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Self-Sustainable Businesses An Opportunity From The Green Banana Peel

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Low recycling rates at various origins, such as homes and factories, lead to recurring landfill crises due to insufficient space for waste disposal and poor waste management. This research aims to analyse the use of solid banana peel waste to create self-sustainable business models and reduce this waste in municipal landfills. The research design will be mixed, taking into account the collection of both qualitative information, such as the characteristics of the peel, and quantitative information, such as the quantity of peel available. The results will be a detailed analysis of the properties and potential applications of green banana peel, as well as the identification of self-sustainable business models that use green banana peel as a raw material.

Keywords: self-sustainability, waste, business, use.

Resumo: Low recycling rates at various origins, such as homes and factories, lead to recurring landfill crises due to insufficient space for waste disposal and poor waste management. This research aims to analyse the use of solid banana peel waste to create self-sustainable business models and reduce this waste in municipal landfills. The research design will be mixed, taking into account the collection of both qualitative information, such as the characteristics of the peel, and quantitative information, such as the quantity of peel available. The results will be a detailed analysis of the properties and potential applications of green banana peel, as well as the identification of self-sustainable business models that use green banana peel as a raw material.

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1. INTRODUCTION

The rapid increase in environmental pollution is gathering pace, and its devastating effects are becoming more evident every day. These include global warming nd various climate changes, as well as phenomena such as La Niña. These affect ecosystems, production systems and human health. These phenomena are exacerbating environmental degradation and threatening the well-being and survival of species and society in general. One of the factors causing this problem is the failure to reuse solid waste, which has a serious impact on this environmental crisis. According to data from the World Health Organization (WHO), an estimated 2 billion tonnes of waste are generated each year. Of this, only 16% is recycled, while 50% ends up in landfills and 34% is burned. This is due to poor waste separation practices, a lack of sustainable practices that minimise resource consumption and inefficient promotion of their use.

Consequently, the accumulation of waste in the oceans is increasing, with an estimated 150 million tons of plastic already present. Similarly, environmental organisations report that 85% of polluting waste is plastic and emphasise that these figures will increase considerably in the future if measures are not taken to recycle this waste. This could lead to increased pollution and the loss of large quantities of recyclable materials that could be put to productive use and contribute to the economies of each country.

The environmental crisis in Colombia is a growing concern that affects its ecosystems, biodiversity and the well-being of its people. Climate change, consumerism, deforestation and the significant increase in solid waste, including plastic bags and bottles, are making the situation in Colombia much more complex. These factors are generating extreme climate changes, such as droughts and floods, which affect not only the environment, but also food security. According to an article published by Semana magazine, the lack of solid waste utilisation in Colombia is currently alarming. Nearly 12 million tonnes of waste are produced annually, of which an average of 16.5% is recycled. Additionally, around 32,000 tonnes of waste are produced daily across the country. According to data from the Superintendency of Public Services, the total figure was 11.8 million tons in 2019.

Furthermore, the article provides important data: for the same period, the country consumed 1.4 million tonnes of plastic, only 20% of which was recycled. Around 770,000 tonnes were used for short-term purposes, such as packaging and containers. At least 38,500 tons of this amount correspond to single-use items, such as disposable bags, plates, cups, cutlery and straws. Waste utilisation indicators in the country are quite low, based on figures from cities such as Bogotá. According to the Greenpeace Foundation, Bogotá generates over 9,000 tonnes of waste daily, almost 3,000 tonnes of which is potentially recyclable. Most of the remainder ends up in the Doña Juana landfill, while only 17% of waste is recyclable and the remaining 84% ends up in landfills, rivers, wetlands and other ecosystems.

According to the National Department of Statistics (DANE), the recycling and reuse rate was 11.82% in 2018, corresponding to around 3.88 million tonnes. This is based on a broader measurement universe than that defined for the sanitation service. The goal by 2030 is to reach a rate of 17.9%. Moreover, air and water pollution resulting from the inadequate management of solid and liquid waste, coupled with the insufficient reuse and recycling of materials in Colombia, is exacerbating the country's environmental crisis. According to figures from the environmental ministries, only 17% of the solid waste generated in Colombia is recycled and reused, while 83% ends up in landfills, generating soil, water and air pollution.

A lack of awareness, knowledge and environmental education programmes for utilising recycled materials and converting them into new entrepreneurial ideas that lead to self-sustaining development and contribute to efficient solid waste management processes are the main obstacles to recycling and reuse in Colombia. The Ministry of Environment states that 47% of Colombia's municipalities have comprehensive solid waste management programmes, but many of these are not being implemented adequately.

From a municipal perspective in the Department of Cesar, an article published in the weekly newspaper La Calle states that 'the Municipality of Valledupar currently has a total capacity of approximately 2,800,000 tons, with limited daily capacity. Considering that it receives approximately 438 tons of waste as a result of its municipal waste collection process — not including waste from neighbouring municipalities — it can be concluded that this issue is due to a lack of public policies and compliance with environmental policies regarding the correct use and final disposal of solid waste. This results in a decrease in the capacity of sanitary landfills and increased environmental concerns.

Additionally, the failure to reuse and recycle signifies a squandering of precious resources, given that a large proportion of the disposed of materials could be employed to manufacture new products. In Cesar, problems such as the misuse of solid waste, including banana peels, can be observed. These are wasted and present in abundance. The food industry exacerbates the current landfill crisis by transforming this product into other by-products characteristic of many informal economy ventures, such as packaged green plantains, stuffed patacones and banana baskets.

These environmental problems affect people's quality of life, particularly in vulnerable communities, and require urgent, coordinated action from the government, private sector and civil society. This action should leverage the sustainable approach of the circular economy, which aims to reduce waste and reuse resources as an alternative to minimising the crisis caused by high volumes of solid waste in landfills. The main objective of this research is therefore to analyse the use of solid banana peel waste in order to create self-sustaining business models that mitigate the negative impacts caused by limited waste reuse.

This research is socially justifiable and seeks to mitigate the harmful effects of environmental pollution, such as the increase in solid waste in landfills and the resulting decrease in their capacity. In theory, this project will provide viable business models for using solid banana peel waste and will serve as a benchmark for reusing other types of solid waste. Methodologically, we will provide precise data and a route for utilising banana peels that can be used as a reference for future projects.

In this context, it is urgent that the circular economy policies currently driving the world's economies — especially Colombia's — address this environmental crisis by generating new, self-sustaining business ideas that contribute to the economy and help mitigate the negative impacts of high levels of plastic waste. It is also essential to design strategies that engage people in promoting the valuable work of recycling and reusing these plastics, establishing it as a key part of productive processes and the circular economy.

In order to mitigate or solve these problems, it is imperative to implement sustainable strategies and practices that contribute to the sustainable development of the economy, waste reduction, and recycling and reuse. Furthermore, it is urgent to educate the population about the importance of environmental protection and to raise awareness of the impact of our actions

on the planet, emphasising the importance of recycling waste to generate new, self-sustaining, profitable businesses.

2. THEORETICAL REFERENCE

This research was based on various theories supporting the need for solid waste utilisation processes to minimise environmental pollution and generate self-sustaining business alternatives that contribute to economic improvement. The circular economy: This model involves sharing, transferring, reusing, repairing, reorganising and recycling existing materials and products for as long as possible. The objective of this model is to address global challenges such as climate change, biodiversity loss, waste management and pollution. It is defined in contrast to the traditional linear economy.

Several authors and a single researcher have studied this model, resulting in an evolutionary and collaborative process. However, the concept is attributed to British economist David Pearce, who developed the idea of 'environmental economics' in 1980 and promoted the integration of the environmental dimension into economic processes. Sustainable entrepreneurship: It is defined as a form of social, human and economic integration that aims to exploit the various opportunities presented by the environment through business initiatives. It is also characterised by identifying the most effective methods of producing goods and services that meet the community's needs, incorporating activities such as creativity and innovation. This approach considers individuals as valuable contributors to the comprehensive development of the economic environment, thereby achieving stability and ensuring sustainability (Chirinos, 2014).

Sustainable business model: According to authors such as Mangematin et al. (2003), each business model has its own purpose and development. This must be consistent with the necessary resources, relationships with customers and suppliers, competencies within the company, financing methods and shareholding structures, all of which are essential for success.

Similarly, Osterwalder, Pigneur & Tucci (2005) were the first to describe sustainable business models as a conceptual tool encompassing a set of elements and relationships that allow companies to express their business purpose. They describe the value that a company offers to one or more customer segments, as well as the structure of the company and its network of partners for creating, commercialising and delivering value — relational capital — to generate profitable and sustainable revenue streams.

Socioeconomic and environmental impact: The impacts that solid waste can generate when used to create new products are not only innovative, but also generate different impacts, such as socioeconomic and environmental ones. This is where the contributions of authors such as Elkington (1997) are important. They argue that any self-sustaining business using raw materials such as banana peels must have a significant socioeconomic impact, which is crucial for assessing its success. Furthermore, the concept of the 'Triple Bottom Line' reinforces this, adding that every company needs to measure its performance in social and environmental terms as well as economic terms.

3. METHODOLOGY

This research employed a mixed-methods approach, utilising both qualitative information, such as peel characteristics, and quantitative information, such as the quantity of peel discarded by business owners. The research population consisted of business owners in the municipality who use green bananas as a raw material. The sample comprised seven informal businesses. This sample was determined by a population census to provide an in-depth analysis of the research topic and results, such as greater representation. The research design was a sequential explanatory approach integrating elements of qualitative and quantitative research. This design enabled a deep and detailed understanding of the studied research topic, as well as the statistical analysis of quantitative data.

Finally, the research was descriptive in nature, as the results obtained by the quality laboratory for two samples of banana peel (cooked and raw) were analysed and described in detail at each stage of the process to reach the stated objective, based on the manipulation of variables. Data was collected using questionnaires, interviews and direct observation with closed and open questions, and analysed using the Excel tool and inferential statistics.

4. PARTIAL OR FINAL RESULTS AND DISCUSSION.

This research study studied the properties of green banana peel in a quality laboratory, yielding the following results**:**

Table 1: Properties of banana peel

Parámetro	P.A	R1	R1
Húmeda	**X**	**87,36**	**87,49**
Solidos solubles	**X**	**0,2**	**0,3**
Agua adicionada			
Acidez titulable	**X**	**0,006**	**0,0067**
PH	**X**	**6,44**	**6,404**
Cenizas	**X**	**1,63057**	**1,68421**
Colorimetría	**X**		
Firmeza	**X**	**10,8**	**10,8**

After analyzing the results, it was evident that the banana peel waste, in its solid form, has optimal properties for generating new products such as paper and organic fertilizer, among others. Succeding the results of the physical and chemical analysis of the banana peel, it was possible to obtain several potential ventures from the reuse of banana peels. Among them are:

Organic Fertilizer: Regarding economic viability and production costs, the focus was on three aspects:

a. Raw material: As mentioned above, the raw material is available; the volume of discarded banana peel in the area is considerable, which allows for continuous availability of this raw material.

b. Procedure: It is a simple process that does not require expensive and difficult-to-access fertilizers, making it favorable for maintaining low production costs.

c. Distribution: Distribution costs can vary depending on demand; however, this demand for this type of product is increasing considerably, which justifies the costs.

Regarding the potential market, two fundamental aspects were taken into account:

a. Demand: There is currently a growing demand for this type of product, thanks to its increased use in agriculture to obtain much healthier and more wholesome products.

b. Competition: There are several types of organic fertilizer on the market; however, organic banana peel fertilizer has a differentiating advantage in its properties and nutrients.

Regarding the economic benefits, two aspects stand out:

a. Income: Production and distribution can generate significant income, especially if marketed in organic farming and gardening markets.

b. Employment: Marketing can generate local employment, especially in rural areas.

Environmental Feasibility of Organic Fertilizer

This environmental feasibility study was carried out based on two key aspects: waste reduction and environmental benefits.

Waste Reduction

a. Reuse: Transforming banana peels into organic fertilizer reduces the amount of waste ending up in landfills, contributing to sustainable waste management and mitigating negative environmental impacts.

b. Utilization: Reusing banana peels into fertilizer becomes an efficient recycling process that can provide nutrients to various crops, allowing for the production of sustainable and environmentally friendly products.

Environmental Benefits

a. Soil Optimization: By transforming banana peels into organic fertilizer, we can achieve greater soil fertilization and minimize fertilizer use, thus reducing soil and water pollution.

b. Emission Reduction: Organic fertilizer has special characteristics such as having a lower carbon footprint than other chemical fertilizers, helping to mitigate the negative impacts on biodiversity.

Handmade Paper: Economic Feasibility - Production Costs

a. Raw Material: Banana peel is a recyclable, abundant, and inexpensive material with no specific destination, significantly reducing costs.

b. Procedure: The process of transforming banana peel into handmade paper requires specific tools and technologies and can be more expensive than compost.

c. Distribution: Distribution costs can be high, considering the type of market, such as printing and international markets.

Regarding the potential market, two key aspects were taken into account:

a. Demand: There is a growing demand for handmade and sustainable paper, especially in the craft, typography, and ecological product markets.

b. Competition: Competition in the handmade paper market is high, however, handmade paper made from banana peels can stand out due to its unique texture and sustainable value.

Regarding the economic benefits, two aspects stand out:

a. Income: Significant income, especially if this marketing is done in typography, craft, and ecological product markets.

b. Employment: Sales of handmade paper can generate employment, contributing to local economic development.

4.1 Environmental Viability of Handmade Paper

The environmental viability of handmade paper with the two key aspects of waste reduction and environmental benefits.

Waste Reduction

a. Reuse: Transforming banana peels into handmade paper reduces the amount of waste reaching landfills by increasing their capacity, contributing to sustainable waste management, and mitigating negative environmental impacts.

b. Recycling: Recycling banana peels into handmade paper allows for a new use of agricultural waste that previously had no specific purpose.

4.2 Environmental Benefits

a. Optimizing reforestation: The production of handmade paper from banana peels reduces tree felling, thus allowing for greater forest conservation.

b. Reducing emissions: Organic paper, like compost, has characteristics that make it unique, such as having a lower carbon footprint than traditional paper-making processes, thus helping to mitigate negative environmental impacts.

4.3 Discussion

These results suggest that banana peels, a recyclable material, represent a self-sustaining business opportunity. At the same time, they reduce the amount of solid waste ending up in landfills, thus mitigating the negative effects of environmental pollution to some extent. These results are consistent with the views of authors such as the British economist David Pearce, who developed the concept of 'environmental economics' in 1980, promoting the need to integrate the environmental dimension into economic processes. After its utilisation, this waste will generate a positive environmental impact for the community and promote productive processes that generate new products, such as organic fertiliser, which can be marketed to generate socioeconomic development in communities where these initiatives are implemented.

Results are also consistent with Chirinos's (2014) assertion that sustainable entrepreneurship is a form of social, human and economic integration that implements business initiatives to utilise the opportunities arising in the environment. It is also characterised by identifying the most effective methods of producing goods and services that meet the community's needs, incorporating activities such as creativity and innovation. The

results demonstrate that different sustainable business ideas can be implemented by taking advantage of the opportunities offered by the environment. Furthermore, utilising solid materials without a specific purpose can lead to innovative solutions for new products and services. This research demonstrates that sustainable products such as organic fertiliser and handmade paper can be produced.

5. CONCLUSIONS

Upon analysing the use of solid banana peel waste for creating self-sustaining business models, it was concluded that producing and marketing compost and handmade paper is indeed feasible. These two products are becoming increasingly popular due to the growing demand for sustainable products that mitigate negative environmental impacts. This creates opportunities for innovative entrepreneurship, generating jobs and providing economic, social and environmental benefits for entrepreneurs and their communities. These types of products are also becoming attractive alternatives for many entrepreneurs and public policies seeking to finance them, setting an example for the community, educational institutions, businesses, governments and society in general.

Nevertheless, it can be concluded that entrepreneurs currently lack clarity on the concept of the circular economy and the use of solid waste. This results in much of this optimal material being lost without being reused, thereby missing the opportunity to create sustainable business models. In other cases, it prevents entrepreneurs from expanding their product catalogues with new alternatives using materials they themselves generate. In this context, it is essential to educate, motivate and encourage the community to make good use of these residues, thus raising awareness of environmental protection and avoiding increased pollution and the need to expand sanitary landfill sites, bearing in mind that many of these residues are removed in large quantities, limiting their management capacity.

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