GREYSILO VENTURES
POSITION PAPER 03

SWEET INNOVATORS: PAVING THE WAY FOR THE WILLY WONKAS OF THE FUTURE

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GSV Position Paper #3:

Sweet Innovators: Paving The Way For The Willy Wonkas Of The Future

Dear Readers,

The third position paper, which you now hold in your hands or view on your screen, delves into one of the most discussed and explored food innovations of recent years: cocoa and chocolate alternatives.

Chocolate is a staple in the daily lives of billions, but recent surges in cocoa prices has heightened attention on the crisis affecting the industry and its surrounding controversies. This situation presents a significant opportunity to invest in new solutions.

These alternatives, without compromising on taste, have the potential to be more locally sourced and have a lower carbon footprint, thus positively impacting the environment. This can be achieved not only through high-tech methods but also by rediscovering traditional recipes, upcycling local ingredients, and creatively updating them to meet modern tastes.

We hope you enjoy reading this paper.

Sincerely,

The Authors.

GREYSILO VENTURES

POSITION PAPER 3

SWEET INNOVATORS: PAVING THE WAY FOR THE WILLY WONKAS OF THE FUTURE

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01

From “food of the gods” to “food of the people”

“*Food of the gods*” was the name the Swedish botanist Carl Von Linné gave to the cocoa plant in 1573, in his book “*Species Plantarum”*, derived from the Latin scientific name *Theobroma*. The history of cocoa production and consumption dates back to 300 BC, when the **Olmec**, one of the oldest civilizations in the Americas, started cocoa farming implementing a rudimentary hydraulic system. The **Mayans and Aztecs**, who followed the Olmec civilization, played a crucial role in cocoa production establishing the first cocoa plantations. At that time cocoa was used primarily as a drink and as an **offering for the gods** in religious rituals. With the Aztec civilization, cocoa started to gain even more value, as it was used not only as a **medicine and aphrodisiac** for the elite and warriors, but even as a **currency.** In Aztec times, cocoa was used to preprare a bitter beverage known as “***chocolatl***”, made of ground cocoa beans mixed with water and spices. With the discovery of the Americas by Europeans and the arrival of the **Spanish conquerors** in the early 16th century, cocoa started its diffusion outside the Americas, with the introduction of this new crop to the Spanish court by Hernàn Cortés in 1519. However, the Europeans found the **bitterness of the cocoa** brew unappealing at first. They began experimenting with and mixing with other ingredients to reduce the bitterness, creating a new brew of cocoa with vanilla, cinnamon, and sweeteners to drink as a **hot beverage.**

The production of **tables of ground cocoa** represented a key innovation for the period, which improved the transport of cocoa and thereby boosted cocoa trading. In the half of the 17th century cocoa **arrived in England,** along with coffee and tea, as hot chocolate. This led to the birth of the so-called ***coffee houses***, where people could debate and drink chocolate, as it was believed to stimulate cognitive abilities.[1]

The surge in chocolate consumption in both the Old and New World led to an uptick in demand for cocoa beans, binging up cocoa prices. However, **labour shortage was the primary challenge** for increasing cocoa beans productions. To tackle this issue, the Spanish initially enslaved the local population to intensify cocoa cultivation and establish new plantations. Unfortunately, this led to the collapse of the native population, by mistreatment and spread of epide-

-mic disease. Still, the cocoa supply-related problem persisted, and the colonizers started to import slaves from Africa, to increase labour work force, and began expanding cocoa production to other regions, initially in Latin America, in present-day Ecuador, Venezuela, and Brazil. Ecuadorian cocoa earned the nickname "**cocoa of the poor**" due to its low quality and affordability, while Venezuela produced higher-quality cocoa primarily for European markets. The **cultivation of cocoa beans spread to Asia,** and it wasn't until the **19th century that cocoa production**

began in Africa, especially in the Gold Coast and Ivory Coast, emerging at the end of the century as the world's largest cocoa producer.[2]

The 19th century was a period of **innovation and discoveries** for the chocolate industry, fuelled by the **Industrial Revolution (1750-1850)**, and the constant demand and diffusion of chocolate products. The first great discovery was the extraction of cocoa butter from the cocoa beans, by skimming off the fats with a press, invented by Dutchman Coenraad Van Houten. The **pressing process** led to the production of two different products: **cocoa butter** – from which plain eatable chocolate was obtained - and **cocoa powder**. A second invention was the so-called "**Dutching process**", where cocoa was treated with alkaline salts to **improve its solubility,** resulting in a powder that mix well in water, for a mild-taste chocolate drink production.

While cocoa powder started to begin being used as a versatile ingredient, as a flavour for biscuits, cakes, and other products, cocoa butter was gaining attention thanks to its "*melting ability*". It was the Fry family – who established the first factory to produce eatable chocolate products, using Watt's steam engine as fuel - that invented a way to mix cocoa powder, sugar, and melted cocoa butter to obtain a paste to produce chocolate bars.

However, many discoveries that changed chocolate production took place in Switzerland, nowadays known for its chocolate production history. It was in 1826 that Philippe Suchar invented the "***mélangeur***", the **mixing machine** for sugar and cocoa powder.[3] He was followed by Daniel Peter that invented the famous **milk chocolate** in 1882, by adding powdered milk – provided by his neighbour Henri Nestlè, founder of the well-known multinational company Nestlè - to the chocolate.[4]

Other two inventions of the time that drove chocolate production and diffusion were the "***conching procedure***" by Rodolphe Lindt, to make solid chocolate with a **smoother and velvetier consistency**, and the "***tempering method***" by Jean Tobler, which also improved solid chocolate texture by destroying the crystal structure of cocoa butter, resulting in smoother chocolate. The fast spread of chocolate popularity and the emergence of familiar chocolate companies (e.g. Nestlè, Cadbury…) made its consumption grow, not only for a restricted group of people but also **among the masses**, placing chocolate from a luxury good into a more affordable one. Drinkable chocolate was the product more affordable and popular among the masses, while solid chocolate obtained from cocoa butter was targeted at wealthy people or the nobility.
In the mid-19th century Nestlè made another big discovery with white chocolate production, commercially available in 1936. The **white chocolate** was indeed an upcycling use of the excess of milk powder during the World War I, resulting in a white-coloured tablet of chocolate, with a milder and sugary taste compared to conventional chocolate.[5]

The **20th century** witnessed significant advancements in chocolate manufacturing, with the establishment of the three key processes of modern chocolate production: **cocoa powder, dark chocolate, and milk chocolate.** The time spanning from 1880 to 1914 is commonly known as the **Great Chocolate Boom,** marked by a substantial increase in global cocoa bean imports, particularly in Europe and North America. Various factors contributed to this surge, including the introduction of new and innovative chocolate products, a decline in production and transportation costs, and the improvement of consumer well-being and incomes.
During this period, **marketing began to play a significant role** in the chocolate industry, enhancing the appeal of chocolate products to consumers. Cocoa production was initially distributed between Africa and Latin America, but by the 1930s, more than half of the total production had become concentrated in Africa. This trend has persisted, making of Africa the world's leading cocoa producer to this day.

02

A bittersweet supply chain: challenges and implications

The cocoa industry features a **complex supply chain** that has undergone consolidation over the years, resulting in various environmental, social, and economic challenges. However, to gain a comprehensive understanding of the cocoa supply chain, it is essential to step back and analyse the journey **from cacao beans to a chocolate bar.**

Cacao trees thrive in warm temperatures, high humidity, and distributed rainfall, typically grown in a narrow equatorial belt. Currently, **Ivory Coast and Ghana** are the primary world' producers of cocoa bean, accounting for approximately **70% of the global production**. Their combined exports amount to $3.6 billion and $1.9 billion, respectively. The cultivation process involves **harvesting and fermenting** cacao pods; a crucial step that imparts flavours to the cocoa beans. Subsequently, the beans undergo **drying and roasting** to enhance the distinctive chocolate flavour. Then, the **winnowing** step is applied, where roasted cocoa beans are separated from the inner **nib**, which is the part used to make chocolate. The nibs are ground into a paste known as **chocolate liquor**, despite containing no alcohol. This liquor undergoes **conching, refining and aerating** the chocolate mass to achieve specific texture and flavour profiles. The chocolate is then **tempered, molded and cooled,** to obtain a specific shape and a shiny finish in the final product, to be packaged and distributed for sale.

In the present day, the primary contributors to the global demand for chocolate are Ivory Coast and Ghana, with additional supply coming from

Cameroon and Ecuador, making the supply chain highly dependent on them and, consequently, vulnerable. The **largest importers** of chocolate are the **Netherlands, Germany,** and the **United States**. Interestingly, the **Netherlands** holds a significant position as both an **importer and exporter,** processing approximately 600,000 tonnes of chocolate annually. Meanwhile, **Belgium** stands out as the leading producer of chocolate and finished products.

Cocoa industry hides a bittersweet side, as it is strictly linked to three issues:
1) socio-economic problems (such as poverty, child labour and corruption)
2) environmental problems (climate change and diseases)
3) nutritional sustainability

In fact, despite the substantial scale of the cocoa beans to chocolate bar journey, not everyone in this vast industry benefits equally. Cocoa is usually grown by **small farmers on farms spanning only a few hectares.** Those farmers could also be part of a larger cooperative, as a legal business structure that could also own farm or centralized fermenters. However, farmers, a crucial element in the chocolate industry puzzle, only have a **6.6% share** of the cocoa supply chain. While their role is indispensable to the process, they possess limited influence in the overall dynamics of the industry. Farmers find themselves walking a tightrope, balancing their **low income** (averaging $0.89 per day) with the continuous demands of cocoa farming. The cocoa farmers cultivate and harvest the cocoa pods and ferment and dry the cocoa beans. For this they receive a fixed price known as the **farm gate price.** The price is the same for all farmers. The farm gate price is set by the Ghanaian and Ivorian governments and depends on global cocoa prices. To cope with this challenge, they often enlist the help of children, who work in cocoa farming at the cost of missing opportunities for education and safe working conditions. There are 2.3 million children working on the 2.5 million cocoa farms in Ghana and the Ivory Coast (Tulane University, 2015). Consequently, farmers wield minimal negotiating power in the cocoa industry, with cocoa typically sold in bulk without much consideration for high quality or sustainability factors.[6] The difficulty in influencing the selling price is mainly due to **two factors:** the disorganization of the farmers where the cocoa comes from and the dependency on this crop, which in certain areas represents the main and only source of income.[7]

On top of this, **fragile institutions and little governmental subsidies** leave room for episodes of

sheer destruction. **Illegal gold mining** is the latest contributor to the disruption of the cocoa industry, as Illegal miners began appearing in some regions of Ghana a few years ago. Local farmers had been resisting threatening demands to sell miners their plantation when in June 2024, they arrived to find it cordoned off. Armed guards blocked their entry, bulldozers tore out the cocoa trees. Miners swarmed the property. Within six months, the gold was finished, and the sites were abandoned, leaving farmers with unusable land contaminated with toxic chemicals.[8]

Climate change is also heavily affecting the global production of cocoa: Cocoa trees are particularly vulnerable to climate changes.. They only grow in a narrow band of about 20 degrees latitude around the Equator. However, severe

drought conditions have hit the West Africa region since February this year. This has been caused by temperatures that soared above 40C, breaking records in countries including the Ivory Coast and Ghana. **high temperatures** increased the rate of evaporation, leaving the crops without sufficient moisture. Another factor impacting the crops was **El Niño.** This is a recurring, natural fluctuation in weather patterns in the tropical Pacific that drives up global temperatures and can lead to **extreme weather** in some places. A strong El Niño has been active since last June. El Niño years often present challenges for farmers, but global warming is exacerbating those changes, in December last year, both countries experienced **intense rains.** Total precipitation in West Africa was more than **double the 30-year average** for the time of year. The wet and humid conditions allowed a fungal infection called **black pod disease** to flourish, rotting cocoa beans on the trees.[9]

Completing the cocoa industry puzzle, it is crucial to note that cocoa production is intricately linked to **deforestation**, as rainforests are cleared to

meet the global demand for chocolate. According to the National Wildlife Federation, **70% of illegal deforestation in Ivory Coast is connected to cocoa farming.** Estimates suggest that only 6% of the country's forest remains, while in Ghana, just 20% of the former forest is intact. Deforestation not only results in the loss of forests but also leads to the **destruction of biodiversity and the over-exploitation of soil and water,** posing threats due to the use of pesticides and chemicals.[10]

The production of chocolate as a final product carries an **elevated overall sustainability cost** due to its combination with other ingredients such as milk, sugar, and vanilla. These additional components introduce challenges related to animal welfare, ethical production, and biodiversity loss. Notably, **vanilla** shares a supply chain structure similar to that of chocolate, primarily sourced from a single country, such as Madagascar, primarily sourced from Madagascar, which represents 80% of the global natural vanilla supply.[11] This connection links both chocolate and vanilla with shared concerns surrounding sustainability and various social and ethical issues.

A beacon of hope

However, some of the biggest players in the cocoa industry are actively working towards improving the cocoa supply chain, with a focus on both ethical and environmental considerations. For example, Nestlé launched the **Nestlé Cocoa Plan** in 2009, with the goal of positively impacting cocoa-farming families across three main pillars: **Better Farming, Better Lives, Better Cocoa.** This plan involves providing training and resources to help farmers improve yields and livelihoods, enhancing social conditions to prevent child labor, promoting women's empowerment for gender equality and increased household revenues, and facilitating access to quality education. Additionally, the plan entails developing certification and verification processes for cocoa supplied through this initiative.[12]

Also, Mondelez launched in 2012 **Cocoa Life,** their cocoa sustainability plan to empower cocoa farmers living in Ghana, Côte d'Ivoire,

Indonesia, India, the Dominican Republic and Brazil. Through the plan they aim to support farmers by increasing production and improving their entrepreneurship and livelihoods. As Nestlè, the aim of Mondelez is to **"re-build" a sustainable cocoa supply chain**, through entrepreneurship development, child education, women empowerment, and land preservation.[13]

Also, family-owned chocolate producer Ritter, maker of the famous square chocolate bar, has started to vertically integrate in 2014 the company announced plans to buy 2000 hectares of land in Nicaragua, upped to 2500, which will allow to source 30% of their annual demand.[14]

The Unmet Need for Sustainable Chocolate

Over the past year, **cocoa prices,** according to Bloomberg,[15] have **surged by more than 250%.** By the end of March, they had exceeded $10,000 per metric ton, marking a twofold increase from just two months earlier. This unprecedented spike is attributed to disastrous harvests in key cocoa-producing areas of West Africa, linked to all above understanding related to the spread of black fungus disease and heavy rains. As per the International Cocoa Organization, global cocoa production is forecasted to **fall short of estimated demand by 330,000 metric tons** in the current crop year.[16]

Currently, **70% of cocoa is processed by 2 corporations** (Barry Callabaut and Cargill) and **60% of the world's cocoa is purchased by 6 corporations** (Meiji, Mars, Mondelez, Nestle, Hershey, and Ferrero).[17]

The existing threats and increased demands provide a clear indication to diversify the market with alternative chocolate products. It is remarkable to ob-

-serve the **surge in innovative start-ups** dedicated to crafting alternatives to traditional cocoa, starting from **new matrices or using breakthrough technologies.** Or, even, to low tech innovation, by reworking old processes used in the past to make alternatives to real chocolate, especially during war times in Europe.

A good example of this rethinking of the production to include more sustainable practices comes from Dutch chocolate manufacturer **Tony's Chocoloney**, a company that has pledged that they will produce **100% of their chocolate without child labor.**

In the following chapter, we will delve into these start-ups and their processes, highlighting the intriguing aspects that make these new products advantageous in terms of production and supply sustainability, nutritional considerations, and, importantly, their potential competitiveness in terms of pricing compared to cocoa.

03

Market trends and need for alt-chocolate products

The **global cacao beans market** is experiencing significant growth, currently valued at approximately **USD 13.6 billion in 2023** and projected to reach USD 26.4 billion by 2033, reflecting a robust CAGR of 6.9%.[18] This growth is closely mirrored by the global chocolate market, which

was valued at USD 127.9 billion in 2022 and is anticipated to expand to USD 160.9 billion by 2027, with a CAGR of 4.7%.[19] **Europe** remains a **dominant force** in the cocoa and chocolate market, boasting a market size of USD 19.95 billion in 2021. The region serves as a **central hub for chocolate production,** sourcing around 61% of global cocoa imports.[20] This stronghold is supported by the presence of **major industrial chocolate producers** in countries such as Belgium, the Netherlands, Germany, and Switzerland.

In the Asia-Pacific region, there is a rapid surge in demand for chocolate confectionery, particularly in **emerging markets like China and India.**

The **B2B segment** of the cacao market involves **bulk sales of cocoa beans, butter, and powder** to manufacturers of chocolate, confectionery, beverages, and cosmetics. Leading companies in this sector, such as Barry Callebaut, Cargill, and Olam International, are focused on expanding their production capacities and innovating product lines to meet increasing demand.[21]

Conversely, the **B2C segment** encompasses the retail sale of chocolate and cocoa-based products through various channels, including **supermarkets, specialty stores, and online retailers**. Key trends driving this market include a rising demand for **organic and sustainably sourced** cocoa products, the **health benefits of dark chocolate,** and the growing popularity of **premium and artisanal chocolates.**[19]

Cacao and chocolate confectionery is an **ever-evolving industry,** with consumer trends as the main drivers for differentiation and innovation.

Nowadays, consumers are looking for **full indulgence** when they buy chocolate products. However, at the same time, they care about sustainability and nutritional claims, longing for a sweet snack that could be good for them and for the planet. According to Mintel's report, *'A Year of Innovation in Chocolate Confectionery, 2024'* (Jan 2024), **conscious consumerism** is on the rise as consumers tend to prefer brands that support **worker welfare, diversity, and sustainability initiatives** as important purchase drivers. **Plant-based, sugar-free, and palm-free** claims keep growing in the chocolate market. According to Barry Callebaut's latest trends report (*Global Top Chocolate Trends 2024 & Beyond, 2024*),[22] 66% of global consumers find chocolate with less or no-sugar claims appealing, while 41% are attracted to vegan and plant-based chocolate options.

Simultaneously, consumers want chocolate to have nutritional claims, especially those linked to **mental health or energy boosting.** In particular, the report states that consumers now find claims related to **high protein content** (63% of consumers) and **energy-boosting ingredients** (59% of consumers) particularly attractive. **Sustainable-related claims are still important** for consumers, as 57% of them actively seek out sustainably produced and certified chocolate. The main high-value points remain the **traceability of the raw material, transparency on origin,** and **ethical farming practices** to fight food poverty. We can see that consumers won't reduce their chocolate product consumption, but they are increasingly **raising the bar on a three-level ladder (taste-health-sustainability),** longing for chocolate that is tasty, fun, good for health, and produced with sustainable and ethical processes.

The inclusion of **sugar**, a primary ingredient in chocolate products, raises concerns regarding **chocolate consumption and its nutritional value**, particularly for white and milk chocolate, with sugar content ranging from 45g to 65g per 100g. A 2019 study published in the journal Nutrients revealed a 22% increase in the average sugar content per 100g of chocolate products

from 1992 to 2017.[23] Switzerland holds the distinction of being the country with a “sweet tooth” for the highest chocolate consumption per capita. On average, an individual consumes 8.8 kg of chocolate annually, equating to a sugar intake of approximately 4-5 kg solely from chocolate each year. This results in a **nutritional unsustainability of chocolate products,** given their high levels of sugar and saturated fats. Therefore, there is a need to explore alternatives that can achieve **sugar reduction while preserving the same taste and texture** in the final product.[24]

The Emerging Market of Cocoa-free chocolate

Given the numerous challenges within the cocoa supply chain, it's not surprising to witness a **surge in innovative startups** dedicated to exploring alternatives to this crop. Despite the sector being in its early stages, there's a remarkable array of **alternative products emerging**, showcasing positive attributes such as sustainable production, sourcing, nutritional benefits, and, notably, potential price competitiveness with cocoa. These startups utilize **new vegetable sources as their starting crop,** employing **innovative technologies** to create a diverse portfolio of products, ranging from milk chocolate to dark chocolate, and even white chocolate, applicable in various finished products like chocolate bars, pralines, and confectionery items.

Their **sustainability claims** are substantiated by the use of planet-friendly or underutilized crops, upcycled ingredients, and the application of breakthrough technologies, and, of course, a fully ethically sustainable supply chain. Additionally, these startups aim to develop products that can **compete in terms of pricing with their benchmarks,**

whether it be mass-market chocolate or even premium chocolate. Lastly, **nutrition stands as one of the key pillars** for cocoa-free chocolate, with several startups focusing on developing products that offer nutritional benefits or reduce the reliance on sugar, a primary concern in the chocolate products industry.

The **fatty component of alternative chocolate** poses challenges in terms of both **cost and sustainability,** especially for companies hesitant to use cocoa. Cocoa butter offers distinctive qualities in texture (contributing to its characteristic snap) and taste (its ability to melt at body temperature enhances palatability). Consequently, finding a suitable substitute proves difficult: companies resort to vegetable fats like **palm oil or chia butter** (karite). However, both options come with drawbacks: palm oil is the cheapest but carries negative nutritional and sustainability implications, while karite butter fares better nutritionally but drives up production costs, surpassing those of conventional chocolate.

04

Who's who in the alt-chocolate industry

To make cocoa-free chocolate alternatives, different technologies and methods are employed. We will categorize them into three main groups:
1) **traditional process**
2) **plant cell-culture based process**
3) **hybrid process**

The traditional process leverage on the conventional **fermentation process** of cocoa beans, using a different crop as starting material, as **carob or oat** for example, which during fermentation and roasting express flavours that could be linked to cocoa ones. On the other hand, **plant-cell culture** technology allows to produce ingredients with **identical characteristics to conventional cocoa products,** through the replication of the cocoa crop cells to obtain cocoa powder or butter. Some startups use a **hybrid method,** that combine a first part of traditional fermentation of the starting material and then using plant-cell cultures technology to achieve the final product.
Let's discover the startup operating in the sector.

Alt-Chocolate: Start-Up Companies

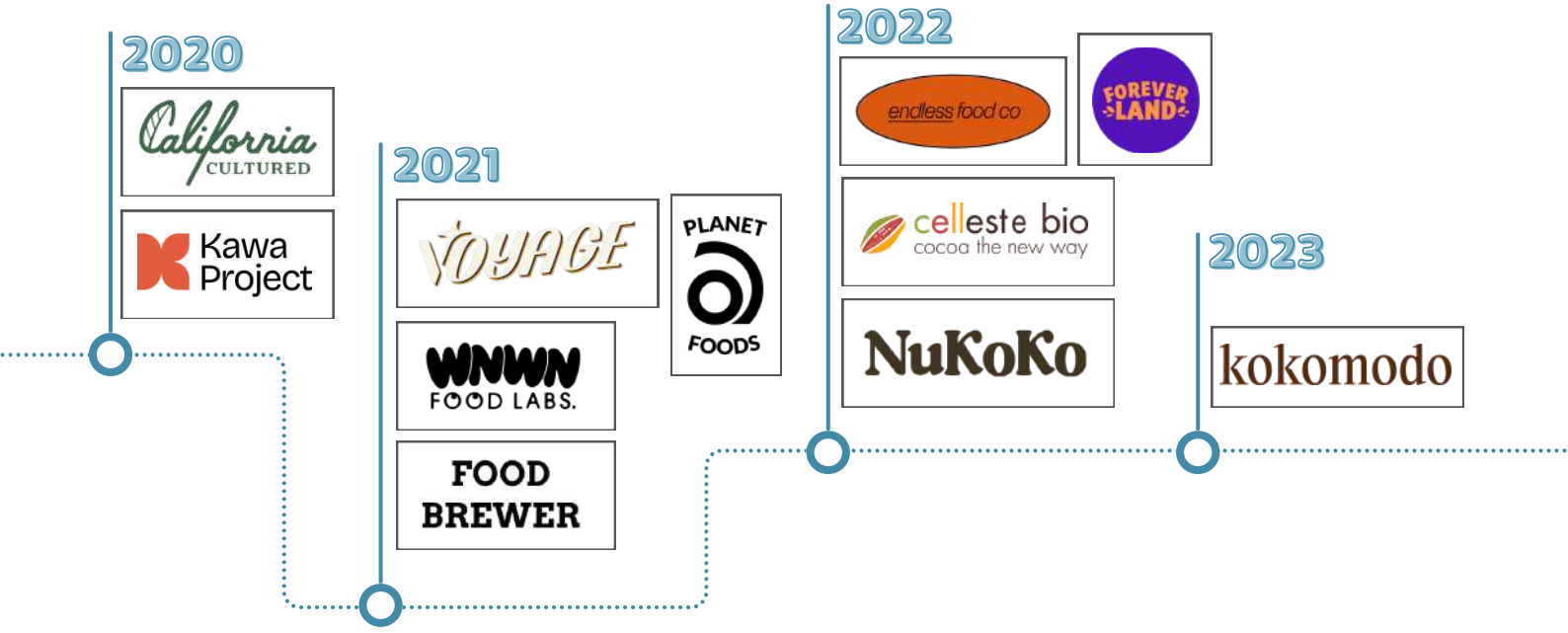


Fig.1 Alternative cocoa start-up: foundation date

Food-tech company that produces cocoa and coffee product using cell culture technology.

- **HQ:** California (US)
- Date founded: 2020
- **Stage:** Early Stage VC
- **Funding:** $ 10 mln
- **Investor:** ADM, Meji, angel investors

A startup that upcycles coffee production waste to produce a biotech-powdered cocoa free alternative.

- **HQ:** California (US)
- **Date founded:** 2020
- **Stage:** n/a
- **Funding:** $100K
- **Investor:** GROW

Offers cocoa-free, nut-free and coffee-free products, using RSPO palm oil, shea kernel oil, grape seeds, and more.

- **HQ:** California (UK)
- **Date founded:** 2021
- **Stage:** Series A
- **Funding:** $22M
- **Investor:** Horizons Ventures, Indie Bio, Social Impact Capital, Level One Fund, UBS O'Connor

Food-tech start up that develops a plant-based alternative to chocolate through fermentation process.

- **HQ:** London (UK)
- **Date founded:** 2021
- **Stage:** Series A
- **Funding:** $5.6M
- **Investor:** Peakbridge, Foodlabs, PINC, Investbridge Capital, Braun Group, Mustard Seeds, HackCapital

FOOD BREWER

A startup using cell culture technology to produce commodities currently challenged by land scarcity, climate, and ethical concerns.

- **HQ:** Switzerland
- **Date founded:** 2021
- **Stage:** Seed
- **Funding:** $5.6 million
- **Investor:** Zürcher Kantonalbank, Max Felchlin AG

Fermentation-based startup that uses oat as a base ingredient for chocolate production.

- **HQ:** Planegg (DE)
- **Date founded:** 2021
- **Stage:** Series A
- **Funding:** $15.4M
- **Investors:** World Fund, Triplepoint Capital, Cherry Ventures, Nuclues Capital, Mudcake, Omnes capital

PLANET FOODS

endless food co

European-based startup that produce alt-cocoa through and upcycling process.

- **HQ:** Copenhagen (DK)
- **Date founded:** 2022
- **Stage:** Pre-seed
- **Funding:** n/a
- **Investor:** n/a

Italian-based startup that produces chocolate from carob beans through a technology under patenting.

- **HQ:** Conversano (IT)
- **Date founded:** 2022
- **Stage:** early Stage
- **Funding:** n/a
- **Investor:** n/a

FOREVER LAND

celleste bio
cocoa the new way

Food-tech startup who produces high-quality cocoa using conventional cell culture methods, using carob and barley.

- **HQ:** Misgav (IL)
- **Date founded:** 2022
- **Stage:** Seed
- **Funding:** n/a
- **Investor:** Mondelez

Fermentation-based startup that uses UK-local beans instead of cocoa beans to produce alt-cocoa.

NuKoKo

- **HQ:** London (UK)
- **Date founded:** 2022
- **Stage:** Seed
- **Funding:** $525,000
- **Investor:** SOSV, Oyster Bay VC, The Mills Fabrica

kokomodo

Chocolate equivalents using proprietary methods on various crops.

- **HQ:** Israel
- **Date founded:** 2023
- **Stage:** Pre-seed
- **Funding:** No funding received yet
- **Investor:** n/a

What about White Chocolate (and Vanilla)?

The vanilla sector is also witnessing the timid emergence of innovative companies exploring alternative methods for vanilla production. Like the cocoa industry, the **natural vanilla supply chain** faces challenges since it predominantly originates from a single country, **Madagascar**, tasked with meeting global demand. However, with demand consistently surpassing the supply capacity, the industry resorts to using synthetic vanilla. Nevertheless, **synthetic vanilla** has a distinct flavour profile, containing only five flavour compounds, in contrast to **soil-grown vanilla,** which boasts over 200 flavour compounds.[25] The rise of **alternatives to vanilla** could signify a significant step towards sustainability for the alternative chocolate industry. Vanilla stands out as a key ingredient in various **chocolate-based confectionery products**, such as **milk chocolate.** Therefore, startups and companies are looking for new cultivation and production methods of vanilla, as **indoor farming, or precision fermentation.**

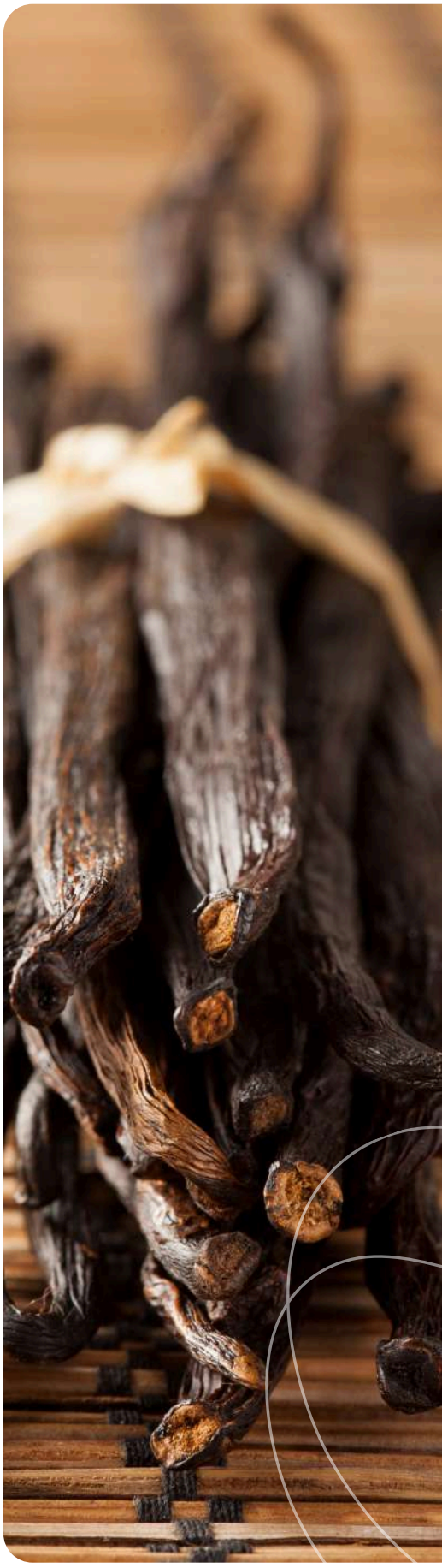
VANILLA VIDA®
Growing Possibilities

Isralel-based startup that develop a natural vanilla produced through a mix of indoor farming in greenhouses, novel indoor curing and a fully automated process.
HQ: Or Yehuda (Israel)
Date founded: 2020
Stage: Series A
Funding: $20M
Investor: n/a

The *Vanilla planifolia Tlilxochitl*, named after the Aztec term for vanilla, originated not only in ancient Mexico but also in the Old World. The Totonaks, skilled agriculturalists, were pioneers in cultivating this well-known vine, characterized by its lengthy climbing stems adorned with fleshy foliage and aerial roots. The planifolia yields fruits containing a **sweet pulp**, which the Aztecs ingeniously incorporated into their cocoa beverages to **offset bitterness.** This blending of flavors might be considered an early rendition of **chocolate milk.**

In the realm of vanilla production, two noteworthy companies emerge. Firstly, the Swiss company **Evolva** (now acquired by Lallemand Inc.) developed a method for producing vanillin **through precision fermentation** by integrating the biochemical pathways leading to vanillin into yeast cells.[26] This technology aimed to address the unsustainable inputs required for synthetic vanillin, which traditionally relies on petrochemicals or wood pulp. Another avenue toward more sustainable, natural vanilla was pursued from 2012 to 2019 at **Wageningen University** in the Netherlands.[27] The project aimed to employ advanced indoor farming techniques to produce local **"eurovanilla".** However, this initiative was ultimately terminated in 2019 due to lack of profitability.[28] Vanilla cultivation presents significant challenges, given its slow growth rate, requiring at least three years to yield the first pods. The costs associated with achieving production through indoor climate control further compound these challenges.

Recently, the Dutch company **Koppert Cress** announced the successful indoor farming of vanilla pods in Europe.[29] Concurrently, the Danish-based company **Dansk Vanilje** also reported successful trials in indoor vanilla cultivation.[30]



05

Deep-dive into alt-chocolate startup

We caught up with **Max, CEO and co-founder of Endless Food,** a company based in Copenhagen that has developed **THIC™ (This Isn't Chocolate),** a chocolate-like ingredient, made to integrate sustainability with deliciousness.

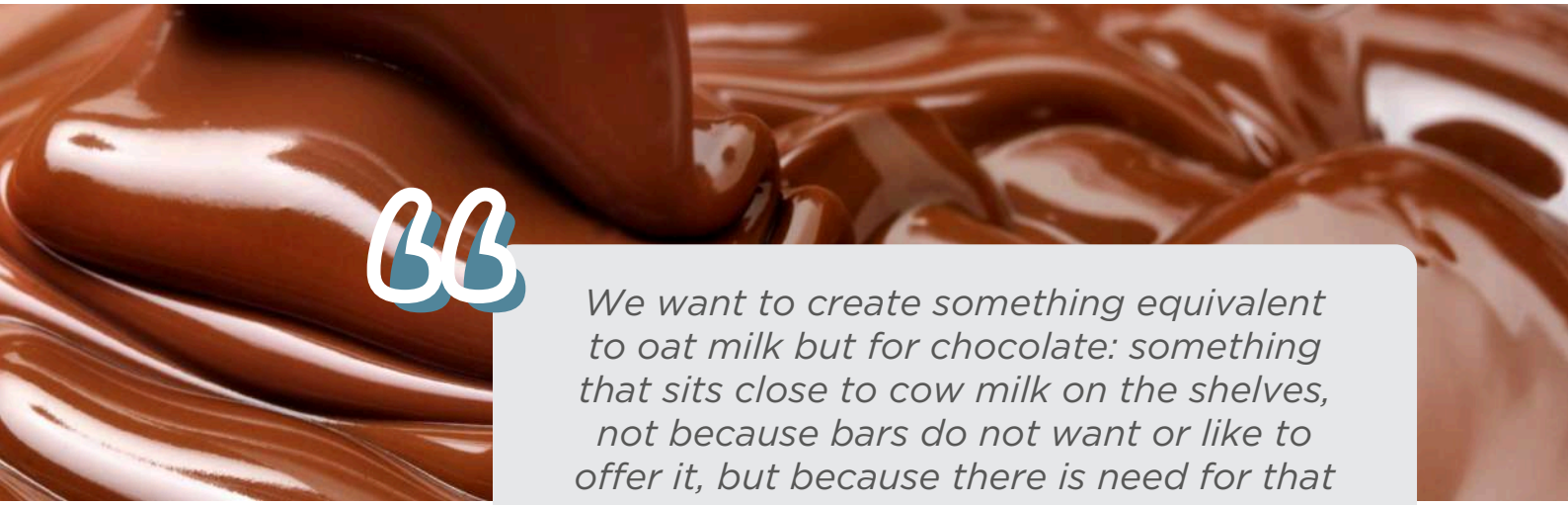
The peculiarity of this company was the history **behind its foundation.** Matthew Orlando, Maximillian Bogenmann, and Christian Bach, the 3 co-founders of Endless, were colleagues at Amass, of the world 50 best restaurants and at the forefront of molecular cuisine where they met in 2014. They then went on and worked together for over 10 years pioneering new cooking techniques, always keeping an eye to **sustainable production and processing** as well as **valorising local ingredients** (their idea was to create a hyper-local restaurant).

At Amass there was a brewery connected to the restaurant, which had lots of spent grains. That's when they realized they could create something that restaurant could not live without: chocolate. They started on **iterations to create a chocolate-like ingredient in 2019**, driven by their need of making a more sustainable product. After 3 years, in November 2022, they started the company and Endless Foods was born.

Their strategy is to become a **B2B ingredient company** – providing customers with both actual chocolate and cocoa powder equivalent – instead of large-scale incumbent companies – where 30 to 50% of the conventional chocolate in the recipe can be discarded and replace it with their own. They also started selling to high quality restaurants and bakeries in June 2022, to start collecting customer feedback.

When we asked Max about the ingredients that make-up for THIC™, he stressed the fact the core identity of the company is to get as much **upcycled, organic and local ingredients** as possible: that's why the key ingredients are **upcycled barley, oats, organic sugars, plant-based fats,** as well as some minor components to add flavours, such as pressing from juice production (cocoa husk).

Funded by EU grants and Innofund program in Denmark, Max told us the priority now is to build their own **pre-processing facilities to process the first basic ingredients** – and create a flavanol powder which will then be processed by their customers and/or partners. (that's where the company IP sits). The first fundraising round will be dedicated to upscaling production with a partner outside of Copenhagen. Initially the goal is to produce 100 kg+ in 10 days -as validation- to then get to 1ton/month towards 2025, and finally go outside Denmark if demand increases, deciding whether it makes sense to build up their own pilot plant or still outsource.



> *We want to create something equivalent to oat milk but for chocolate: something that sits close to cow milk on the shelves, not because bars do not want or like to offer it, but because there is need for that kind of products.*

As far as development plans, Max said their idea is very clear: "we want to create something **equivalent to oat milk but for chocolate:** something that sits close to cow milk on the shelves, not because bars do not want or like to offer it, but because there is need for that kind of products just as much as there is for conventional ones".

Their product portfolio looks to **address different chocolates** (cocoa%, textures, functionalities), keeping in mind a key point, which is that, especially for an indulgence product such as chocolate, **flavor is king.** That said, Max told us that they are well aware that, as a B2B ingredient company who will end up serving big corporations, who most of all are **price sensitive**, they also need to keep in mind the cost side of business, and that is why in their opinion, despite being probably just as much needed, plant-cell culturing cocoa pods (or their extracted compounds) will just take a long time before we see the results in the market.

When it comes to pioneers in the field of alternative chocolate, UK-based WNWN is definitely one of them. Started in 2021 by **Ahrum Pak, CEO and co-founder and Johnny Drain, CSO and co-founder,** the story behind the company is somewhat fascinating, and surely not the conventional one, but in every sense very much rooted in what the two founders grew up and dedicated their upbringing and/or education to.

Ahrum grew in a family where **fermenting food for a living was the normality**. She then went on to complete her business school, and upon finishing MBA she was sure that she'd end in up in the renwable energy industry, so she went on and worked in Investment Banking for a couple of years. Soon after, she realized that this was not what drove her motivation up, instead she quoted "I was really bored", and that's when she decided to **go back to fermentation.** She started looking for a technical co-founder, until the efforts led her to Johnny. His background in science (materials science at Oxford, and nanomaterials at Imperial College, plus his particular focus on **fermentation, food waste, circular systems,** and future foods created the perfect match.

But the best part of the story is not the perfect blend of skills and backgrounds, rather the way these two came together: Ahrum straightforwardly sent him a cold-LinkedIn message where she asked him if he wanted to create a company. They were both interested in **industries not yet disrupted –chocolate being one of them-** and soon realized where their efforts were going to be leading. Soon after WNWN was born.

We asked Ahrum some of the most pressing questions on the chocolate industry, the peculiarity of WNWN and its technological stack, as well as how they managed to attract some of the most relevant foodtech investors such as Foodlabs and Peakbridge to invest in their company.

Why do you think that chocolate more than other industries is ripe for disruption?

A: "Traders controlling the market and just a handful of processing companies are the real puppeteers who control a multi-billion-dollar market. **Farmers,** the most important part of the value chain, **are often overlooked** and do not get enough credit for the work they do."

Ok, so how is WNWN helping to face the challenges that we know of?

A: "Cocoa has a problem because cocoa is so cheap. **Affordability must be top of mind,** but at the same time we don't want it to be a race to the bottom. That is why we started creating **products that behave just like chocolate** but are made without the cocoa, trying to keep the **price competitive.**"

To the limit of what you can disclose, could you please help us better understand how you can create chocolate-like products without the use of cocoa?

A: "We are very inspired by how chocolate is made – taking the pods out of the bean, starting the sun drying process that activates the **fermentation,** and then processing the pods – the only difference is that we replicate these steps, only instead of using the cocoa beans we use **other crops** – **carob and barley** mainly – they are abundant and can be grown all year around. On top of this, they both have a much better sustainability index than cocoa."

Does that apply also to the manufacturing methods?

A: "Absolutely. Our technology does not include **any synthetic biology technique**; all our ingredients are **GMO-free,** and we use off-the shelf equipment; we can easily retrofit existing chocolate manufacturing equipment – which means we can go for almost a **1:1 swap.**"

How do you manage to achieve great taste though?

A: “For our team, predominantly made of scientists and technologists, the **key focus** has always been (and will always be) on getting to produce the **best tasting products** – we focus a lot on flavours and iterate often to get to a taste profile as close to chocolate as possible.”

> *That is why we started creating products that behave just like chocolate but are made without the cocoa, trying to keep the price competitive.*

I saw that recently you started selling your own bars, is that the go-to market strategy?

A: “We launched our first **3 signature products**: our dark, vegan-m.lk and caramel choc, which are available on our website for D2C purchases. But that is not the end goal, as, despite having a consumer challenger brand out, we will predominantly be a **B2B company – working directly with industry partners**. By the way, we have 2 exciting partnerships which are going to be announced soon.”

Got it. And what about your production? How are you currently operating?

A: “We consider ourselves as an **R&D company** – most of the money from the round was spend on this and scale-up- while production wise we work with a network of CMOs around the world - not only in the UK- to which we **outsource the production while retaining our IP,** which is the core of our technology.”

Staying in the UK, Nukoko is yet another company that has found a way to leverage a **local, sustainable and widely spread crop such as Fava** to create their own version of an alternative to chocolate. We first met with the team during our visit to London on the occasion of Future Foodtech 2023, where we met with **Ross Netwon, CEO and co-founder and Kit Tomlison, COO and co-founder.** The pair had known each other and have been working together for a multitude of years, since their foundation of a chocolate company and brand, Mighty Fine Honeycomb, which they sold in 2022 to a conventional chocolate manufacturer. They are supported by **David Salt,** a professor from **Nottingham University on the technical side.** We caught up with Ross, CEO and co-founder to better understand how they operate.

NuKoKo

Your experience in founding a chocolate brand led you to start yet another chocolate (alternative company) What is the reason why you started Nukoko?

R: "Cocoa farmers are being increasingly affected by climate change, we are on the back of a **3-year supply deficit** and this means **cocoa prices have been increasing rapidly by over 200%.** Currently cocoa prices are at record highs and with climate modelling showing this will only get worse. Even at current pricing levels this has **huge impact on manufacturers ability to maintain their current business models,** and means the consumer will face increasing prices, smaller products, and a general reduction in quality. On top of this the chocolate we do eat has a **massive negative environmental impact** with high CO_2 emissions and increasing levels of deforestation, exasperated by climate change."

You're focus is to fight these problems with your own category of products. What is the product portfolio that you are building at Nukoko?

R: "We started out with some **first consumer products** such as Nukoko-covered pralines just to get validation, but our end goal is to sell our **Nukoko powders and other semi-finished products** such as chocolate to food manufacturers who can include them into their formulations."

What is the secret ingredient that make Nukoko's products so similar to chocolate?

R: "We source **local fava beans from farms in UK and EU,** then apply our **fermentation process**, which is similar to the fermentation process we see used on cocoa farms, that transforms the humble fava bean into this cocoa bean like product."

Do you produce in house or via third parties?

R: "Currently we produce **in-house** but are **exploring third party** options as we grow."

What are the key advantages of your products compared to conventional chocolate?

R: "We can offer **taste, sustainability, value and stability** as an alternative to conventional cocoa. Fava is a hugely abundant cheap crop across the world, that is sustainable sourced and robust."

We source local fava beans from farms in UK and EU, then apply our fermentation process, which is similar to the fermentation process we see used on cocoa farms, that transforms the humble fava bean into this cocoa bean like product.

Which technology will be best suited to help with the current cocoa crisis: proprietary treatments on other crops or mimicking chocolate via e.g. plant cell culture? Do you think that the two of them can co-exist?

R: "I think it all comes down to **taste, sustainability, scale and price.** Whatever option you are looking at it needs to deliver on these **core principles** to be a viable alternative."

What is your personal outlook on the future of the industry?

R: "We have worked in the chocolate industry for over 10 years, and it is fair to say **we have not seen such uncertainty as we are seeing now.** We have owned chocolate brands ourselves and I feel the pain of current brands who face huge difficulties in the face of these issues in the cocoa supply chain. It is the reason we started Nukoko in the first place, we saw a few years ago the oncoming problems and **set out to create a solution that we as chocolate lovers could potentially use and sell to others.** There will be a great **deal of transition** over the coming years, where alternatives such as Nukoko are utilised, but I hope that we can go some way to maintaining the chocolate industry that we love for the future."

Freshly funded with the largest European Venture Capital rounds (of 15+ mln€) for an alternative chocolate company, Planet A Foods, makers of **alt-choc brand ChoViva,** is one of the most known and advanced companies in the space, having secured production contracts from industry giants such as Peter Kolln and Rewe. **Founded by chocolate-siblings Max and Sara Marquart in 2021** near Munich, the company rolled out different products in the market, from choc-like chips to fillings and is now looking to expand even more their production after setting up their proprietary plant in Pilsen (CZ). We have visited the company back in November 2022, and are surprised by the speed they were moving and reacting to market needs in order to keep up with demand. We interviewed Max 2 years after, and he gave us a comprehensive view of how he sees the evolutions of the cocoa industry.

Max, can you please help the public understand why it is critical to start thinking about alternatives to chocolate that are made without cocoa?

M: "First and foremost is a **supply chain risk:** There is **not enough cocoa in the market** for all the growing demand. Chocolate demand grows at over 6% YoY whole supply is decreasing constantly. There's a **huge dependence** on only two supply regions - Ghana and Ivory Coast. Climate change will hit both most likely. Secondly, **pest and diseases:** more and more pest and diseases are affecting the cocoa trees in those regions. The trees itself are quite sensible towards pests and diseases. Lastly, **farming practices being inefficient,** and farmers who are stuck to using old methods. The **trees are at the limit of their productivity** and need to be renewed soon. After renewal they need another 5 years until they reach their peak productivity."

What are they main challenges that you see for the newcomers in the field?

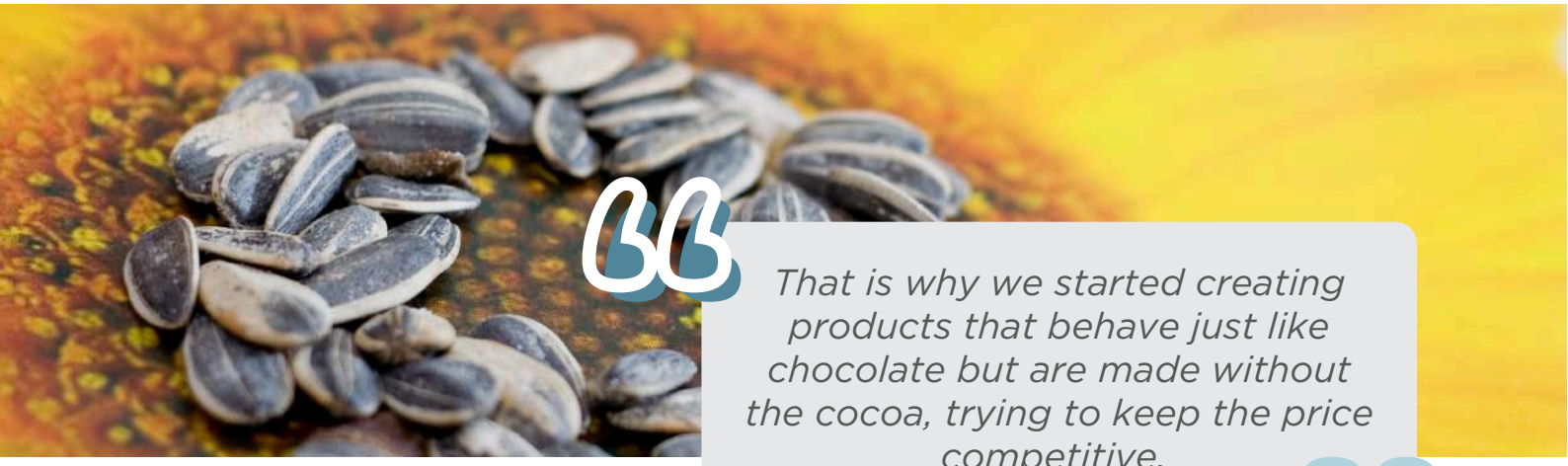
M: "Farmers are **moving away from cocoa + regulation**: There are certainly challenges related to EU legislation that are not easy to solve regarding regulatory - EUDR and ESG related."

What is the product portfolio that you are building at Planet A Foods? Are you planning to produce consumer products (e.g chocolate bars, pralines, etc) or is your product more of a semi-finished product, therefore suited for food manufacturing companies only?

M: "We are **B2B only.** Currently we are not pursuing our own consumer products. However, we pursue our **ingredient brand ChoViva** with the CO2-reduced storytelling."

How is Planet A producing its key ingredient ChoViva?

M: "We **re-engineered** the process that generates the flavors of chocolate - **fermentation and roasting** - after realizing that 80% of the flavors in a milk chocolate are actually process derived flavors. Instead of cocoa we use abundant ingredients such as **oats and sunflower seeds** to make our cocoa powder. They are available in vast amounts, really cost efficient and don't fluctuate so much. For the **cocoa butter** we are using a **precision fermentation** process that we are developing in-house."



That is why we started creating products that behave just like chocolate but are made without the cocoa, trying to keep the price competitive.

What are the key advantages of ChoViva compared to conventional chocolate?

M: "We have an **in-house production** in Pilsen - our own plant with all state-of-the-art certifications. We look to achieve same Taste, but with a production process that uses up to **90% less CO_2** and is it **30-50% cheaper** than conventional chocolate. The story resonates well with younger customers; thus we can also generate additional revenue with line extensions."

You have been great in securing traction with some big industry players like Rewe and Kolln. What is the recipe for such early success?"

M: "The key was to understand the industry and play with them instead of against them. We are not here to try to blame chocolate - there is no sense in starting a fight against chocolate or cocoa – Rather, we look to **solve a 10X problem - sustainability is not enough.**"

What is your personal outlook on the future of the industry?

M: "The story of ChoViva can somewhat be **related to the story of sugar from sugar beets.** In 1747, three decades before the American colonies declared their independence, German chemist Andreas Marggraf discovered that sugar beet roots contained sucrose, the same sugar as that of sugar cane. Marggraf's apprentice, Franz Karl Achard, began selectively breeding sugar beets in 1784. Before the 17th century, sugar was the crop of the rich aristocrats as it was only won from sugar canes and imported b ships. **Before this invention, no one thought that sugar can be generated from sugar beet but only from sugar cane.** With ChoViva we can do the same in a fastly changing environment - we can provide an **indulgent, sustainable & cost-efficient new product.** I think in the future, developments like ours will become the new normal next to conventional chocolate & cell cultured chocolate. All three technologies will co-exist."

Foreverland Food is another one of those fast-moving, good-for-the-planet kind of companies that has been under the spotlight many times recently, the last one after it was announced as one of the finalists of the Hack and Givaudan challenge organized in sight of the HackSummit in June 2024. The Italian-based company, **founded by energetic, complementary founders Massimo, Riccardo and Giuseppe in early 2023,** is active in the alternative chocolate space, their core product being a **semi-finished ingredient that leverages carob,** a forgotten ingredient and resembles milk chocolate in taste and texture, but boasts a better nutritional profile (less added refined sugars), and a more sustainable and price-competitive production process when compared to conventional chocolate.

We caught up with **Giuseppe, CMO of the company,** to gain his insights on the industry and how Foreverland is moving up the ranks in this ever-evolving space.

Starting from the basis, can you help us understand what drove you as a team to build an alternative to chocolate and why is important to sensibilize the public on the problems of chocolate?

G: "Chocolate, one of the world's most beloved treats, often conceals a darker side to its production. The cocoa industry is responsible for almost **half of deforestation** in Ivory Coast and Ghana, the sources of two-thirds of the world's cocoa. Additionally, over **1.5 million children are exploited in its harvesting.** Furthermore, chocolate ranks as the **top water-intensive ingredient,** requiring approximately 24,000 liters of water per kilogram, while **contributing significantly to carbon emissions,** ranking second among CO2 emitters, primarily due to logistics and land exploitation. Traditional chocolate also faces **two economic challenges:** a price increase of +300% compared to last year and the potential disappearance of 90% of plantations in Ghana and Ivory Coast by 2050 due to climate change. We do not know what will happen with the climate crisis and what the price trend will be, but **sustainability is and will be a problem not easily solved in the cocoa supply chain**, and these are the reasons why we absolutely need to think about alternatives to chocolate."

So what is the product portfolio that you are building at Foreverland?

G: “Our product portfolio is continuously expanding and evolving, starting with our **Freecao,** the **chocolate alternative made from carob**. We have developed the "**vegan milk**" version with **four different applications and over ten unique recipes.** We are now working on **dark, white, and powdered versions**, each with their own distinct applications. Additionally, our catalogue is growing to include other strategic products such as **allergen-free hazelnut** and **peanut spreads,** along with several other products currently in development.”

What is Foreverland’s key technology and production process?

G: “Foreverland utilizes cutting-edge food technologies, including **roasting, fermentation, and biocatalysts,** to unlock the rich flavor potential of carob, creating an ingredient that closely mimics the smell and taste of cacao. By blending Foreverland **carob with other "forgotten ingredients,"** we then craft a unique cocoa-free chocolate that offers a delightful and sustainable alternative to traditional chocolate.”

It seems like demand is really knocking at your doors. Do you produce in house or via third parties?

G: “We currently produce our semi-finished products through various **co-packers** but in September we open our **plant in Puglia** with a production capacity of 1000 tons.”

> *By blending Foreverland carob with other "forgotten ingredients," we then craft a unique cocoa-free chocolate that offers a delightful and sustainable alternative to traditional chocolate.*

What are the key advantages of your products compared to conventional chocolate?

G: “Freecao is the **chocolate alternative made from Italian carob** - delicious, future-proof, and sustainable, not just for the planet but also economically. Freecao is super sustainable, with **90% less water and 80% less CO_2** completely **allergen-free, less sugar, low nickel** chocolate alternative made from Italian carob, no artificial ingredients, and health benefits like low glycaemic index and high in fiber. Freecao is also **free of theobromine and caffeine**, making it more digestible and suitable for a broader audience.”

This seems like a completely new product category, which leverages the powers of carob to make a new class of ingredients. How do you see that when compared to chocolate?

G: “We envision a future where **fair-trade cocoa and alt-choc coexist** to create a socially, economically, and environmentally sustainable chocolate industry, both for consumers and farmers. Currently, **carob pods** are primarily used as **animal feed and fertilizer,** limiting their commercial appeal. However, with proprietary treatment methods like the one we apply, carob is gaining added value, offering a **new business opportunity for local Mediterranean farmers** who previously did not consider it a viable source of income. This shift can alleviate also the financial strain on African cocoa farmers by reducing dependence on mass-market cocoa, allowing them to focus on producing high-quality cocoa at fair prices.”

That leads me to the next question, which is your personal outlook on the future of the industry?

G: “The world is changing due to the unstoppable climate crisis, a continuously growing global population, and the rapid expansion of new markets like those in Asia. Consequently, it is **essential for the food industry**, including the chocolate sector, to **adapt and evolve by developing more sustainable products sourced** from different, more responsible origins than those currently in use.”

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About the contributors

The mission of Grey Silo Ventures, the **Corporate Venture Capital of Cereal Docks Group** established to invest in the supply chain of **non-animal-based ingredients** and related **innovative technologies,** is to broaden horizons in the global food-tech sector while maintaining the original vocation as a processor of plant based sources and explorer of new opportunities for innovation and business diversification.

Grey Silo Ventures is committed to study the great potential of **new fermentation processes** and **innovative green proteins**, by using them to create novel ingredients. The **ag-tech** world and **cellular agriculture** represent other areas of interest that are part of the value chain in which Cereal Docks Group operates.

Cereal Docks is an **Italian industrial group** headquartered in Camisano Vicentino (Vi), active since 1983 in the **first agro-food processing** for the production of ingredients destined for applications in the **feed, food, pharma, cosmetic and technical use sectors.** Today, the Cereal Docks Group employs more than 430 people in eleven different facilities.

In addition to consolidation of its core business, the Cereal Docks Group is also committed to new development focused on transforming the concept of feeding to that of nutrition. The development of solutions that guarantee the correct balance of nutritional principles in a context defined by **quality, safety, standardization** and **environmental sustainability** is central for offering better responses to health and wellness needs.

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