----------------------------|
| Universidade Federal de Alfenas | X | - | X | X |
| Universidade Federal de Itajubá | X | - | - | - |
| Universidade Federal de Juiz de Fora | X | X | - | - |
| Universidade Federal de Lavras | X | X | - | - |
| Universidade Federal de Minas Gerais | X | X | - | - |
| Universidade Federal de Ouro Preto | X | X | - | - |
| Universidade Federal de São Carlos | X | X | - | - |
| Universidade Federal de São João del-Rei | X | - | X | - |
| Universidade Federal de São Paulo | X | - | X | X |
| Universidade Federal de Uberlândia | X | X | - | - |
| Universidade Federal de Viçosa | X | X | - | - |
| Universidade Federal do ABC | X | - | X | X |
| Universidade Federal do Espírito Santo | X | X | X | - |
| Universidade Federal do Estado do Rio de Janeiro | X | X | X | X |
| Universidade Federal do Rio de Janeiro | X | X | - | - |
| Universidade Federal do Triângulo Mineiro | X | X | X | X |
| Universidade Federal dos Vales do Jequitinhonha e Mucuri | X | X | X | X |
| Universidade Federal Rural do Rio de Janeiro | X | X | - | - |
| Universidade Federal Fluminense | X | X | X | X |

Source: Authors.

It is possible to identify that all federal universities in the southeastern region have an institutional development plan, however five of them do not deal with the theme of waste, being the universities of Alfenas, Itajubá, São João Del Rey, São Paulo and ABC. Of the 19 institutions, only 9 have PLS, less than half, and of these 2 do not discuss waste management in their plans.

Table 2 presents the findings identified on the website of each sample institution. And just like the table above, the letter “X” indicates that there is information and the header of each of the columns indicates what type of information it is.

Table 2. List of information on food waste on the universities' website.

| Universities | Talks about food waste | Informs type of treatment | Presents research on the theme |
|----------------------------------------------------------|------------------------|---------------------------|--------------------------------|
| Universidade Federal de Alfenas | - | - | - |
| Universidade Federal de Itajubá | - | - | - |
| Universidade Federal de Juiz de Fora | - | - | - |
| Universidade Federal de Lavras | X | - | - |
| Universidade Federal de Minas Gerais | X | X | X |
| Universidade Federal de Ouro Preto | - | - | - |
| Universidade Federal de São Carlos | X | - | - |
| Universidade Federal de São João del-Rei | - | - | - |
| Universidade Federal de São Paulo | X | - | - |
| Universidade Federal de Uberlândia | - | - | - |
| Universidade Federal de Viçosa | - | - | - |
| Universidade Federal do ABC | - | - | - |
| Universidade Federal do Espírito Santo | - | - | - |
| Universidade Federal do Estado do Rio de Janeiro | - | - | - |
| Universidade Federal do Rio de Janeiro | X | X | X |
| Universidade Federal do Triângulo Mineiro | X | - | - |
| Universidade Federal dos Vales do Jequitinhonha e Mucuri | - | - | - |
| Universidade Federal Rural do Rio de Janeiro | X | X | X |
| Universidade Federal Fluminense | X | - | - |

Source: Authors

Available on their websites, only 8 universities present information on food waste, of which only 3 inform the type of treatment that is given to this waste and present research on the topic, these are: the Federal University of Rio de Janeiro, the University Federal Rural of Rio de Janeiro and the Federal University of Minas Gerais. However, none of the three have a Sustainable Logistics Plan.

4.2 Discussion of Results

Within all universities, 100% have PDI and despite the existence of waste issues and their management in the sample is 73.68%, only 47.37% have PLS, although this is a

responsibility of the public administration. In addition, all produce food waste and only 15.79% of the total sample informs the treatments and/or research that these institutions carry out on their sites.

With the importance that the subject is currently having and observing the percentages obtained in the research, it is possible to observe that there is little investment by top management in the planning, organization of goals, deadlines, inspection of the actions carried out and their dissemination.

It is possible to understand that in most cases of the sample, each sector is responsible for the management, if not all, but of a large part of the waste generated there, and as there is often no investment in activities related to the theme, it can be understood that this management sometimes it is carried out in an inadequate way, as is the case of food waste, which is mostly collected by a third party company and the agency does not know the final destination given to that waste, believing that paying this organization for the removal of this “garbage”, the responsibility becomes be hers, hurting the PNRS that institutes shared responsibility, that is, whoever produces the waste is responsible for its correct disposal.

It is noticed that there are cases of interest and initiative of the theme in research by Professors and students, however there is a need for investments in these studies.

Emphasizing also the importance of education regarding the issue and communication for the entire university community in order to disseminate knowledge outside it.

5. Conclusion

Although the topic has proved to be important, not much information was found about the treatment actions and / or research related to the recovery of food waste carried out by the universities in the sample, indicating that it is still an incipient subject and presenting the importance of investment and involvement. senior management in planning, organizing and controlling activities related to the issue.

Taking into account that there are different types of treatment of food waste, providing that it is recovered and used as a raw material for another production process, the type of treatment being dependent on many factors such as amount of waste, space, temperature etc., therefore it is advisable to study by a specialist who will identify the appropriate type for each location.

It is also of paramount importance that there is a future research analyzing the perception of employees regarding this issue and opening up to their suggestions regarding the solution of the problem.

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