



THE AMAZONIAN NATIVE RUBBER FOR DESIGN AND FASHION: ANALYSIS OF THE INTERFACE OF CRAFTS WITH PRODUCT LIFE CYCLE FRAMEWORK

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Abstract

Despite the end of the rubber cycle in the Brazilian Amazon, some sociotechnical systems based on latex extractivism have been developed in the forest in the past three decades, producing materials and products for fashion and design value chains. Given this context, this research analyzes fifteen cases studies of rubber materials and products produced by rural workers, indigenous people, and rubber tappers. The main goal is to comprehend the development stage of rubber materials and products in the Amazon. Covering a period from 1992 to 2022, with a fieldwork in Acre, the cases were analyzed according to six Approaches of Crafts, and the Product Life Cycle framework. The main results show that most initiatives have achieved their growth or have failed. The predominant craft approach identified was the Productivist one, which perpetuates dependent relationships. This research tried to fill a gap in the literature of the Amazonian native rubber materials and products for fashion and design. Future research should include fieldwork in Pará, investigate the artistic aspect of crafts, and differentiate the working process of rural workers from indigenous people.

Keywords: Amazonian rubber; Amazonian design; Arts and crafts; Product Life Cycle; Amazonian fashion

1. Introduction

Since the 1990s, rural workers, indigenous people, and rubber tappers have been extracting latex to manufacture – in the middle of the Amazon rainforest – materials and products for design and fashion value chains. Despite all challenges of the forest, such as lack of telephone and internet signals, and flooded roads, rubber sociotechnical systems have been developed in

Acre, Amazonas, Rondônia and Pará. Apart from the inherent challenges of the forest, many projects aiming to scale up small rubber initiatives to mass artisanal production have failed due to lack of materials quality, dependency on chemicals, lack or delay of subsidies, market trends, the pressure to reduce costs, and competition with cattle and nuts extraction. The systems implemented by enterprises, designers, scientists, and NGOs, became at the end, empty promises of sustainable development in the forest.

That said, the main goal of this research is to comprehend the development stage of rubber materials and products in the Amazon. Specific goals are: (a) to relate technical and social aspects of the systems; (b) to identify similarities and connections among the systems; (c) to correlate the crafts approach with the product life cycle framework.

2. Literature review

The literature on the technical manifestations of rubber materials in Acre focuses on the study of material technologies and its transformations into new products, the empowerment of communities, and the analysis of the viability of rubber extraction in the Amazon to develop new production processes (SILBERLING & FRANCO, 1995; ANDERSON & CLAY, 2002; SAMONEK, 2006; SARMENTO, 2014; AMADEU, 2015; JARAMILLO-GIRALDO *et al*, 2017). One of the reasons to explain the lack of literature is that scientists and businesspeople wanted to protect the technologies they developed, especially the chemicals, sequence of production processes, and the nature of some key partnerships. On the other hand, reports from NGOs (PASTORE JR., PERES JR., DO NASCIMENTO, 2015, SOS AMAZONIA 2020, VILELA, 2020) describe the projects developed focusing on their technological aspects and short-term impact on the local communities.

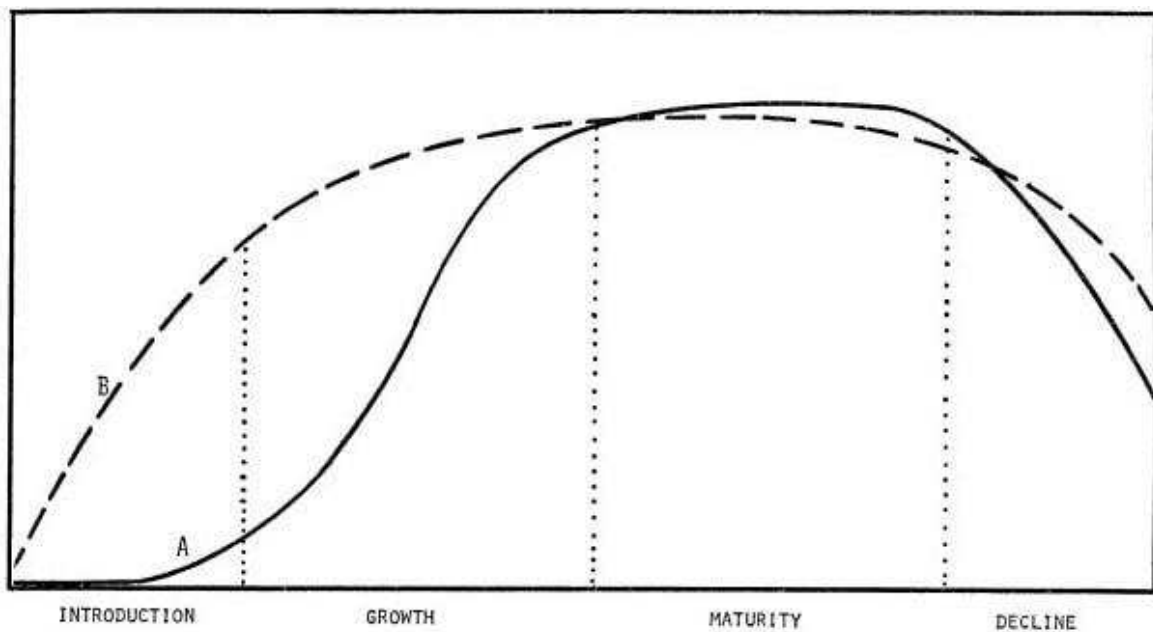
2.1. Product Life Cycle

The description of the case studies uses the frameworks of Product Life Cycle (POLI & COOK, 1969; BAXTER, 2000; SLACK *et al*, 2006), and Approaches of Crafts (BONSIEPE, 2019), in the fields of Production Engineering and Product Design. At least since 1959 (POLI & COOK, 1969), the first framework has been explained by an analogy in Biology. Like “living beings”, the products in a company: (1) born (are launched); (2) grow (scale up, sales increase); (3) mature (the technology stabilizes, more competitors appear); and (4) die (decline or fail). In some cases, they still can have their life cycle prolonged (RINK &

SWAN, 1979; JONES, 2005). The goal of this analysis is to diagnose a company’s product, determining its life stage (BAXTER, 2000).

The characteristic life cycle curve (Figure 1–A) presents the aforementioned phases, showing an “initial resistance to widespread acceptance of a new way of behaving and is purchased by only a limited segment of the buying population” (POLLI & COOK 1969, p. 386). Thus, the traditional curve A represents a “dramatic innovation” (POLLI & COOK, 1969), also referred to as breakthrough or radical innovation (ROZENFELD *et al*, 2006), referring to cases (9) and (13).

Figure 1 – Two frequently hypothesized life cycle patterns



Source: Polli & Cook (1969)

On the other hand, the exponential curve B refers to less innovative products, that enter the market supported by adequate promotion – which is the case (15), a traditional type of rubber being reintroduced in the forest, nevertheless viable via partnerships with NGOs and donations of equipment. Initiatives like these, offered “to help” the local communities and “to save the Amazon”, have been addressing the forest as a profitable business. After all, if the Amazon rainforest has been seen as a tech-lab, or a factory by “technocratic projects” (MCDERMOTT, 2007) – why not use a framework accordingly to this view?

2.2. Crafts approaches

The transition from a small batch to mass production is widely studied, since the rationalization of work in Taylorism to the automatization of industry 4.0. Although some authors defend the idea of the “Amazon 4.0” (NOBRE, 2018), considering the forest as a large factory, the main literature in Production Engineering does not cover the small and artisanal production units of rubber materials for fashion and design in the Amazon rainforest. Thus, the research was situated in the border of Product Design (DE MORAES, 2008) with Arts and Crafts. One of its canon authors (BONSIEPE, 2010) once distinguished six Approaches of Crafts (Table 1).

Table 1 – Crafts Approaches

Approach		Brief description
1	Conservative	Seeks to protect the craftsman against any design influence from outside
2	Aesthetic	Artisans as representatives of popular culture and elevates their work to the status of art
3	Productivist	Considers artisans as skilled and cheap labor, using their abilities to produce objects developed and signed by designers and artists. It takes a good deal of ingenuity to accept this approach, presented as <help> for handicrafts in the Periphery.
4	Culturalist or essentialist	Considers the local projects of artisans as a basis or starting point for true Latin American or Indo-American design.
5	Paternalistic	Artisans are a political clientele of welfare programs and plays a mediating role between production and commercialization
6	Innovation-promoting	Advocates the autonomy of artisans to improve their subsistence conditions

Source: author, based on Bonsiepe (2010)

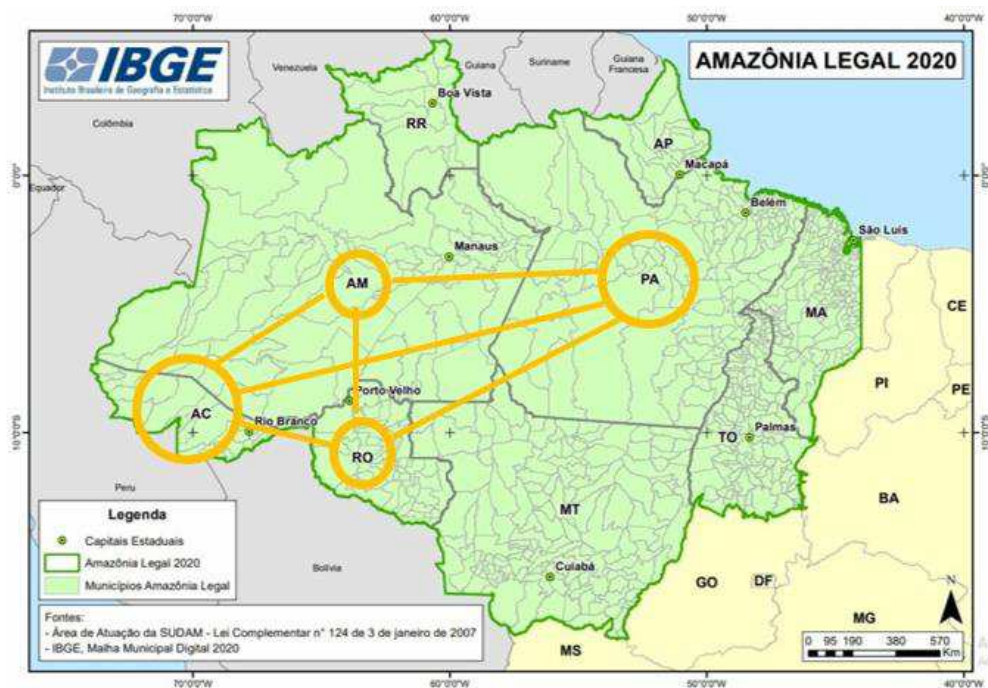
The approaches Conservative and Aesthetic were not identified in the selected cases, while the Productivist is predominant, being described in the next sessions.

3. Methodology

The methodology of this qualitative research is divided into four phases. First, the theoretical phase is based on more than a decade of desk research about rubber for fashion and design in the Amazon, situated in the fields of Product Design and Product Engineering.

Second, in the exploratory phase, a sample of 15 key initiatives were selected. Covering a period from 1992 to 2022, the initiatives are in the states of Acre, Amazonas, Rondônia, and Pará (Figure 2). They were chosen due to their similarities and connections. For instance, one material fails in one state and is later developed in another state (cases 2 and 13 in AC and PA), or similar materials are developed concomitantly in different states (vegetal leather in AC, AM, PA, and RO). Some interviews were taken in the fieldwork in Acre in 2018, and remotely with key actors during the pandemic.

Figure 2 – Localities of 15 cases studies of native rubber for fashion and design



Source: author based on IBGE 2020

Third, in the experimental phase, the data collected in previous phases was related. The crafts approach and the product life cycle framework were used to comprehend the cases. To synthesize the complexity of the analyses, the cases were grouped per type of technology: (A) Smoked rubber Crafts (1); (B) *New Encauchado* (2); (C) Semi-Artifact Sheet (3-8); (D) Vegetal Leather (9-12); (E) Liquid Smoked Sheet (13, 14); (F) Pressed Virgin Rubber (15) (Table 2). Note that there are estimated dates (*). Finally, the conclusive phase highlights the main findings and indicate future research.

Table 2 – Native rubber sociotechnical systems in the Amazon

Case studies	Smoked rubber crafts	New Encauchados	Semi-Artifact Sheet Amadeu	Semi-Artifact Sheet Borracha	Semi-Artifact Sheet Sarmento	Semi-Artifact Sheet Paimm	Amazonian Rubberized Fabric	Rubberized Yarn	Vegetal Leather Company A	Vegetal Leather Arruda	Fabric of the Forest	Vegetal Leather in a Cooperative	Liquid Smoked Sheet Company B	Liquid Smoked Sheet Osklen	Pressed Virgin Rubber Company B
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Group	A														
Ascension year	1900*														
Type	Material Final product														
State	Acre Amazonas Rondônia Pará														
Technology level	Low High														
Market	Brazil International														
Crafts Approach	Productivist Culturalist Paternalistic Innovation														
Product life cycle phase	Introduction Growth Maturity Decline														
Cycle age by 2023 or decline	*	29	19	16	4	8	9	9	9	4*	19	12	19	3	7*

Source: author

4. Results and discussion

4.1. Group A: Smoked rubber crafts

Located in Acre, this type of craft normally has the shape of animals found in the region. The smoked rubber, dark brown in color, is enameled with solid colors. As an example (Figure 3), one of the artisans produced crafts in series to be sold in a catalog with technical and commercial support from SEBRAE, which managed to boost its commercialization by intermediating sales to large stores in the Southeast, such as Tok & Stok (like the European Ikea).

To guarantee the sales up to hundreds of objects, the artisan needed to produce in batches, with the same quality standard. However, after a couple of years, these crafts declined, being substituted by the new *encauchados* in SEBRAE Crafts catalogue. Notwithstanding, they can still be found at the central market in Rio Branco–AC.

Figure 3 – Smoked rubber decorative craft handmade in Acre



Source: SEBRAE 2009, p. 18.

4.2. Group B: New *encauchados*

Based on the indigenous *encauchado*, a rubberized cotton canvas, the “New *Encauchados of Vegetals*” incorporated four innovations: (1) the pre-vulcanization of latex from the field, (2) the manufacture of rubberized fabric using pre-vulcanized latex, (3) the manufacture of a natural preservative based on ash and (4) the manufacture of blankets and small objects from the aggregation of short vegetable fibers, introduced as fillers and pigments (AMARAL e SAMONEK, 2006; SAMONEK, 2006; LEANDRO, DA SILVA & SAMONEK, 2013). The aggregation of natural fibers to rubber results in a blended material (Figure 4).

Figure 4 – Pots and packages made of *Novos Encauchados de Vegetais*, and vegetal leather on sticks



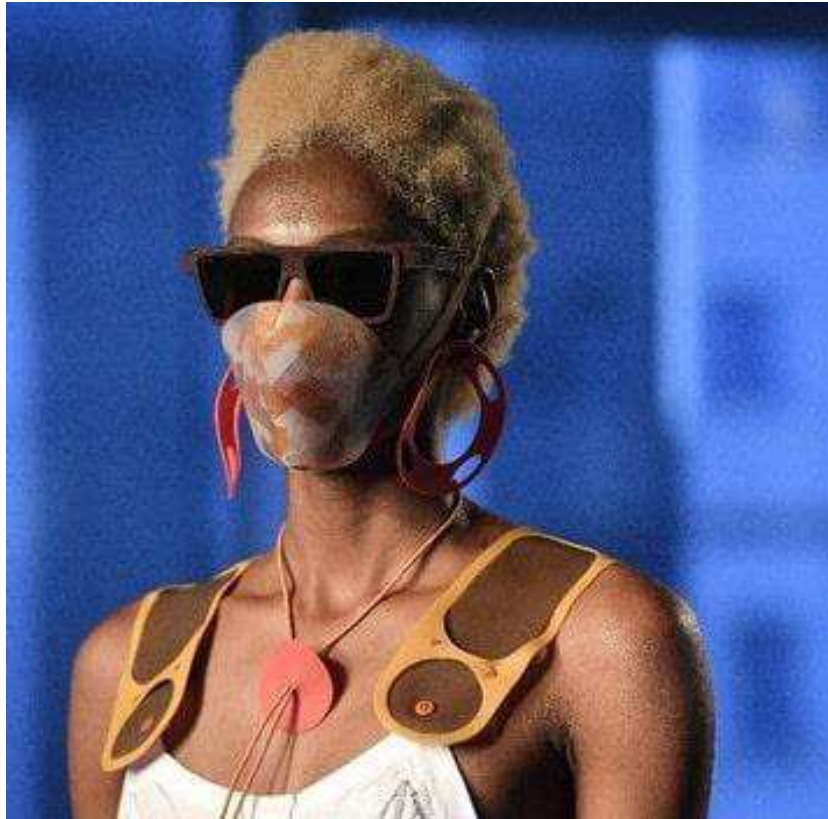
Source: A Lavoura (2023)

The so-called “pre-vulcanization” process means some chemicals developed by “Professor X” on his lab bench, and offered by the communities (initially, free of charge). In Acre, a local community became dependent on the chemicals (later, sold to them), this being one of the factors that contributed to its failure. The system moved to Pará, where it is growing. This Productivist case is intersected by the Paternalistic approach, since the inventor has been claiming along the years that the State should support his innovation.

4.3. Group C: Semi-Artifact Sheet

Six case studies are part of this group, four being the Semi-Artifact Sheet (SAS) in Acre (3, 4, 6) and Pará (3, 5), and the other two the Amazonian Rubberized Fabric (7) and the Rubberized Yarn (8), both in Pará. Except for case (7), the artisans produce the material integrated to the product. The initiatives tend to promote innovation and the artisans’ empowerment, focusing on women. Most technologies were developed by “Professor Y”, with adherence of designers (3, 5-8), and a very skilled rubber tapper artisan (4) to also develop the sociotechnical systems. Regarding case (3), although being in the market for two decades, it is still growing because of diversified products and markets, via collabs with other brands (Figure 5); investment from startup funds/awards; and is currently selling a material like (7).

Figure 5 – Rubber jewelry by Amadeu and collabs



Source: Marcelo Soubhia; Agência Fotosite (Ethical Fashion Brazil, 2023)

Some cases achieved their maturity due to the value proposition in the same market (4, 6) and/or the low complexity of the technology associated to one type of product (8), to mention a few factors. Finally, while case (5) failed due to conflict of interests (SARMENTO, 2014), case (7) is being introduced in the market.

4.4. Group D: Vegetal leather

In Brazil, the Law 4.888, known as the “Leather Law” states that one can only call leather the skin of animals (PLANALTO, 1965). However, a couple of initiatives based on the traditional *encauchados*, referred to the “vegetal leather”. The most popular one was the case of Treetap (9). The process of developing the new material involved several actors, such as the Institute of Research and Technology, as well as attempts at chemical products, starting with the use of gunpowder and, later, sulphur, resin and softener, resulting in a patent. It received national and international awards, becoming a supplier to Hermès (Figure 6) in 1999 (ORTEGA, 2016).

Figure 6 – Hermès bag model “Garden Party” made with the rubber laminate “vegetal leather” and buffalo leather (details), conserved, and deteriorated



Source: Malleries (2016)

The material was produced in 36 units in Acre and Amazonas, by circa 200 rubber tappers and indigenous peoples (Kashinawá and Yawanawá), who received the same training – to mention just one technical aspect of their production process that in unstable quality standards, and failure (clients returned products to Hermès).

In 2011, some artisans (12) were taken by SEBRAE from Xapuri-AC to Boca do Acre-AM, to buy the “vegetal leather” produced by the ex-manager of case (9). The artisans even held “vegetal leather workshops”, to develop sewing techniques and products.

Between 2004-2010, SEBRAE tried to implement the “vegetal leather” production (11) with the rubber tappers of COOPFLORA, in Machadinho d’Oeste-RO. The rubber tappers there did not know about the similar initiative in Acre. After SEBRAE developed a short-term Productivist project with the cooperative, the rubber tappers continued to produce the vegetal leather on a small scale, for eventual buyers.

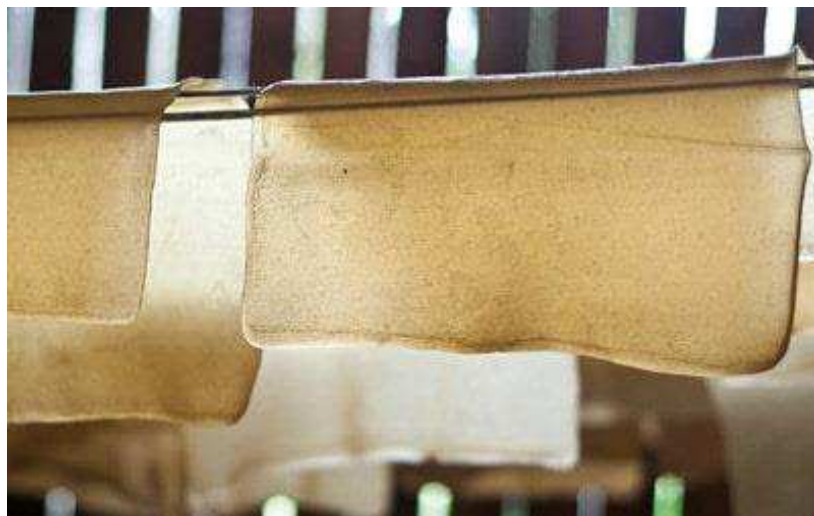
After a decade of the “vegetal leather” failure in Acre, a designer carried out some experiments with a similar material in two communities in Pará (10). She failed to unite it with other industrial materials. Also, the rural workers preferred to harvest açaí, paralyzing latex extraction (CASTRO, CUNHA & MAIA, 2016). Thus, she could not complete her

research. One year later, one of the communities received a “Sustainable Unit of Amazonian Encauchados of Vegetals” (CASTRO, CUNHA, MAIA 2016, p. 5), producing rubber again. In this case, the Productivist approach shifted between similar drivers/gatekeepers, from a designer trying new techniques and trying to create a new sociotechnical system to a professor implementing his system that had failed in Acre.

4.5. Groups E and F: Liquid Smoked Sheet and Pressed Virgin Rubber

The Liquid Smoked Sheet (Figure 7) is a patented rubber and process developed by “Professor Y”, in 2004. It was produced in small production units donated to dozens of rural workers and indigenous people Shanenawá, who sold their production for only one company, Veja/Vert. The sociotechnical system was formed in partnership with the government, universities, NGOs WWF and SOS Amazônia, cooperatives, and associations.

Figure 7 – Liquid Smoked Sheet drying on wires in an artisanal rubber plant



Source: Pastore Jr., Peres Jr. & Do Nascimento (2015)

In 2018, a rubber plant installed in Sena Madureira-AC (Figure 8) started its operations, eliminating the cost to transport LSS to be processed in the Southeast. Thus, Veja/Vert aborted a project with the last NGO to produce LSS. Veja/Vert aimed to expand the rubber production accordingly to its new growth strategy (millions of sneakers to be sold worldwide). To scale up the rubber extractivism, another partner joined the new PVR project,

the NGO Partnerships For Forests. Until 2021, they reached 800 families of rural workers, in AC, AM, and RO, through associations and cooperatives – and little technical assistance.

Figure 8 – Rubber plant in Acre



Source: author 2018

In parallel, trying to continue competitively in the sustainable footwear market, only in 2020 Osklen launched a shoe that uses rubber from the Amazon on its soles (Figure 9). Failing to break Veja/Vert monopoly in Acre, Osklen buys LSS rubber from communities in the Xingu indigenous territory, in Pará.

Figure 9 – Compost material with native rubber



Source: Mod Store (2023)



The LSS produced in these communities does not need to be of great quality, since the soles' manufacturing mixes LSS with materials of lower mechanical resistance, such as recycled rubber, dust from discarded tires, cork, and rice straw. Thus, LSS becomes a mere load of rubber soles, resulting in a blended material – just another material that is not better than the options already in the market. If Veja/Vert used to mislead the consumer to believe that they were saving the forest, New Encauchados and Osklen misleads by selling a new tech-trash material, difficult to recycle, in the name of sustainable development.

4.7. Discussion

Among the crafts approach, two were not applicable: the Conservative and the Aesthetic. The first “is occasionally found among anthropologists who reject any approximation between design and craftsman, as they want to keep the craftsman in a pure, immaculate state and immune to contemporary influences” (BONSIEPE, 2010, p. 71). Even the anthropologists could not protect the indigenous peoples to become workforce in cases (9) and (13). Regarding the second approach, no artisan was “elevated” to the state of artist. Instead, the “proletariat of the forest” is occupied with technologies. The predominant approach is the Productivist one, which justified by “humanitarian interests”, claims to:

produce designs 'inspired' by local popular culture or designs brought in directly from the Center to take advantage of these communities' cheap labor. Such a design practice tends to perpetuate dependency relationships, rather than contributing to their overcoming (BONSIEPE, 2010, p. 71-72).

Although this approach considers the artisan as a mere worker of other people's interests (except, partly, cases 1, 3-6, 8), the reality in the Amazon is slightly different. Many projects were only possible due to donations to the artisans, besides payment in advance, being these are the perks of assistentialism/clientelism that counter-balanced the interests of intensive-labour (compared to other source of income). At least during their initial year(s) – until a “feeling” of a breaking-even point – when the donations of equipment and such would justify the intensive-labour, the subsidies delayed by the government, and making less profits than raising cattle (JARAMILLO-GIRALDO *et al*, 2017; HOELLE, 2011), then the rural workers would extract latex.



The aspect of “serial craft”, also known as “industrial craft”, or simply “industrianato”, in Portuguese, and Italian (MICHELLI, 2022), is common for cases 1-11. While case 12 is a cooperative where they produce according to their own parameters, cases 13-15 produce an “artisanal commodity” for two monopolies sustained by NGOs, cooperatives, and associations.

As a counter side of increasing productivity and, consequently, income in the “industrianato”, the “productivist artisan” can be driven by the perspectives of growth. Unaware of the typical cycles of a product and a system, besides design trends, the artisan can compromise his income by acquiring consumer goods for a more comfortable life and, after a period of economic upswing, ends up in debt.

The life cycle of a product takes more time in the Amazon. Some initiatives that are still growing (2, 3, 15) have been in the market between 15 to 29 years. Furthermore, since some scientists have been dedicating their lives to develop rubber sociotechnical systems (2, 7, 13), some systems have been active for the past 30 years. Regarding the decline phase, initiatives that failed completely took between 4 to 9 years (5, 9, 10), while others achieved a “plateau” decline (1, 13), with few artisans active. There are no studies showing the consequences of failure (cases 2, 5, 9, 10, 11) for the local communities. In this sense, the promise of the futuristic Amazon continues to hover in the literature, keeping alive the mystical Eldorado of white gold, in the name of sustainable development.

5. Conclusions

This research tried to fill a gap in the literature of the Amazonian native rubber materials and products for fashion and design. Both frameworks – the popular one, “Product Life Cycle”, and the specific one, “Approaches of Crafts” – were useful to understand the development stage of rubber materials and products in the Amazon. They could be the vector for a creative historiography on this topic.

As a limitation, the Art dimension can be implicit in some of the cases, which would require an understanding from the artisans’ perspective that they refer to as art in their work. Future research should not only investigate the artistic aspect of crafts, but also differentiate the indigenous and rural workers’ production, and include fieldwork in Pará – the new rubber Eldorado.



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