SHIRINGA BIO-LEATHER

Information about the material regenerating Amazonia while protecting people, animals and the planet

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CONTEXT

In February 2025, Collective Fashion Justice released a short film called SHIRINGA: Fashion Regenerating Amazonia. It was the first in our Total Ethics Fashion Future series of short films about next-gen bio-materials replacing animal-derived materials and their synthetic counterparts.

We chose to highlight a little known yet powerful and inspiring bio-material to feature in our first film: shiringa bio-leather. If you have not seen our film, we encourage you to do so, immersing yourself in the value of this bio-material and its incredible provenance.

This document is designed to answer frequently asked questions from those who have viewed the film and work in the fashion industry, interested to use the material.

WHAT IS SHIRINGA BIO-LEATHER?

Shiringa bio-leather is a leather-like material made largely from the latex sap of shiringa trees. Shiringa trees are a type of rubber tree that grow across the Amazon Rainforest, throughout multiple countries including Peru, Brazil and Ecuador, and beyond.

Shiringa trees have long been used by Indigenous communities for the regenerative collection of shiringa sap, or latex, that has been used to waterproof fabrics, baskets and other items.

Now, Indigenous people collect shiringa sap for the creation of bio-leather: on hundreds of years old trees that their ancestors also protected.

HOW SHIRINGA BIO-LEATHER DIFFERS FROM OTHER MATERIALS

Wondering how shiringa bio-leather differs from other rubber-based materials?

Unlike conventional natural rubber, this bio-leather is made up of a woven base with layers of shiringa sap latex, rather than latex rubber poured into a mould. As a result, the appearance, texture and other qualities such as flexibility are different and more leather-like.

Unlike modern rubber, which is usually made wholly from petro-chemicals, shiringa bio-leather can be either wholly or predominately bio-based.

Shiringa bio-leather can be produced at scale with Caxacori Studio, while previously it has been only an artisanal product, limiting its capacity to replace animal-derived and fossil fuel-based synthetics, and to benefit a wider number of Amazonian communities.

STAGES OF SHIRINGA BIO-LEATHER PRODUCTION

TIER FOUR: RAW MATERIAL PRODUCTION
Shiringa latex sap is collected by carving a very shallow, few millimetre deep line into the tree's bark, curved around the tree. Sap trickles down this carving and into a collection cup.

Every 48 hours, between 150 - 200ml of shiringa sap can be collected from trees aged 8 to over 100 years old. Over its lifetime, a tree may offer almost 3,400 litres of sap without damage to its growth and contribution to the forest. The Indigenous communities working with these trees know best how much to take before it is too much, and when trees must rest.

While the Amazon has a dark history of colonialism where non-native people cut down trees for this sap and exploited Indigenous people for its collection (which still persists in some areas, due to low payment rates), the Awajún people of the Peruvian Amazon work in a conservation agreement established by Indigenous leaders and government, and are paid a fair wage significantly higher than other communities for sap collection.

As deforestation is such a risk in Amazonia, largely due to cattle ranching and mining, the capacity for Indigenous people to support themselves from keeping shiringa trees standing through regenerative use benefits both land protection and community economic uplift. Protected reserve areas established by the government are more likely to be established in such cases.

Bio-material company Caxacori Studio offers Indigenous communities a cost 50% higher than the standard Peruvian remuneration for latex collection, reflected in a conservation agreement via the Tuntanain Communal Reserve, that has been in operation for many years and which can be renewed for continual benefit to the community. Caxacori Studio does not work with rubber plantations, only works with wild shiringa trees within protected reserves, in order to preserve Amazonian biodiversity and Indigenous culture. Trees are geolocated and monitored by Indigenous forest rangers.

Some native plants used as dyes include annatto and huito, producing colours including red, orange and brown. Green, black and other colours can also be produced naturally.

TIER THREE: TRADITIONAL

Shiringa bio-leather has been used by a small number of South American designers for fashion production. These designers have, until very recently, used a shiringa bio-leather that is made entirely in Amazonia.

Latex sap coats native Peruvian cotton, which is stretched onto a frame and painted with the sap, drying after each coat. The more coats, the thicker the material. It is during this stage that natural dyes can be incorporated. Indigenous communities are paid to complete the entire artisanal process themselves, producing a beautiful and unique finished product.

TIER THREE: ENGINEERED FOR PRECISION

The traditional way of making bio-leather offers an artisanal product which may not be suitable to all brands, particularly at a larger scale of production. As such, material innovator Caxacori Studio has developed an alternative method of processing shiringa sap into bio-leather.

Caxacori Studio brings the sap from Amazonia to Lima, where their laboratory is. Here, a similar process can occur, but with mechanical (no additional chemistry) equipment that allows for more precise production where there is greater consistency of thickness and colour across materials. The latex is also purified.

Caxacori Studio also offers options with agricultural waste inputs from Peruvian plant food production, which can help to further strengthen the material.

The material lab works with their own bio-curative that helps to improve shiringa bio-leather's durability when mixed with sap. The most durable version of this material includes 25% curative from water-based polyurethane.

The curative comes in a number of forms, some which include synthetic inputs due to durability requirements expected by some companies (for the same reason much leather includes a thin plastic coating), though the synthetic input can vary depending on brand preference, and a version without this input is also available. Water is used in place of harmful chemical solvents in this curative.

It is important to balance durability and material input considerations for sustainability, and the biodegradability testing for shiringa bio-leather in this document explores this in more depth.

DURABILITY TESTING AND DESIGN CAPABILITIES

Caxacori Studio's shiringa bio-leather
has been tested using the following methods:

NTP ISO 17694 / NTP ISO 20344

Flexural strength: 125,000 cycles
(many cow skin leathers average 50,000)
Adhesion resistance: 2,7 N/10mm
Abrasion resistance: 9,000 circles of dry rubbing
Colour resistance: level 5 (dry / wet / sweat)

Independent testing was completed
by Instituto Tecnológico de la Producción

(Based on shiringa bio-leather with 75% bio-based content)

QUALITIES OF SHIRINGA BIO-LEATHER:

- ☑ Water resistant
- ☑ Pleasant, natural smell
- ☑ Thermally insulating
- ☑ Fold and sew without cracking
- ☑ Embossable
- ☑ Flexible
- ☑ Customisable

THE PROBLEMS SHIRINGA BIO-LEATHER HELPS SOLVE

DEFORESTATION

Deforestation in the Amazon is largely driven by cattle ranching, as well as mining. Governments are more willing to set up reserve areas which are better protected against deforestation when Indigenous communities are able to financially sustain themselves by working with the land. Shiringa trees are not only ecologically and culturally valuable while standing, but economically too, given the regenerative harvesting technique that is used.

Increased shiringa bio-leather production is directly linked to increased areas under government reservation in agreement with Indigenous communities, decreasing deforestation.

In the Awajún community of the Peruvian Amazon, deforestation occurs just outside of their reserve area, highlighting the critical importance of scaling this solution to prevent Indigenous land rights violations, associated violence and destruction.

BIODIVERSITY DESTRUCTION

Deforestation is a danger to Indigenous peoples and animals alike, and to the plant life they coexist with. Even when deforestation does not occur for animal-derived leather production, this material is highly land inefficient, requiring large swathes of already cleared land to rear large animals for slaughter. Shiringa bio-leather meanwhile, has a relatively small land footprint due to how much latex can be produced from wild trees which stay standing.

Because wild shiringa trees are not a monoculture crop, but naturally occurring parts of a unique web of ancient biodiversity, their use and protection strengthened through fashion's use of shiringa bio-leather is highly valuable for conservation.

CLIMATE CRISIS

Animal-derived leather is one of the most climate impactful materials on the fashion market. This is largely due to the significant methane associated with animal rearing, but also due to emissions from processing skins. Meanwhile, shiringa bio-leather has a far reduced carbon equivalent footprint compared to animal and wholly synthetic materials.

MASS FOSSIL FUEL MINING

Just as we cannot afford to continue with widespread animal production, we cannot afford to continue mining for fossil fuels, should we live on a habitable planet. Shiringa bio-leather significantly reduces our reliance on synthetic inputs, and as it further develops, will be able to help totally eliminate it.

HIGH CHEMISTRY USE

Animal-derived leather is typically tanned with a large number of often toxic substances, including carcinogenic inputs. Shiringa bio-leather is not a tanned product, and trees are wild harvested, so no chemistry is involved in the cultivation and collection of the next-gen leather's raw material (though some additives are required later in the process for a more durable option, balancing sustainability requirements).

UNJUST LABOUR

Indigenous communities continue to be exploited, their labour not fairly remunerated. This is true in some of fashion's rubber production today, used for shoe soles, as well as in the production of other South American raw materials, such as vicuna fibre. Caxacori Studio works in a conservation agreement approved by the Peruvian government and the leaders of Indigenous communities, to ensure fair, living wages.

POVERTY IN INDIGENOUS COMMUNITIES

Many Indigenous Amazonian communities today seek to increase their children's access to education, and to solve issues of malnutrition. Shiringa bio-leather production allows Indigenous communities to support and economically uplift themselves in order to meet these and other goals, while maintaining their way of life and connection to the land.

According to the Peruvian government, the average monthly income of a native Awajún family is equal to US$34 per month. Meanwhile, each Awajún person collecting from shiringa trees can receive US$4.8 per kilogram of sap, able to collect up to 3kg in six hours of work, equalling to US$14.4 per day, or US$216 per month if trees are worked every 48 hours. Most Awajún people choose to work with shiringa trees much less often, while still significantly increasing their income. Even if a person chose to work just three days per week, their income would be multiplied some five times compared to the average monthly income.

ANIMAL EXPLOITATION

Shiringa bio-leather is an entirely animal-free material, eliminating animal suffering and slaughter from the supply chain. This is ethically important. It also removes risks for brands which must increasingly manage consumer expectations and legal requirements to treat our fellow animals with the respect they deserve.

LIFE-CYCLE ASSESSMENT (LCA)

Caxacori Studio is in the process of obtaining LCA assessment and results.

BIODEGRADABILITY TESTING

Laboratory testing using the Marindale method show positive results for shiringa bio-leather's capacity to biodegrade. Biodegradability tests carried out under the ASTM D5988-18 Standard compared shiringa bio-leather to a sample of cow skin leather, which showed shiringa bio-leather to have greater biodegradability (as shown through a higher percentage of CO2 consumption in the soil).

Additional phases of biodegradability testing are planned for 2025.

CURRENT SCALE CAPACITY AND OPPORTUNITIES FOR GROWTH

As of February 2025, Caxacori Studio has capacity to produce 600 square metres of shiringa bio-leather per month.

The per square metre cost of a 1 x 0.5m sheet of shiringa bio-leather is currently US$33.

With increased investment from the fashion industry, Caxacori Studio can:

- Increase the number of Indigenous communities it works with, increasing both its positive impact and raw material supply. With shiringa trees growing all across the Amazon and just a tiny portion producing shiringa bio-leather, scaling capacity is significant.
- Improve its laboratory capacity for increased scaling.
- Increase sheet sizes.
- Reduce the material cost at scale.

SAMPLING AND TRIALLING SHIRINGA BIO-LEATHER

Those interested in sampling and trialling shiringa bio-leather can contact info@collectivefashionjustice.org for further information and an introduction to Caxacori studio, or visit caxacoristudio.com

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