

Circular economy through composite materials



We seek for promoting environmental sustainability through the responsible use of plastic waste, the strengthening of circular economy, and poverty fighting.

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Acknowledgment: To the advisors John R. Abelson and Achille Djeagou

Acknowledgment: Dr. Gerardo Fonthal and Dr. Isabel Hoyos, professors at the University of Quindío.

Our proposal

SUSTAINABLE DEVELOPMENT GOALS



Technical training helps communities generate sustainable income, reducing poverty and strengthening the local economy.



Improve sanitation and preserve water bodies by reducing plastic and organic waste, and promoting the use of rainwater and solar energy in recycling processes.



Promote decent employment and sustainable growth through small-businesses based on recycled and organic residues, strengthening the local economy.



Reusing recycled materials and biomass promotes the circular economy, reducing the use of raw resources, waste, and environmental impact.

We aims to develop a composite material made of biomass and plastics for the production of crafts and general-purpose commercial products.

The production, distribution and sale of the products will be carried out by a vulnerable and organized community, in order to improve their economic well-being and promote awareness about the environmental impact of plastic.

Background: We have developed previous trials with tree pruning waste (lignocellulose) and polyethylene to produce a composite material similar to plastic wood.









Plastics everywhere

Between 2000 and 2019, around 4.8 billion tons of plastic were generated, representing 3.4% of greenhouse gas emissions. About 9% of this plastic is recycled, while 79% ends up in the environment or in landfills, seriously affecting water bodies and oceans [1, 2].

Plastic is primarily a petroleum derivative that has experienced an increase in its use due to its low production cost.

Plastics:
How long do they take to decompose?

	Fishing line ± 600 years The same amount of time since... Leonardo da Vinci painted the "Mona Lisa" (1503)
	Bottle ± 500 years The same amount of time since... Shakespeare wrote "Hamlet" (1600)
	Cutlery ± 400 years The same amount of time since... Isaac Newton formulated the laws of motion (1687)
	Lighter 100 years The same amount of time since... Amelia Earhart became the first woman to fly solo across the Atlantic (1932)
	Cup 65-75 years The same amount of time since... The first organ transplant was performed (1954)
	Bag 55 years The same amount of time since... The first email was sent (1971)

Biomass and its applications

Biomass management has great potential in the social, environmental and economic spheres. Using this waste instead of allowing it to decompose or be incinerated can prevent the release of carbon and other pollutants into the atmosphere. Its use contributes to reducing the demand for virgin resources, reducing the overall ecological impact.

From an economic point of view, the use of biomass encourages the creation of local companies dedicated to the circular economy. A clear example of this is the manufacture of value-added products, such as construction materials, from recycled biomass.

The main biomass waste products are:



Forest waste constitutes the largest amount of biomass



Agro-industrial waste, such as fruit peels, constitute the second largest amount of biomass.



Urban organic waste, this is mainly food waste but also green waste such as grass and leaves.

Composite materials

A composite material is a type of material formed by combining two or more materials that enhance the physical properties of the resulting material [3].

These materials have two main components: the matrix and the reinforcement. The reinforcement is the material that provides the mechanical properties to the composite, while the matrix is the material that surrounds or impregnates the reinforcement [3].

Composite materials are present in many products, such as concrete, Kevlar and fiberglass.



Our Solution

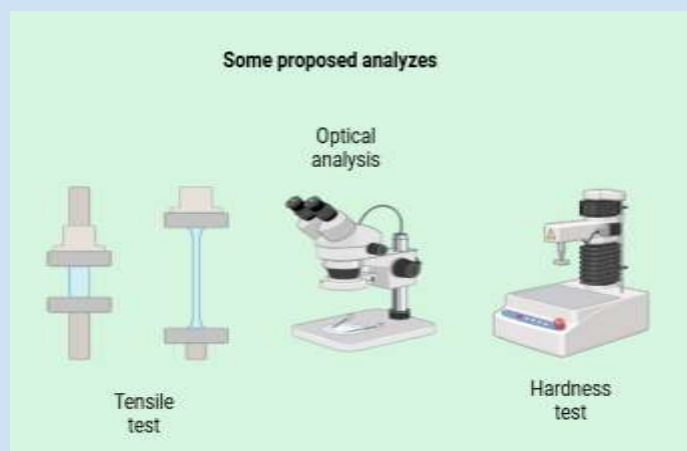
First, we identify the type of plastic with an physicochemical structure that is compatible with biomass to produce the composite material.

The production of High Density Polyethylene (HDPE) and Low Density Polyethylene (LDPE) amounts to 75 million tons per year. Their high availability makes them good candidates to be considered as raw material for composite materials and thus reduce the harmful environmental impact of plastics.

Additionally, the melting point of this type of plastic is relatively low (ranging between 105 °C to 130 °C), which makes it ideal for this project.

Material Characterization

Composite panels made of plastic and biomass will be manufactured and subjected to mechanical characterization to determine their possible commercial use.



Benefits for vulnerable communities

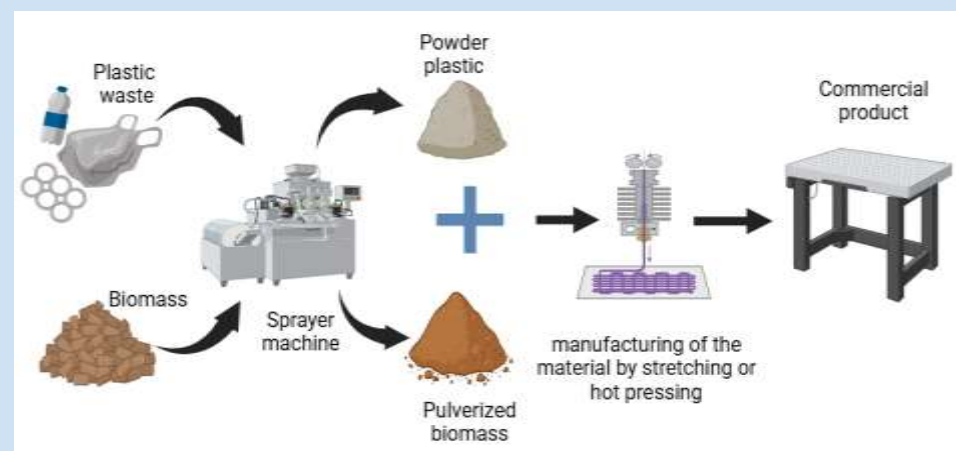
Once the commercial composite material has been obtained, the aim is to raise awareness in vulnerable communities so that they take ownership of the production process.



1. **Awareness campaigns** will be conducted to sensitize vulnerable communities, which are mainly large producers of biomass, such as farmers, carpenters, and even neighborhood communities in Colombia, to organize and collect biomass and plastics.

2. **The organized communities will be trained** to develop the production process. At this point, a feasibility study is necessary in the context of a small business. The estimated cost of the investment, over a period of 2 years, is 100,000 dollars for the acquisition of tools, raw materials, machinery, salaries, etc.

3. Finally, **a small business enterprise will be set up** dedicated to the manufacture of commercial products from composite materials. This enterprise will primarily benefit the community itself, for instance, farmers using their waste to make chairs, boards, tables, etc. for a school operating in their area.



References

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[2]. Greenpeace. (n.d.). *Data on plastic production*. Retrieved from <https://es.greenpeace.org/es/trabajamos-en/consumismo/plasticos/datos-sobre-la-produccion-de-plasticos/>

[3]. Clyne, T. W., & Hull, D. (2019). *An introduction to composite materials*. Cambridge: MRS.