The Residue of Palm Oil from Frying Acarajé and Circular Economy

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A circular economy is a concept that decouples economic growth from the unbridled use of natural resources, reducing negative impacts on nature and promoting the reuse and valorization of waste and by-products within the scope of sustainable development. The palm oil residue from the acarajé frying can be transformed into other products, avoiding its disposal in nature. This topic has few studies and works. The present article presents the relationship between the circular economy and the reuse of waste in producing another good related to palm oil and acarajé. The method used was bibliographic, descriptive, and exploratory research. Reusing waste aligns with the circular economy, reducing disposal and environmental damage.
Keywords: Sustainable Development. Environmental Damage. Environmental Impacts.

Introduction

Bahia is the birthplace of the foundation of the Brazilian state, whose capital is Salvador. It is a multi-racial state with a cultural diversity of indigenous, enslaved black Africans, Portuguese colonizers, and other immigrants. Among the products originating from African culture is the acarajé, a delicacy made from black-eyed peas pounded and fried in palm oil, which has already become Brazil's material and immaterial heritage.

The acarajé originated from the Gulf of Benin in East Africa and arrived in Brazil through enslaved black people. The word acarajé is the junction of the Yoruba term "akará", which means "fire cake", and "je", meaning "to eat" [1].

The commercialization of acarajé produces many solid and liquid wastes treated as residential waste. Most of it is recyclable; however, its disposal is incorrect, partly due to the lack of an appropriate place. Furthermore, the acarajé 's frying generates an average of 5 liters of waste per day for each seller, and improper disposal causes environmental problems, which can result in the clogging of drainage systems, impact on fauna and flora, production of toxic substances and smelly.

Palm oil has great gastronomic potential and nutritional importance, imparting a peculiar flavor, aroma, and color to the foods. However, after its use, it becomes unfit for human consumption, representing a source of waste that must be appropriately disposed of or reused to produce biodiesel, lubricants, resins, and soap [2].

One of the consequences of population growth is the increase in waste, presented in all human activities. However, some are potentially harmful to the environment, with the ability to threaten life and nature. This fact requires mitigation or elimination of the risk and their effects. Reusing the good for another purpose or recycling the product as a raw material are some of the mitigated actions [3-6].

The industry uses in its production process the linear economy, predominant since the beginning of the Industrial Revolution, having as its principle the extraction, production, use, and later the discarding of the good, generating an accumulation of garbage, which has a distinct decomposition period, increasing considerably dumps and polluting mainly the soil and water sources. Moreover, this

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type of economy is an unsustainable model for the planet's well-being because the linear economy has no provision for reusing generated waste, which is discarded after use [7-9].

In recent years, the Circular Economy (CE) has gained space in governmental discussions and society, becoming a solution for the planet's sustainability. It is a comprehensive concept that generates benefits for humanity, although the intended results are not always achieved [3, 10]. Moreover, the discussion about CE started to have more global evidence in 2012, with several reports by the Ellen MacArthur Foundation entitled „Towards the Circular Economy" [3,7,10, 13,14].

CE or analeptic economics concerns obsolete or useless products that are reused, returned to the economy, or used sustainably and efficiently, avoiding their disposal and the need to explore or extract new resources. In addition, it aims to protect the environment, generate income, create employment, develop new sectors, skills, and capabilities, and make consumers aware of their behavior towards nature.

CE is based on the 4Rs of sustainability, and its model includes the economic, social, and environmental aspects.

Reducing the consumption of goods decreases the emission of pollutants, and the use of resources in a sustainable way produces minimal waste. Reuse means giving new functions to the product, destining them for other purposes, such as using returnable packaging and writing on paper on both sides. Renewing means prioritizing using renewable raw materials in production and sustainable consumption [11,12].

Recycling the product is to separate the classes of products that no longer have utility and reuse, transforming them into something new. This action tends to send the waste to the proper place for its disposal. It is also promising in generating employment, extending the useful life of landfills, reducing soil, air, and water pollution, and helping to make people ecologically aware [11,12].

CE principle encourages the elimination of waste and pollution from the beginning of the product design, keeping it in use for the maximum possible period, which tends to reduce the need to extract new natural resources, avoiding ecosystem destruction. It also maximizes natural assets and prioritizes the flow of goods. This condition tends to minimize waste production at all economic levels, generating innovation in processes and business models, focusing on producing sustainable, intelligent, and integrative goods, which contributes to stimulating economic growth and job creation, especially in the new activities generated. Furthermore, it is a sustainable and applied solution to alleviate environmental impacts because it incorporates recycling and reuse strategies, which is beneficial for nature and biodiversity [7, 12-14].

Recycling and disposal of waste are described in the National Solid Waste Policy (PNRS), Law nº 12,305/2010, which has an easy-to-understand approach to minimizing harmful environmental effects, providing the means of prevention and ways to reduce waste. It also shows the forms of waste management, which has as a tool the reverse logistic in its various stages of production, as well as the responsibilities of individuals and legal entities that produce waste and their management plans [15].

The reuse of waste generated in the frying of acarajé in the production of artisanal soap has been little studied, not finding many academic works on the subject mainly related to the circular economy. The present work aims to verify the relationship between the circular economy and the reuse of palm oil residues from acarajé frying to produce other products.

Materials and Methods

We did a literature review and a description of a particular population to identify the relationship between the variables of circular economy and the generation of waste from palm oil used in frying acarajé [16].

We did bibliographic research in documents already published in physical or virtual form, which allows the collection of information from available sources to serve as a reference in

developing the work [16]. We used keywords such as circular economy, environmental education, waste management, waste generation, waste reuse, waste disposal, and palm oil in the database for the research.

The method steps were as follows:

- Research strategies and keywords definition;
- Checking the information contained in the published works;
- Treatment of the data obtained;
- Information analysis and results obtained.

Results and Discussion

Law nº 12,305/2010 requires companies to be responsible for waste management, taking responsibility in all their production cycles, allowing them to carry out reverse logistics, collecting their products to be reused or reintegrated into their process, and preventing improper disposal by users.

The obligation to minimize the volume of waste generated is on the companies, the consumers, and public service holders, that must adopt practices that allow the reintegration of waste or obsolete materials into the production cycle by installing places to receive these products. Furthermore, the consumer must give an excellent final destination in the previously indicated places, avoiding mixing the generated residues of different natures.

Environmental education has faced many obstacles related to the conscious practices of waste disposal because it represents a new knowledge opposite to what is currently practiced by people, who sometimes find it fashionable, not realizing the danger that the planet is experiencing with the finitude of natural resources.

The Associação das Baianas de Acarajé, Mingau, Receptivo e Similares, ABAM, gives lectures with the associates on the environmental and economic importance of the residues from the palm oil used in the frying of acarajé, explaining ways of collection and disposal and its use as raw material to make soap, which can be sold and generate income for the associates.

Palm oil is one of the most important ingredients in Afro-Bahian cuisine, being used mainly in the frying of acarajé, later becoming unfit for human consumption, constituting a residue capable of causing damage to the environment when discarded incorrectly in the kitchen sink, in the culverts and in the beach sand, which can cause clogging of pipes, contamination of the sewage system and/or rainwater, with the potential to pollute the water table, rivers, streams, beach, fundraising sites water, in the soil and the sand of the beach. Therefore its recycling is equivalent to the management given to the residue.

The residues produced in the frying of acarajé are discarded correctly and may not be used in other production processes. However, in CE, they can have new uses and be valued in a new production cycle, adding value and increasing their life cycle.Transforming the waste into a new product, such as handmade soap, which all the Baianas of Acarajé produce, is a way of using the 4 Rs of sustainability. Artisanal soap can also be manufactured by all people who use palm oil to produce food.

The agreement between the Federal University of Bahia (UFBA) through the Baianambiental project and ABAM made it possible to share knowledge about soap production and its chemical manufacturing process carried out on the premises of the laboratory of the UFBA Institute of Chemistry.

About 25 Baianas de Acarajé of Salvador, selected by the association, participated in activities in the Chemical Institute of UFBA laboratory. However, just five women participated in each meeting, as the laboratory facilities could not house all of them.

The raw material used was the residues from frying acarajé with palm oil. The process used is simple and of low financial cost, having among its components caustic soda or sodium hydroxide (reagent), residues of palm oil used in the frying of acarajé (fat or fatty acid), which needs to go through a process of filtration to remove solid particles, and water. Dyes were used to define the color. Rosemary and vanilla flavorings were used.

The linear economy, the prevailing model in the Industrial Revolution, valued consumption more, and products were thought of only in the production-use-disposal phases. In contrast, CE concepts that products must be reused in a new way cycle, and this attitude contributes to the non-generation of garbage and waste. The use of material many times postpones its disposal, which occurs much later.

CE and the conscious disposal of waste have the same objective. They concern the form of consumption and how the waste generated after using a product is treated. CE is inserted in all stages of producing a good, aiming at the destination of waste and directing its use to a new use before its disposal. It also seeks to use the goods, including products that are little utilized by the owner can serve as a loan for those who need to use them.

The practice of recycling the product, transforming the residue of palm oil from frying into artisanal soap, is a transition from the linear model to the CE, as its raw material is of secondary origin, resulting in a reduction in the environmental impact, especially when compared to the production of industrial soap with the use of other raw materials such as coconut oil, which requires a more complex process for its manufacture.

There are several advantages in the proposal of CE, such as the generation of jobs, innovation in the reuse of waste, and generation of income with the sale of products for reuse in another function different from the one that was designed, as long as the design is thought of in this possibility of use. Furthermore, for companies, it renders visibility in society, showing that their brand is concerned with the environment and biodiversity, revealing that their thinking is not restricted to profitability. This action also served as an instrument of environmental awareness of the people involved in the production of this waste, dissemination, and awareness of environmental risks, as well as encouraging and moving the informal economy, as the handmade soap generated can serve as another product to be marketed by the Baianas do Acarajé or serve as a souvenir to be distributed to customers who buy and consume its products. In this way, it is included in the concept of CE, as the residue of palm oil is transformed into a raw material for the production of another well, positively impacting the environment.

Conclusion

Palm oil is one of the essential ingredients for Bahian cuisine in producing typical and traditional dishes with the know-how, a contribution to the country by enslaved Africans. Frying acarajé leaves a residue of palm oil that must be disposed of consciously to avoid environmental and biodiversity damage. Among the harmful effects of unconscious disposal, there is the possibility of clogging the pipes and contaminating the water table, beaches, rivers, riverside, ponds, and soil.

The reuse of palm oil residues used to fry acarajé in the production of soap constitutes one of the principles of the circular economy, representing an alternative to the disposal of the product. Furthermore, the artisanal soap will be able to generate additional income for the Baianas de Acarajé, who are able to commercialize with the customers that consume the products of its tray, in addition to demonstrating to their customers that they are concerned about the environment.

The production of artisanal soap from the waste generated in the frying of acarajé brings benefits to the environment and biodiversity, reducing the disposal of the product, which is one of the principles of the circular economy.

The PNRS is in line with the principles of the circular economy, helping to encourage the use of a product for the maximum period of its useful life before it becomes disposable waste, removing potential waste that would be discarded to be used in another occupation.

The actions of public entities, consumers, and organizations are fundamental for waste management to be effective in its purpose.

The objective of the work was to verify the relationship between the circular economy and the production of a new product using disposable material, such as the residues of palm oil used in

the manufacture of handmade soap. When disposed of incorrectly, the waste generated causes damage to the environment and can become a serious urban problem. The deficiency in education and environmental awareness, combined with the lack of places for the correct waste disposal, drives some sellers to discard palm oil in the culverts near their point of sale or on the beach sands. This action contributes to contaminating the water table, the soil, and the beaches, which is also extensive for homes that dispose of the kitchen sink due to the lack of someone to collect.

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