Nextcoa - The Next Generation of Chocolate Bar

by Alexandra Kazaks and Lauren Ho

Brief description

For thousands of years, cacao has been adored for its rich flavor, energizing properties, and cultural significance. Ancient civilizations valued it as a sacred beverage, while modern consumers appreciate its deep, complex taste and potential health benefits.

However, the rise of industrial chocolate production has placed a strain on cacao cultivation. Surprisingly, only 8 to 10% of the cacao fruit—the beans—are utilized, while the rest is discarded as waste. This inefficiency not only contributes to environmental concerns but also overlooks the vast potential of cacao's byproducts.

Before modern chocolate-making processes became dominant, more parts of the cacao plant were used, including the pulp for beverages and fermentation, while the husks and pods were sometimes repurposed for animal feed or compost. However, much of the cacao biomass was still discarded.

Nextcoa, a startup based in Colombia, South America, is revolutionizing cacao processing by upcycling cacao biomass in ways that honor traditional uses of the plant. The company is pioneering innovative methods to transform cacao byproducts, such as shells and pulp, into valuable products, supporting a circular economy and minimizing waste in the cacao industry. Nextcoa's technical "toolbox" enables the use of nearly 100% of the cacao fruit, promoting sustainable chocolate production and providing cacao farmers with incentives to maintain clean pod management, ensuring the entire pod can be processed efficiently.

The Founders' Story

In 2016, this idea came to Cristian Blanco-Tirado and Marianny Y. Combariza when they returned to their home country, Colombia, after getting their degrees in chemistry at the University of Massachusetts Amherst, (U.S.). Having grown up near cacao farms, they were all too familiar with the piles of discarded cacao fruit left to waste on plantations. They realized this wasn't just a local problem—it was a global issue.

Determined to make a difference, Cristian and Marianny set out on a mission to create a sustainable chocolate bar, turning what was once waste into a valuable resource. They co-founded Nextcoa to present a solution for processing cacao fruits and producing 100% cacao-based products while increasing cacao fruit value that directly benefits the cacao grower communities in Colombia.

To understand what inspired them so much to initiate the whole cacao upcycling chocolate bar, let's dive into the world of Colombia's cacao.

The History of Cacao in Colombia

Colombia is one of the major countries producing cacao, with around 2.8 million hectares (about 7 million acres) of land suitable for cocoa growth. Thanks to a large percentage, around 95%, of cocoa being classified as fine or flavor cocoa, Colombia has increased its cacao bean exports by over 400% since 2011. This also means that cocoa production has a high social impact, affecting more than 65,000 households.[1]

How did it all come to this point? In the 16th century, the Spanish introduced cocoa to Colombia, primarily for their own consumption. However, cocoa cultivation didn't gain significant commercial importance until the late 19th and early 20th centuries when Colombia started exporting cacao beans. During the 20th century, cacao became an important cash crop for many small farmers in Colombia, particularly in regions such as Santander and Huila. These regions offered suitable climates and soil conditions for cocoa cultivation. In the late 20th century, cocoa production faced challenges due to factors such as disease, aging trees, and fluctuating market prices. This led to a decline in cocoa cultivation in some regions.[2]

However, in recent years, there has been a resurgence of interest in cocoa farming in Colombia. The government and various organizations have implemented cooperatives and programs to support cocoa farmers, improve cultivation techniques, and promote sustainable practices. Additionally, the global demand for high-quality cocoa has increased, providing opportunities for Colombian cocoa producers to thrive in both domestic and international markets. Colombia is known for producing cacao beans prized for their unique taste profiles, and so, the Colombian cocoa industry continues to evolve, with an emphasis on quality, sustainability, and social responsibility.[3]

From Waste to Taste: The Science Behind Nextcoa

Despite advancements in the chocolate industry, it still faces major challenges. Cacao beans, which are the primary ingredient in chocolate, account for just 8 to 10% of the cacao fruit. The rest of the fruit is left unused, contributing to significant waste. To make matters worse, it takes an entire year for a cacao tree to produce these valuable beans, the only economically viable part of the plant.

So, what happens to the rest of the fruit? As illustrated by the photo in Figure 1, cacao pods are composed of several parts: the exocarp, a thick, leathery outer skin that protects the pod; the mesocarp (pulp), a sweet, fibrous layer surrounding the seeds; the beans, which are used for chocolate production; and the

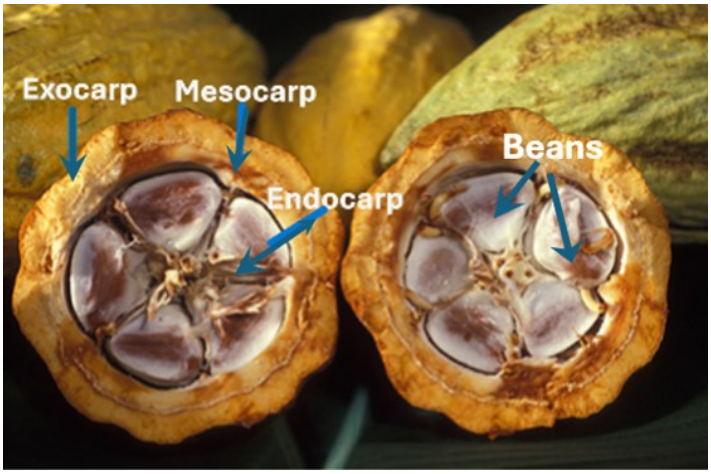

Figure 1. Cross-section of a healthy cacao pod.[4]

endocarp, a membrane that encases and safeguards the beans. Unfortunately, all of the cocoa pulp waste, cocoa shells, and other crop residues are discarded. With 60 million tons of cacao fruit being grown globally each year, the resulting biomass waste has become a significant environmental issue.

Up until now, all those unused parts of cacao have been piling up in the corner of the farm, waiting for their final fate: being eaten by cows or chickens—if they are lucky—or rotting away, ending their life without any use. When more than 90% of the plant is not used, it is not surprising that farms have problems with space to contain all that waste. Using it for animal feed is definitely not a long-term solution. Without any practical and inventive ideas, cacao farmers, not only in Colombia, but around the world, are essentially ignoring the problem, leaving it for Mother Nature to deal with.

Cacao in Colombia

This is where Nextcoa comes into the picture. Using science and technology, Cristian and Marianny utilize wasted cacao biomass to turn every part of the fruit into a bar of chocolate—one crafted 100% from cacao. Instead of using the cane sugar, milk, and soy lecithin found in a typical chocolate bar, Cristian says that their product uses sweeteners and emulsifiers extracted from the cacao fruit itself—elements that were previously discarded after the cacao beans were extracted for export. The transformation journey of cacao beans starts right at the harvesting step.

After the fruits are picked, the beans are extracted right on the farm by opening the pods. In traditional cacao processing, only the beans are fermented, while the empty husks and placenta are discarded, left to decompose in the field. But with Nextcoa, nothing goes to waste. They take the husk and placenta and process them further.

As shown in Figure 2, the husk is first ground up and then dried. Chemistry scientists can make packaging material and extract pectin from the dried husks. In addition, the fresh placenta is dried and then used as a sweetener and emulsifier. In the fermentation process of cacao beans, the cacao mucilage exudate (CME) is lixiviated, or strained, from the process and is collected to be utilized as a sweetener in the chocolate bar. And lastly, the fermented beans are dried to produce cacao liquor to make the final chocolate bar products.

It is also worth noting that the rest of the cacao is not just “waste.” They are “unpolished gemstones.” For example, cacao bean shells are packed with dietary fiber and strong antioxidant properties, all of which are known to promote good health in humans. Despite being a rich source of substantial nutritional properties, only the right type of technology can make these healthy components shine!

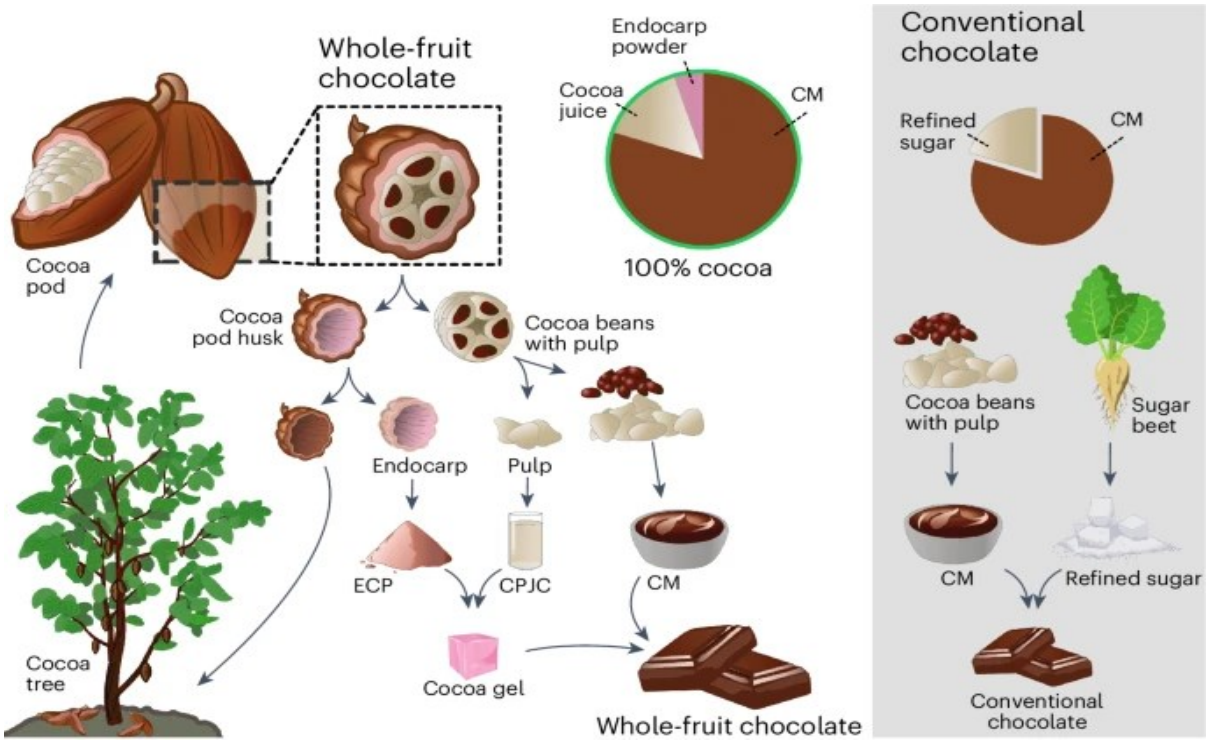

Figure 2. Whole-fruit and conventional chocolate manufacturing processes.[5]
Left: the whole-fruit chocolate manufacturing process, showcasing the use of the cocoa pod husk endocarp and the CPJC (cocoa pulp juice concentrate) together with CM (cocoa mass). The endocarp powder (ECP) and CPJC form a gel, serving as a sweetening agent and improving nutritional profile. Right: the conventional chocolate process characterized by the utilization of refined sugar from sugar beet together with CM. CM production, chocolate molding, and cooling is done in the same way for both processes.

The Ripple Effect of Upcycling Cacao Fruits: Environmental, Economic, and Social Benefits

Upcycling cacao fruits is not only about waste reduction, sustainability, and positive environmental impact but also about the economy. Incorporating agricultural biomass waste into farming practices promotes a circular economy wherein resources are reused and recycled. By closing the loop and integrating waste into cacao processing upcycling systems, dependency on external inputs is reduced, and a more sustainable and self-sufficient farming model is created.

Although cacao beans are considered cash crops, Cristian believes the farmers have not received a fair amount of cash back. Farmers typically receive a small fraction of the final sale price of cocoa products. The World Economic Forum reports that cocoa farmers may earn as little as 6.6% of the final value of a bar of chocolate.[5]

"Our Santander region in Colombia has traditionally been a producer of excellent cacao, Cristian revealed, so we asked if it was possible to take better advantage of the cacao fruit by developing technology for the production, not only of beans but of products with greater value."

Marianny shared her thoughts on the cacao farmers' lives: "They have their wives and children work as well. It's free labor . . . [The children] lose their childhood. [They] go straight to work after school." With the introduction of technology into cacao processing, they promise a brighter future for the family here. "[The technology] definitely reduces the time it takes them to work. So increasing the life quality!". Upcycling waste products will expand farmers' current income because a greater proportion of the plant has value.

Despite all, one of the hardest problems, according to Cristian, is actually convincing the local farmers to accept this new way of selling their cacao. Although in the long run, upcycling cacao brings back a lot of benefits to farmers, not all of them can thoroughly acknowledge the fact that this technology will help them. Small local farmers usually look for immediate incentives; on the other hand, getting the cacao ready for upcycling waste materials might seem to be more work for them. Hence, Cristian and Marianny's idea is brilliant: they in fact showcase to the farmer the final result of upcycling waste: a tasty chocolate bar!

Nextcoa's goal is to shift farmers' perspectives on cacao fruit upcycling by demonstrating its benefits and transforming traditional methods through education.

Will it Succeed?: The Competitors and Challenges

Nextcoa is not the only company striving to make chocolate products as sustainably as possible.

Other producers are innovating with the concept of using 100% of the cocoa pod, including the beans, pulp, husks, and even the shell, to create various products. However, there is inconsistent availability in retail markets.

Lindt Chocolate, a Swiss company that is a global leader in the premium chocolate category, released a limited edition of their Excellence Cocoa Pure chocolate bar in 2020. For the first time, they produced a bar that was made of 100% cocoa fruit without any refined sugar.

Barry Callebaut, one of the world's largest chocolate manufacturers, introduced WholeFruit chocolate in 2019. The label declaration shows that the ingredients are: Unsweetened chocolate, fructose (from cacao fruit pulp), cacao fruit sugar, and dry cacao fruit juice concentrate. The chocolate was initially available to chefs and artisans around the world before it became available to consumer brands in 2024.

Blue Stripes Cacao is another notable brand committed to using all parts of the cacao pod, transforming its pulp, husk, and beans into various food and beverage products. With Hershey's chocolate company as an investor, it has increased its presence in the U.S. market as it started out with direct-to-consumer sales online in 2020 and now offers its products in Whole Foods stores nationwide.

Nonetheless, Nextcoa is still very unique: their cocoa extraction technology and the creativity of making use of the materials are comprehensive. Hence, they are rare in using up to 100% of the beans, even in the packaging of the products. Another huge advantage is that Nextcoa's manufacturing plant is in close proximity to the cacao farms, which means that the two scientists are able to form stable relationships with the neighboring farmers!

What would the 100%-cocoa chocolate bar taste like? Although Nextcoa has not yet had a sensory evaluation for a definitive report, an author had the honor to try the product herself! The luxurious look of Nextcoa's packaging was eye-catching, and the rich and distinct fragrance of this Colombian chocolate is exquisite, a high-end product. More than everything else, the chocolate is packed with nutrients, antioxidants, and bioactive compounds, which can be sourced from underutilized materials: the husks and the placenta.

Into the Future

The current scale of Nextcoa is still very local. Fewer than 10 people are working in the plant, and around 15 people are conducting research to further optimize the system. Therefore, one of the goals for Cristian and Marianny is to expand the manufacturing plant to scale up production.

Nextcoa plans to bring its chocolate outside to the world's market, starting with the United States. They recently made their first business pitch debut at Columbia University (U.S.) Potential business partners are impressed that Nextcoa has offered to launch its product in Canada and Japan, promising a future where Nextcoa enters the global market.

Cacao is not the final stop for these two ambitious scientists. Their technology is very versatile and can be applied to other underutilized crops including coffee, palm, banana, or plantains. Each crop's waste has its use and properties that, only through the lens of science and technology can we see its beauty.

References

1. Colombia: The Colombian Cacao Industry | USDA Foreign Agricultural Service [Internet]. 2022 Jun [cited 2025 Feb 25]. Available from: https://www.fas.usda.gov/data/colombia-colombian- cacao-industry/
2. Benjamin T, Lundy MM, Abbott PC, Burniske G, Croft M, Fenton MC, et al. AN ANALYSIS OF THE SUPPLY CHAIN OF CACAO IN COLOMBIA. 2018 [cited 2025 Feb 25]; Available from: http://rgdoi.net/10.13140/RG.2.2.19395.04645
3. International Cocoa Organization [Internet]. [cited 2025 Feb 25]. International Cocoa Organization - Statistics. Available from: https://www.icco.org/statistics/
4. Weller, K. (Photographer). (2005). *Cross-section of a healthy cacao pod* [Photograph]. USDA Agricultural Research Service. Image Number K4636-12 https://www.ars.usda.gov/oc/images/photos/oct05/k4636-12/
5. Mishra K, Green A, Burkard J, Gubler I, Enrish J. W. Valorization of cocoa pod side streams improves nutritional and sustainability aspects of chocolate | *Nature Food*. [cited 2025 Feb 25]; Available from: https://www.nature.com/articles/s43016-024-00967-2/

Further Reading

How can the Whole Cacao Pod be Upcycled? Cacao Fruit
https://cocoafuture.org/blogs/blog/upcycling-the-whole-cacao-fruit

NEXTCOA: How an Entrepreneurial University can Transform the Cocoa Industry Towards Circularity
https://papers.academic-conferences.org/index.php/ecie/article/view/1631

https://ensia.com/features/agricultural-waste/

Exploring the chemical composition and coloring qualities of cacao fruit epicarp extracts†
https://pubs.rsc.org/en/content/articlelanding/2023/ra/d3ra01049j

Process intensification technologies for the recovery of valuable compounds from cocoa by-products
https://www.sciencedirect.com/science/article/abs/pii/S1466856421000023?via%3Dihub

Added-value biomolecules' production from cocoa pod husks: A review
https://www.sciencedirect.com/science/article/pii/S0960852421015947

Cocoa's bittersweet supply chain in one visualization
https://www.weforum.org/stories/2020/11/cocoa-chocolate-supply-chain-business-bar-africa-exports/?utm_source=chatgpt.com