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CENÁRIOS PARA O APROVEITAMENTO DOS RESÍDUOS SÓLIDOS ORGÂNICOS DA CEASA DO RIO DE JANEIRO

SCENARIOS FOR THE USE OF SOLID ORGANIC WASTE FROM CEASA IN RIO DE JANEIRO

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Resumo

A preocupação ambiental ao redor do planeta vem ganhando destaque e com isso os resíduos têm sido vistos como uma preocupação. Diante deste cenário, surge então uma possibilidade de transformação e aproveitamento dos resíduos orgânicos seja gerando energia através de um biodigestor ou aproveitando como adubo orgânico através de uma compostagem. A pesquisa foi realizada em 2012 através de uma pesquisa de campo com realização de entrevistas com funcionário da Unidade I - Grande Rio da Ceasa, localizada na Avenida Brasil, 19.001, Irajá, Rio de Janeiro. Foram colocadas três tecnologias de aproveitamento: compostagem, biodigestor e incinerador para demonstração de que existem possibilidades de tratamento. Apesar dessas técnicas serem amplamente utilizadas, ainda é necessária uma análise quantitativa referente a proporção e tipo de resíduos e outros parâmetros, com o intuito de identificar a melhor tecnologia para que se tenha uma decisão mais precisa em termos econômicos.

Palavras-Chave: Sustentabilidade. Logística Agrícola. Economia Circular. Tratamento de Resíduos.

Abstract

The environmental concern around the planet has been gaining prominence and this waste has been seen as a concern. Given this scenario, there is then a possibility of transformation and use of organic waste, whether generating energy through a biodigester or using it as organic fertilizer through composting. The research was carried out in 2012 through field research with interviews with an employee of Unit I - Grande Rio da Ceasa, located at Avenida Brasil, 19.001, Irajá, Rio de Janeiro. Three recovery technologies were used: composting, biodigester, and incinerator to demonstrate that there are possibilities for treatment. Although these techniques are widely used, a quantitative analysis regarding the proportion and type of waste and other parameters is still needed, to identify the best technology to make a more precise decision in economic terms.

Keywords: Sustainability. Agricultural logistics. Circular Economy. Waste Treatment.

1. Introduction

According to Passos (2009), at the international level, environmental concern began to take a greater proportion in 1972 with the Stockholm Conference, in which he initiated the global agenda of environmental debates and presented as its objective the discussion of the effects of environmental degradation and it dealt with human development policies and the search for a shared vision of preserving natural resources.

Chassot (2001) points out that the beginning of the 21st century was marked by debates about the need to preserve the environment, however, society has carried out contrary practices such as burning, deforestation, inadequate disposal of waste, among others, which demonstrates that this issue is still being ignored.

This paper proposes a qualitative assessment of three technologies for the use, treatment, and/or transformation of organic solid waste, which has often been incorrectly disposed of, into raw material that will be reinserted in a new production process, making this disposal not more happens and analyzing its social, environmental and economic aspects.

The three models that will be evaluated are composting, anaerobic digestion, and incineration.

According to Flick (2013), the research contributes to the basis for decision making. Gray (2012) mentions that the research seeks to increase knowledge regarding organizational procedures to generate society, useful conclusions.

The article begins with a literature review, which, according to Alves (1992), is one of the most important parts of an investigation, due to the need to locate, analyze, synthesize and interpret research carried out in books, dissertations, theses, journals. scientific articles and articles carried out in the study area.

Thus, bibliographic research was carried out to characterize the different waste treatment/use technologies. Their characteristics and forms of use were also researched through articles and websites, to compare the technologies, analyzing social, environmental, and economic aspects.

This research can be considered applied because it aims to produce knowledge to solve specific problems in practice. (PRODANOV AND FREITAS, 2013). The research is also considered as qualitative which, as Santos and Vidal (2011, p.45) put it as being the one in which the data obtained are not expressed numerically or based on no measurement scale. Regarding the nature of the results, they can be OBJECTIVE, when the data indicate discomfort (cold, heat, hardness), or SUBJECTIVE when they return data indicative of sensations (ambiance, disorganization).

It is exploratory, as it seeks a greater understanding of the topic and research methods are more flexible and less structured.

Gil (2010, p. 27) highlights that exploratory research aims to provide greater familiarity with the problem, intending to make it more explicit or building hypotheses. Its planning tends to be quite flexible, as it is interesting to consider the most varied aspects related to the studied fact or phenomenon. It can be said that most research carried out for academic purposes, at least initially, assumes the character of exploratory research since at this moment it is unlikely that the researcher will have a clear definition of what he will investigate.

The research is also considered descriptive, because according to Vergara (2000), it presents characteristics of a certain population or a certain phenomenon, being able

to correlate variables and defining their nature. The author also states that even though this type of research does not have the obligation to interpret the phenomena it describes, it serves as a basis for it.

Regarding the population of the studied sample, Vergara (2011, p. 46) presents that “A population is understood not as the number of inhabitants of a place, as the term is widely known, but a set of elements (company, products, people, for example) that have the characteristics that will be the object of study”.

Marconi and Lakatos (2010, p.146) state that “delimiting the research is to establish limits for the investigation”. Because of this, the research shows as a population the Supply Center of the State of Rio de Janeiro CEASA-RJ, which is linked to the State Department of Agriculture, Livestock, Fisheries, and Supply and has six units in Rio de Janeiro, which are: Grande Rio, São Gonçalo, Mountain Region (Nova Friburgo), Northwest Fluminense Region (Itaocara), North Fluminense Region (São José de Ubá) and Middle Paraíba Region (Paty do Alferes).

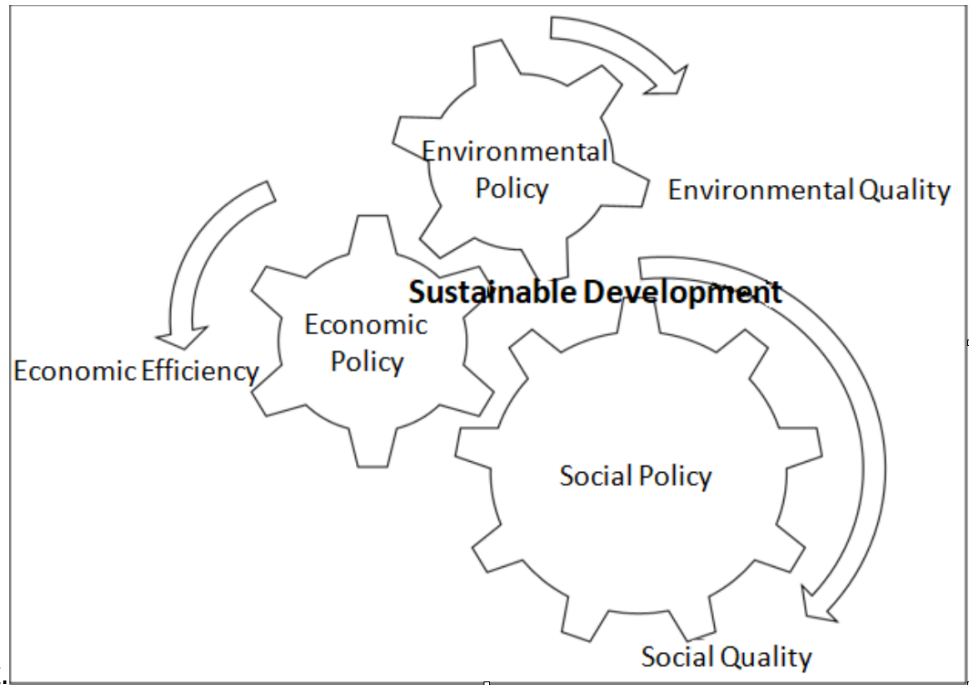
The research sample will be Unit I - Grande Rio, located at Avenida Brasil, 19.001, Irajá, Rio de Janeiro, considered the second-largest Supply Center in Latin America.

The investigation was carried out during 2012 when a field survey took place. The surveys were conducted through interviews with Market employees, as well as shopkeepers, informally. Where the questions were opened and according to what was being observed in the place. As a material, photographs of organic solid waste generated daily at this center were also recorded.

2. Waste and Sustainability

The term sustainable development (or sustainability) is sometimes understood as actions related to environmental protection, but it also involves the social and economic parts that are linked to our actions and the maintenance of human life on Earth (JONAS, 1995). In this way, the dimensions that make up sustainable development are intrinsically involved, as represented in Figure 1.

Figure 1 - Interconnection of the three dimensions of sustainable development.



Source: Barboza et al. 2019

Manzini and Vezzoli (2002) indicate that environmental sustainability is linked to human activities that should not interfere with the planet's natural cycles and, at the same time, should not impoverish its natural capital. To consider human actions as sustainable, they must be based on renewable resources, improving the use of non-renewable resources, avoiding the generation of waste in which the ecosystem is unable to reuse, and ensuring that communities remain within the limits of their spaces environmental issues.

According to Silva et al. (2019), small changes in daily life and some simple daily actions can influence the parties involved to adopt and demand from organizations and people with whom they relate to adopting sustainable practices, even if they do not fully know the environmental and social concepts.

Two paths lead to change towards sustainability: the path whose process will be forced by catastrophic events and results and the path that this change will take place through a conscious and prudent choice (MANZINI; VEZZOLI, 2002).

With the demand for existing resources, the development of sustainable consumption and production attitudes has proven to be essential (GU et al., 2019).

Silva and Giuliano (2017) mention that, given the unsustainable situation in which most communities find themselves, it is irrefutable to consider environmental, social,

and economic requirements throughout the stages, still requiring professionals who innovate for the projection and development of products. with less environmental impact, greater social relevance and added economic value.

In this sense, the current competitiveness of the market makes it necessary to invest in sustainable actions that become a differential, being thought of since the beginning of business activities when managers strategically align their processes through process management techniques (COSTA et al., 2019).

Considering the term of sustainability for actions taken today that should not compromise the ability of future generations to meet their needs, it is essential to think about renewable resources and not produce quantities of waste that the ecosystem is not able to use in other production processes, reflecting the integrality of the human being (BELLA et al., 2021).

According to the Intergovernmental Panel on Climate Change (IPCC), it is estimated that 1.5 billion tons of urban waste is generated annually in the world, with an estimated growth of around 2.2 tons for the year 2025 and around 300 million tons, of which, currently, 20% are recycled; 13% undergo energy recovery treatment, 13% are disposed of in landfills and 53% are placed in dumps (IPCC, 2014).

The Brazilian Association of Public Cleaning and Special Waste Companies (ABRELPE, 2019) shows that in 2018 almost 79 million tons of urban solid waste (USW) were generated in the country, with 72.7 million tons being collected and 6 .3 million tons of these were improperly disposed of. The final destination also showed that the incorrect order continued to be carried out by 3,001 Brazilian municipalities, which sent 29.5 million tons of waste, corresponding to 40.58%, to landfills or controlled landfills, which do not have the necessary actions for the protection of the environment regarding damage and degradation.

The definition of solid waste according to the National Solid Waste Policy (BRASIL, 2010) is:

> Law No. 12,305, art. 3rd, item XVI - [...] material, substance, object or discarded property resulting from human activities in society, whose final destination proceeds, is proposed to proceed or is obliged to proceed, in solid or semi-solid states, as well as gases contained in containers and liquids whose particularities make their release into the public sewer

> system or water bodies unfeasible, or require technically or economically unfeasible solutions, given the best available technology.

According to Albuquerque and Coluna (2018), in the emissions analysis document, urban solid waste has been treated as having low biological, physical and energy recovery, as what is discarded is often sent to landfills or dumps, ignoring alternatives, such as recycling organic waste (compost) or dry waste.

One of the topics that are present in the objective "Responsible Consumption and Production", in which there are 17 Sustainable Development Objectives (SDGs) is 12.5 which states that "By 2030, substantially reduce the generation of waste through prevention, reduction, recycling, and reuse" (UNITED NATIONS BRAZIL, s/d).

Ng et al. (2019) also place the importance of management with greater economic and environmental gain so that these wastes are no longer dumped in landfills and that for this a more integrated, circular, and developed transformation system is needed. For sustainable development in waste management, it is necessary that instead of disposing of these, treatments are carried out that add value to the resource so that it can be used again, following the circular economy model (SEPÚLVEDA, 2016).

In the case of organic residues, due to agile decomposition, they generate bad odors and because of that they attract insects and vectors that contribute to the emergence of many diseases, but these residues can be used as raw materials in another production line, reducing environmental impacts (YAZID et al., 2017).

Souza et al (2020) state that due to the existence of different types of treatment of food waste, some are recoverable and it is possible to use what no longer serves in a production process as raw material for another, with the choice of this type being dependent of many factors, such as the amount of waste, space, temperature, etc., it is advisable to consult a specialist who will indicate the appropriate type for each location.

It is also important to mention the separation of these wastes and the need for this when recovering these tailings, adding value to the substance produced later (ABDEL-SHAFY, 2018).

The manual of the Ministry of the Environment - MMA (2017) presents alternatives for the treatment of organics, as in Table 1.

Table 1. Types of treatment of organic waste and their characteristics

Types of treatment	Characteristics
Burial	• Low amount of waste; • Necessary availability of space for burial; • Avoid burial of meat and care for animals • households such as dogs and cats do not arrive at the site interfering with the process.
Treatment in earthworms or vermicomposting	• Treatment normally used in apartments; • Low amount of waste; • More common indoors to prevent worms from escaping. E.g.: plastic boxes; • Avoid mixing leftovers of meat, citrus, cooked or with • high salt content.
Anaerobic Biodigestion	• It produces fertilizers (usually liquids) and gases (biogas), as is the case of methane gas (CH4), which is a fuel that can be used to generate heat, electricity or as fuel in cars or other adapted engines; • The method widely used for the treatment of liquid waste and animal manure; • More complex model than composting, requiring adequate infrastructure and specialized technical knowledge to operate safely.
Incineration	• Generates electrical energy, thermal energy, and ash; • A complex process, with high technology involved; • It makes its recycling and transformation into organic fertilizer unfeasible; • High cost and risk of atmospheric contamination.
Composting	• It is a safe and simple method; • Used in plant cultivation;

	• Suitable for both small, medium, or large quantities; • It needs to be well operated to avoid odors and the proliferation of disease vectors.

Source: Adapted from the MMA Manual (2017).

According to Ng et al. (2019), in the United Kingdom, traditional models such as composting, Anaerobic Digestion (AD), and incineration are being used as a means of dealing with organic waste that is generated within the household. The authors emphasize that those produced in companies are often forgotten, but they can contribute to more sustainable resource management, generating greater environmental and economic benefits with the transformation of the current linear economy model to one of circular economy, where the that no longer serves in one process becomes raw material for another.

The current methods 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 and therefore the least indicated. (NG et al. 2019).

Abdel-Shafy (2018) mentions that organic waste that undergoes incineration pollutes the air, when left in landfills, it generates leachate that pollutes groundwater and their degradation produces methane. Because of this, correct management is necessary, because if it is not carried out, it ends up causing problems in public and environmental health, in addition to organic substances containing substances that make them raw materials for other production processes, such as composting and AD.

According to Deganutti (2002), the biodigester consists of a closed chamber where the organic material is placed, in an aqueous solution, where it undergoes decomposition (anaerobic), generating the biogas that will accumulate in the upper part. The functioning of biodigesters can be classified into two types: batch and continuous.

In the Law on the National Solid Waste Policy (Brazil, 2010), materials that can be recycled should not undergo any other type of treatment, other than recycling.

In the sole paragraph of art. 927 of the Brazilian Civil Code, it is emphasized that there will be an obligation to repair the damage, regardless of fault, in the cases specified by law, or when the activity normally carried out by the author of the damage

implies, by its nature, a risk to the rights of others, that is, environmental responsibility in Brazil is subjective, therefore, it does not depend on fault for repair. (BRAZIL, 2002).

3. Case Study

In the research sample, evaluating the marketing and supply chain, the Supply Centers of the Irajá Unit in the North region of the Municipality of Rio de Janeiro, handled, for example, more than 120 thousand tons of horticultural products in December 2013 (Data obtained from the Market Conjuncture available on the Institution's website).

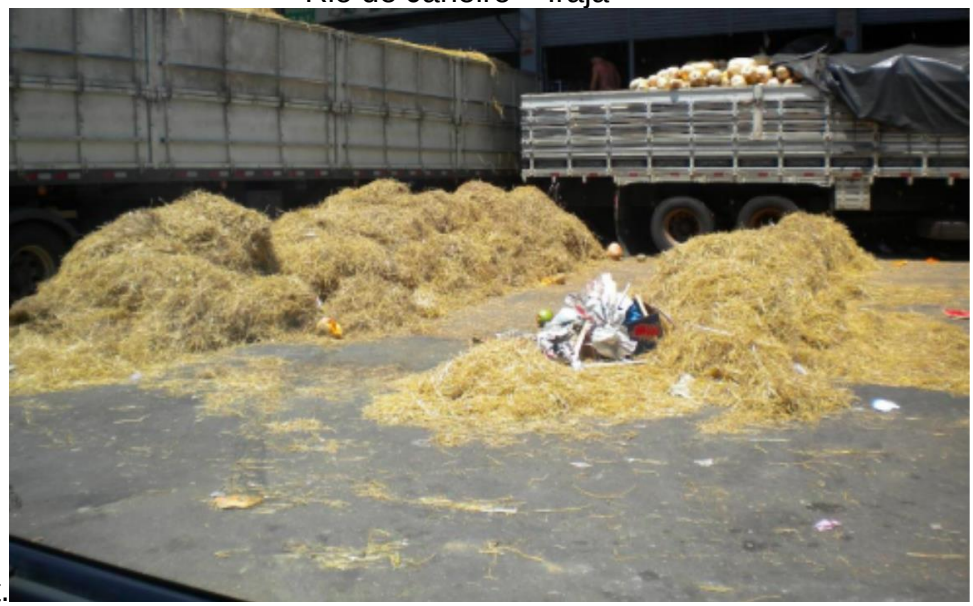
According to data from the Commercial Association of Ceasa Grande Rio Producers and Users – ACEGRI in 2009, the average daily generation of waste destined for the Sanitary Landfill was 110 tons (this value is equivalent to a municipality of approximately 100 thousand inhabitants). The estimate is that the organic portion is between 60 to 70% of the total.

It can be seen that the residues are disposed of in buckets and are often irregularly dumped on the ground.

When the subject is the treatment of organic solid waste generated daily in some system or location, some qualitative aspects must be discussed to make a decision on which technology to use.

Figure 2 below shows how inadequate disposal of organic residues consisting of straw occurs at the Supply Centers of the State of Rio de Janeiro – Irajá Unit (2012), from pumpkin and watermelon trucks.

Figure 2. Disposal of organic residues from straw at the Supply Centers of the State of Rio de Janeiro – Irajá Unit.



Source: Authors.

The lack of knowledge or culture (social aspect) causes the generator to inappropriately dispose of this type of waste, which can often cause pollution with its decomposition in the soil and contamination of the water table and also cause a favorable environment to attract pests' urban areas such as flies, rats, and birds (environmental aspect).

Greater resources are also spent on cleaning and later disposal in landfills because it could be invested in some utilization technology with the generation of organic substrate and/or energy from biogas.

4. Conclusion

Given the scenario presented, then there is a possibility of using organic waste, either partially or fully, generating energy or organic compost/substrate, so that the waste can be reused and inserted back into the production chain, preventing them from being sent to landfills and/or dumps.

The treatment of organic solid waste can be viable in social, environmental, and economic terms.

The social aspect takes place in the possibility of including both local workers and the surrounding population in the waste treatment process, providing knowledge on the subject and enabling them to disseminate the acquired knowledge.

The environmental aspect occurs when the waste is treated and, therefore, it avoids its improper disposal, causing degradation or pollution of the soil, water, and air, attracting vectors and urban pests, which can cause diseases to the population.

The economic aspect is presented because, regardless of the chosen treatment, what was previously "garbage" becomes raw material for another production process (circular economy), being able to generate energy (reducing its cost) and even biofertilizer that can be used in the institution itself, also providing an elimination with the cost of disposal.

All treatments have disadvantages and advantages (whether composting, biodigestion or biofermentation, or incineration) can be measured by the non-cost of the landfill, job and income generation, environmental education, low to medium operating cost, the possibility of using the compost in fertilization of soil for agriculture and gardening or sale, reduction of air and groundwater pollution, avoiding environmental contamination, in addition to contributing to the continuous improvement of soil quality, among others.

Therefore, an analysis must be carried out by a specialist to see which type of treatment would be best suited to the locality.

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