

3-5 April 2019

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# Designing Sustainability for All

## LIBRELOTTO L. I.; MEDINA F.; FERROLI P. C., NASCIMENTO E. C.; CARBONARI L. T., Universidade Federal de Santa Catarina Bamboo supply chain: opportunity for circular and creative economy

### 1. INTRODUCTION

Bamboo is a renewable material that has about 1200 species around the world. In Brazil there are approximately 250 species (endemic or introduced), which can be used in food, products, building constructions, among other purposes. In this way, there are many possibilities of generating products at each stage and filling the gaps, which occur from the production of seedlings and planting to the distribution of the products benefited. So, along with the ecological and social advantages that bamboo already presents today, one can notice it's easy connection with the circular economy and the creative one. Such integration would enable a considerable economic growth, which, adding value to a product of national abundance, with great aptitude for agriculture, could make Brazil a world reference in the planting and industrialization of the product, generating new jobs, creating income and economic development in local and national level. This article discusses this potential and identifies the possibilities of obtaining products from the bamboo raw material.

### 2. SUPPLY CHAIN

Brazil is the country of the Americas with the highest incidence of bamboo in its territory. There are 258 species of bamboo in Brazil, as well as one of the largest native bamboo forests of the world, located in the South-Western Amazon. It is so present in this scenario that for many it is considered a pest, because its rapid propagation harms some species of the local flora. What could be an ecological problem can become an economic and sustainable benefit at regional, national and global scales. For the social, economic and environmental assimilation of this raw material, the consolidation and improvement of the supply chain is paramount. It is also extremely necessary that there be governmental incentive, as is happening with the State Plan for the development of bamboo for the state of Acre, which encompasses learning centers, technical education, incentives and international partnerships.

### 3. CIRCULAR AND CREATIVE ECONOMY

It is known that the current predominant linear economy no longer supplies the demand of the modern world. Considering the scarcity of natural resources, global overpopulation, global crises and inefficiency in waste management, the circular economy arises with the goal of articulating a conscious and optimized way of extracting, producing, consuming and discarding. And along with it the creative economy also gains space, this form of production has the creativity, the culture and the intellectual capital as form of generation of income. The paper discusses how these two new ways of thinking economy can add value to the national product, as it puts Brazil at the forefront of global sustainable innovation.

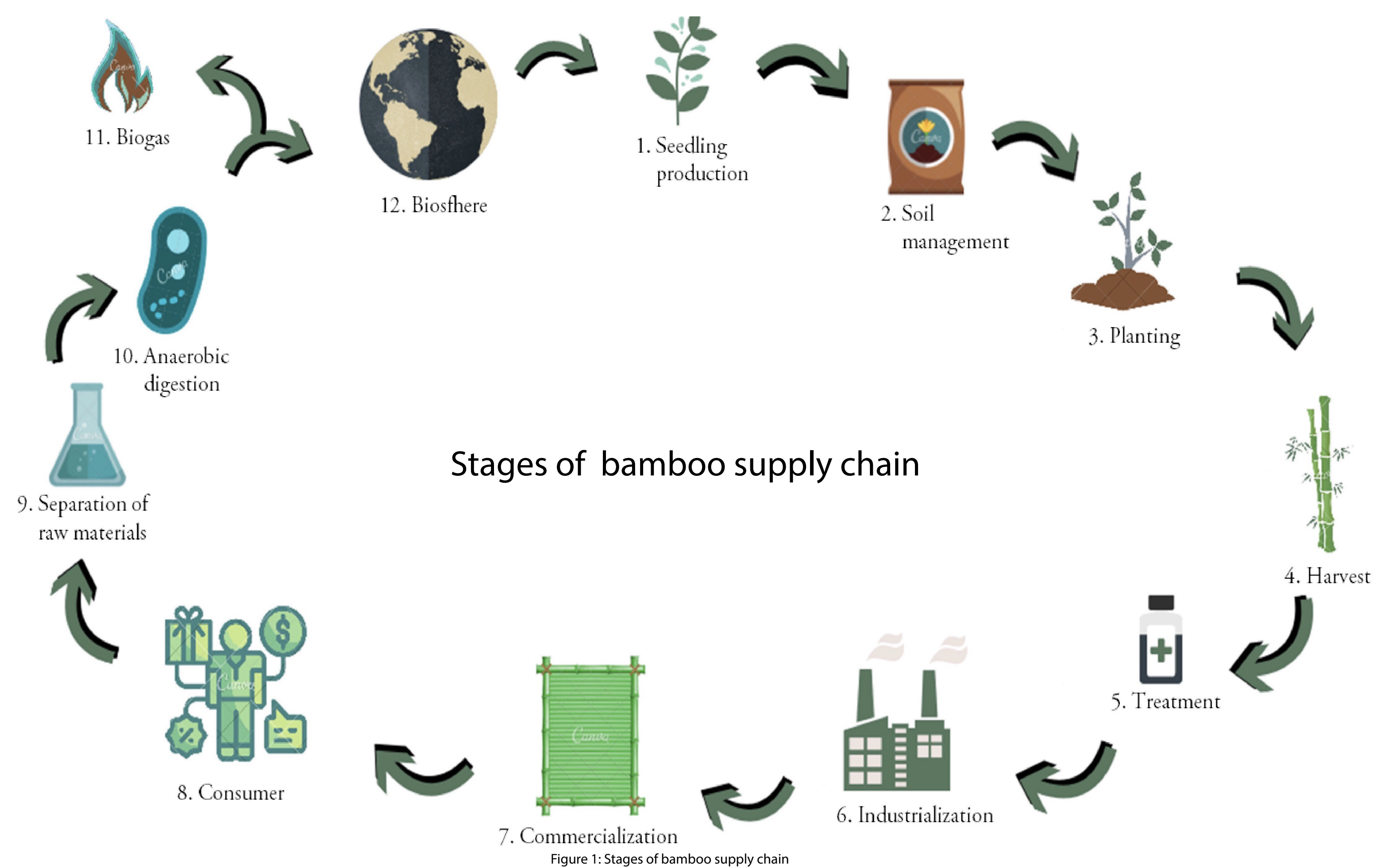
### 4. METHOD

In order to achieve the sustainability of the use of bamboo, it is necessary to diagnose all phases of the production chain in a circular and creative scenario, and to encourage good practices. To achieve the objectives of the research, it is presented the modeling of the chain and possibilities of product generation in the stages, in order to obtain its development, by filling the gaps in the process. As results, it is expected to show the employment potential, technological transfer and knowledge about the supply chain in Brazil. The first stage of the research consisted of a bibliographical review. The words: bamboo, circular economy OR creative economy and supply chain were used as operators. For the understanding of the bamboo supply chain, several references were consulted, besides those found in the systematic review. The second stage consisted of the supply chain modeling followed by the identification of the potentialities for the circular economy.

### 5. NATIONAL POTENTIAL FOR THE CIRCULAR AND CREATIVE ECONOMY

To understand the steps and how they relate to each other, what their products are and what the employment possibilities generated at each stage, a scheme was developed that demonstrates the phases of the bamboo supply chain within a circular and creative economy. [Figure 1]

The products and the possibility of employment assimilation are the most varied. In step 1 we have the production and sale of seedlings and seeds, followed by soil preparation and planting.



In step 4 we have the bud of the bamboo, the seedlings from parts of the bamboo, the green manure and the use of the water of the accumulated in the stems for homeopathic purposes. In the treatment phase we have the octaborate, which pododser used as salt fertilizer. In step 5 we have a vast range of products, more than 1500 applications cataloged (MANHÃES, 2007) among civil construction, furniture, pharmaceutical industry, textile, cosmetics, among others. Opportunities for the creative and circular chain can be found from the beginning of the chain, but the opportunities are in the stages of industrialization, commercialization and consumption. Through the technical and cultural stimulation of the use of bamboo, creative forms of use can add value to the material. Examples include companies such as Brazil's Petbamboo, which manufactures accessories and containers for bamboo-based pet food, and the Canadian company ChopValue, which produces furniture and accessories of something of value added from used hashis of bamboo.

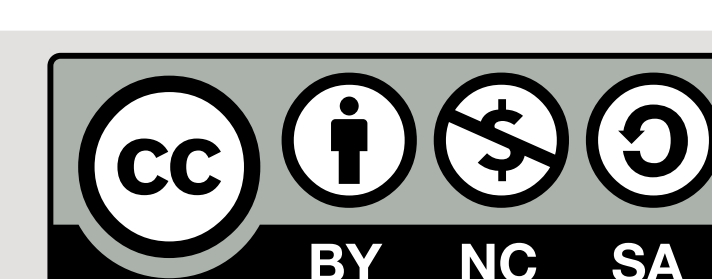
After initial use, the circular economy provides for optimization by reusing or using by-products. This means making the sequential use of the material, predicting the smallest internal circuits of the systems, such as restore, renew, re-pass, only to recycle. At this point, the importance of designing for durability is emphasized, as opposed to the linear system that feeds on programmed obsolescence. Professionals of the future need to be molded to design for remanufacturing, renovation and recycling.

After cascading, according to a circular economy, the bamboo can undergo a process of separation of the raw materials that make up the product. Many products can be studied for this destination, including use as fuel for stoves, boilers, engines and sustainable electricity generation through biogas. At the end of the cycle, the material will return to the biosphere, nourishing the soil and allowing the fertilization of other plants in a sustainable cycle.

### 5. FINAL CONSIDERATIONS

Through the understanding and improvement of the stages of the production chain of bamboo at the national level, primarily in the treatment (to confer quality), industrialization (adding value to the product) and commercialization (export and recognition of the national product of the world market), Brazil would assume an active role in the world market with exports of manufactured bamboo products. There are many opportunities to explore. The production chain of bamboo in Brazil needs promotion, dissemination and incentives that go through governmental policies, innovation in research to develop new uses, adequate equipment, technologies for treatment that do not compromise the health or the quality of the environments where the material is workshops and activities to disseminate the best techniques for the material. Finally, as a gift from the gods, the human being can not miss this opportunity to search for a more sustainable way.

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With the support of the Erasmus+ Programme of the European Union