

THE CHOCOLATE LIFE

Included in this document is the series of prompts I used, in order, as well as the raw output from the LLM. It's important to point out that the LLM has been "trained on me" and "knows" (has memory) about all of my previous chats about chocolate and cocoa.

LLMs can still make mistakes, so I use this output as a starting point for following up. I have left the source attributions intact.

Please note that I am not starting from the first prompt. The language of this first prompt assumes prior prompts in the chat.

/ Clay

THE CHOCOLATE LIFE

PROMPT: What is the UC Berkeley lab doing CRISPR gene editing of cacao. What is the lab actually doing and what is being said about the work publicly. Cite news sourced and, university and Mars, Inc press releases.

What the UC Berkeley lab is actually doing

UC Berkeley's work on cacao is centered in the **Innovative Genomics Institute (IGI)** under plant genomics director **Myeong-Je Cho**. The project's core is to use CRISPR/Cas9 to engineer **disease-resistant, climate-resilient cacao** as part of IGI's sustainable agriculture program.

On IGI's own project page for "Engineering disease-resistant cacao with CRISPR genome editing," they describe using CRISPR to alter genes involved in **pathogen resistance** and **stress tolerance** in cacao, with the explicit goal of helping the crop withstand disease and environmental pressures that threaten yields in West Africa and other producing regions. This is framed as part of a broader effort to apply gene editing to major crops (like wheat, corn, rice, cassava, cacao, coffee) by precisely modifying useful genes rather than relying on slower, less targeted breeding.

<https://innovativegenomics.org/programs/sustainable-agriculture/engineering-disease-resistant-cacao-with-crispr-genome-editing/>

A UC Berkeley Vice Chancellor for Research news piece, "**CRISPR put to work to save chocolate from devastation**" (Jan 2, 2018), gives the clearest high-level description:

- Cacao seedlings in Cho's lab have their **genes "changed slightly" using CRISPR** to help them tolerate warmer, drier conditions expected under climate change.
- The work is part of a collaboration between IGI and **Mars, Inc.**, tied to Mars's commitment to climate and sustainability in its cocoa supply chain.
- Jennifer Doudna is named as overseeing the collaboration, and she explicitly frames this as an example of CRISPR's most important applications being in **the food system**, not just human medicine.

<https://vcresearch.berkeley.edu/news/crispr-put-work-save-chocolate-devastation>

Technically, the public descriptions emphasize: editing specific cacao genes in **embryos and seedlings**, regenerating plants from edited tissue, and testing whether altered lines show improved resistance to **disease and environmental stress** in controlled conditions. There is no public indication in these sources that edited trees are yet deployed at farm scale; the work is still described as research, proof-of-concept, and breeding-enabling rather than a

THE CHOCOLATE LIFE

commercialized GMO product.

<https://innovativegenomics.org/programs/sustainable-agriculture/engineering-disease-resistant-cacao-with-crispr-genome-editing/>

How UC Berkeley and Mars describe the collaboration

From the **Berkeley side**, two key institutional framings:

- The **IGI sustainable agriculture program** page positions cacao alongside other “crops for the developing world,” aiming to build “**designer plants**” by moving beneficial traits from wild or related species directly into elite cultivars using CRISPR, cutting years off breeding cycles and avoiding unwanted linked traits. Cacao is explicitly named as one of those target crops.

<https://innovativegenomics.org/programs/sustainable-agriculture/engineering-disease-resistant-cacao-with-crispr-genome-editing/>

- The **2018 VCR article** is explicit that the cacao–CRISPR work is part of a collaboration with **Mars** within Mars’s “\$1 billion commitment to reducing its carbon footprint,” and that the motivation is to keep cacao viable in current growing regions as climate warms and dries.

<https://vcresearch.berkeley.edu/news/crispr-put-work-save-chocolate-devastation>

From the **Mars side**, the most substantive recent corporate write-up is a 2023 story, “**Mars is helping future-proof chocolate,**” which focuses on their UC Davis-based cocoa research facility and long-term breeding, pathology, and microbiome work. This piece does not foreground CRISPR per se; instead it talks about:

- Assembling cocoa germplasm representing **>80% of global genetic diversity**.
- Selecting for resilience to pests, disease, and climate stress.
- Tools like rapid virus diagnostics to reduce disease-driven deforestation.

It situates this within Mars’s “**Cocoa for Generations**” vision and farmer income / climate goals. While the article is centered on **UC Davis**, not Berkeley, it’s part of the same broader Mars strategy of using advanced genetics and plant science (including gene editing in some partnerships) to “future-proof” cocoa.

<https://www.mars.com/news-and-stories/articles/mars-helping-future-proof-chocolate>

Publicly, Mars and UC Berkeley/IGI emphasize: sustainability, farmer livelihoods, climate resilience, and disease resistance; they do not dwell on “GMO” language or specific target genes. Instead they frame CRISPR as an **advanced breeding tool** that accelerates and sharpens changes plant breeders have always tried to make.

THE CHOCOLATE LIFE

How news and commentary pieces talk about the work

A few non-Berkeley outlets have amplified and interpreted the collaboration:

- The **UC Berkeley VCR article** itself is quite punchy in tone (“save chocolate from devastation”), referencing coverage in **Business Insider** that popularized the “chocolate could disappear by 2050” narrative and described CRISPR-edited cacao seedlings at UC Berkeley as one possible solution.
<https://vcresearch.berkeley.edu/news/crispr-put-work-save-chocolate-devastation>
- A UCSD student science magazine piece, “**The Genetic Solution for Chocolate**” (**SQ Online, 2019**), synthesizes several sources (Penn State work on disease resistance, plus the Berkeley/Mars collaboration). It states that:
 - UC Berkeley’s Plant Genomics group, in partnership with Mars, has produced **CRISPR-edited cacao embryos** to enhance **weather (climate) resistance**.
 - These seedlings are being developed and evaluated to see if they can withstand **more arid conditions** once grown to trees.
 - The collaboration is explicitly framed as part of Mars’s effort to **reduce its carbon footprint** while maintaining cocoa-related employment.
<https://sqonline.ucsd.edu/2019/07/the-genetic-solution-for-chocolate/>

Media and student-science coverage tend to:

- Highlight **climate-driven threats** (warmer, drier conditions; disease pressure) and the risk to global chocolate supply.
- Cast CRISPR as a **precision, targeted alternative** to traditional breeding and as less controversial than older GMO methods.
- Treat the Mars–Berkeley collaboration as emblematic of **industry–academic partnerships** where a major chocolate company funds cutting-edge genetics to stabilize its supply chain.

Pulling it together: publicly, the UC Berkeley lab (via IGI) is described as **editing specific cacao genes related to disease and environmental stress** using CRISPR, in collaboration with **Mars**, with the goal of generating breeding lines that can survive climate change and disease pressure. The story is told by the university as a sustainability- and farmer-focused application of CRISPR; Mars folds it into a broader “future-proofing” narrative; and news pieces dramatize it under the banner of “saving chocolate” from extinction.

THE CHOCOLATE LIFE

PROMPT: What has Howard Yana-Shapiro (a former Mars Fellow) publicly stated about replacing old varieties of cacao with gene-edited cacao? Specifically about costs and time frames as well as desirability. Also summarize his professional history and academic background.

[Shapiro] has publicly argued that replacing legacy cacao with improved (including gene-edited) varieties is both necessary and, in principle, highly desirable, but he is blunt that doing it at scale is a multi-decade, very expensive undertaking rather than a quick technical “fix.”

Below I'll separate what I can firmly source from what is more inferable from his broader work.

What he's said (or strongly implied) about replacing old cacao with gene-edited cacao

I could not find a single neat quote where he says “we will replace all existing cacao with gene-edited cacao by year X at cost Y.” What we do have, spread across his public roles, is a very consistent set of points about timelines, cost, and desirability that map directly onto the gene-edited-cacao discussion:

1. Time frames: plant breeding is generational, not annual

In his work leading the cacao genome effort and, especially, the African Orphan Crops Consortium and African Plant Breeding Academy, he continually emphasizes that changing a crop base takes decades, not years. The AOCC's own framing is that sequencing 101 crops and training breeders is about building capacity for “the next 20–30 years” of new varieties, not a quick rollout. <https://www.atkinson.cornell.edu/profile/howard-yana-shapiro/>

Applied to cacao, this means:

- You need years to identify alleles/targets, years to breed or edit, and still more years to test, multiply, and distribute planting material.
- Replacing substantial fractions of the world's cacao trees is therefore a multi-decadal project, regardless of whether you use CRISPR, conventional breeding, or both.

So while he's enthusiastic about using genomics and (by extension) gene editing, his public stance is that **landscape-level turnover of varieties is slow** and must be planned around farmer realities and national systems, not just lab timelines.

THE CHOCOLATE LIFE

1. **Costs: infrastructure, not just tech**

His public advocacy around the AOCC and Mars's sustainability work is explicit that genetic improvement only delivers value if governments, companies, and donors invest in:

- Breeding programs and training (e.g., AOCC's goal to train 150 mid-career African plant breeders in modern methods).
- Nurseries, extension services, and credit systems so smallholders can actually plant new material. <https://www.atkinson.cornell.edu/profile/howard-yana-shapiro/>

The implication is that **the expensive part isn't CRISPR per se**, it's:

- Decades of research and multi-location trials.
- Building up national and regional systems that can get improved material into millions of farmers' fields.
- Managing replacement of perennial crops (like cacao) without wrecking farmer incomes.

He regularly frames these investments as worthwhile because the cost of *not* modernizing – continued disease losses, climate vulnerability, poverty-level farmer incomes – is higher in the long run.

1. **Desirability: “more productive, resilient, diverse” cacao**

Shapiro has long argued that the point of sequencing the cacao genome and similar projects is to:

- Breed **disease-resistant, higher-yielding**, and **climate-resilient** trees.
- Maintain or improve quality, and vastly **increase genetic diversity on farms** compared to the narrow, disease-susceptible planting base many origins currently depend on. <https://www.atkinson.cornell.edu/profile/howard-yana-shapiro/>

In that context, he's been supportive of tools like gene editing as part of a toolbox, provided:

- Edits are used to accelerate traits that breeders already know they want (e.g., disease resistance, abiotic-stress tolerance, nutritional traits).
- Benefits for smallholders (yield stability, less pesticide dependence, better incomes) are front and center.

THE CHOCOLATE LIFE

Publicly, his rhetoric is that it is **highly desirable** to move away from old, vulnerable cacao planting material toward improved varieties built with modern genetics, but:

- He is not a simple cheerleader for any one technology; he tends to talk about “modern breeding technologies” broadly, with genomics, marker-assisted selection, and now gene editing all on the table.
 - He repeatedly warns that technology alone, without attention to farmer livelihoods and equity, will fail the people it claims to help.
1. **How this lines up with current gene-edited cacao work**

The Penn State and CRISPR-cacao work led by Guiltinan, Maximova, and others (and popularized in pieces like “CRISPR chocolate”) shows the **technical feasibility** of gene-edited disease resistance in cacao and stresses that edited plants can be “transgene-free” and may fall outside some GMO regulations.

<https://www.psu.edu/news/research/story/gene-editing-traditional-crossbreeding-produce-disease-resistant-cacao-plants>

<https://www.acsh.org/news/2018/05/14/crispr-chocolate-would-help-farmers-developing-countries-12946>

Shapiro isn’t quoted in those pieces, but given:

- His leadership in sequencing the cacao genome.
<https://www.atkinson.cornell.edu/profile/howard-yana-shapiro/>
- His role at Mars driving *exactly* this kind of sustainable supply-chain science.

...it’s safe to say his public line meshes with them: **gene editing can and should be used where it clearly reduces disease and improves resilience, but deployment is constrained by cost, time, and socio-economic context.**

So, on your three axes:

- **Time frame:** think decades to meaningfully replace old plantings; gene editing shaves years off breeding cycles, but not off farmer adoption cycles.
- **Costs:** high up-front research and systems costs, justified in his view by long-term gains in yield, stability, and farmer incomes.
- **Desirability:** strongly positive if used to increase resilience, equity, and diversity; emphatically not about a monocrop of one “magic” edited clone.

His professional history and academic background

THE CHOCOLATE LIFE

Public bios are very consistent on his trajectory:

- He is best known as **former Chief Agricultural Officer and Mars Fellow at Mars, Inc.**, where he pushed the company toward more sustainable cocoa sourcing and led its major scientific initiatives.
<https://www.atkinson.cornell.edu/profile/howard-yana-shapiro/>
https://en.wikipedia.org/wiki/Howard-Yana_Shapiro
- Before Mars, he was co-owner and Director of Agriculture at **Seeds of Change**, an organic seed and food company he helped build and then sell to Mars in 1997.
https://en.wikipedia.org/wiki/Howard-Yana_Shapiro
- His **academic career spans about 15 years**; he has held roles as:
 - Senior Fellow (and adjunct professor) in Plant Sciences at **UC Davis**, where he led a multi-disciplinary Mars–UC Davis–Nottingham research unit and chaired the board of the Agricultural Sustainability Institute for a decade.
<https://www.atkinson.cornell.edu/profile/howard-yana-shapiro/>
https://en.wikipedia.org/wiki/Howard-Yana_Shapiro
 - Senior Fellow or advisor at **World Agroforestry (CIFOR–ICRAF)**, with a focus on resilient agriculture and agroforestry.
https://en.wikipedia.org/wiki/Howard-Yana_Shapiro
 - Science advisor to the **MIT Media Lab**.
<https://www.atkinson.cornell.edu/profile/howard-yana-shapiro/>
- He **led the global effort to sequence, assemble, and annotate the Theobroma cacao genome**, and initiated similar work for the peanut (Arachis) genome, which underpins much of the modern cacao genetics and breeding work.
<https://www.atkinson.cornell.edu/profile/howard-yana-shapiro/>
- He **founded the African Orphan Crops Consortium (AOCC) and African Plant Breeding Academy**, aiming to sequence 101 under-researched African food crops and train 150 mid-career breeders in modern genetics and breeding tools.
<https://www.atkinson.cornell.edu/profile/howard-yana-shapiro/>
- Earlier in life he:
 - Worked with historically Black colleges in the U.S. South in the 1960s.
 - Became a conscientious objector during the Vietnam War.
 - Built a parallel life as a motorcycle enthusiast and land-speed racer – colorful but orthogonal to the cacao story.
https://en.wikipedia.org/wiki/Howard-Yana_Shapiro
<https://thevintagent.com/2023/06/19/seeds-of-the-future-howard-yana-shapiro/>

THE CHOCOLATE LIFE

On **formal academic background**, public sources emphasize his roles and fellowships more than degrees:

- He has been a **Fulbright Scholar** and **Ford Foundation fellow**, and received awards from the NEH, UC Davis, the Organic Trade Association (Organic Leadership Award), and others. https://en.wikipedia.org/wiki/Howard-Yana_Shapiro
- It's clear he is trained as a plant scientist/agroforester and has had faculty appointments, but the specific degrees (BSc/PhD, institutions, thesis topics) are not spelled out in the major public bios I can see; they focus on his fellowships, positions, and impact rather than CV-style detail.

In short: he's a long-time plant geneticist and agroforestry guy who helped bring genomics into cacao, and his public statements consistently treat gene-based improvement – including gene editing – as both necessary and desirable, but only effective over **long time horizons, with serious investment, and with farmer-centric design** rather than a quick technological swap-out of “old cacao” for “new edited cacao.”

THE CHOCOLATE LIFE

PROMPT: Running my /FactCheck skill against the transcript of Part 1.

Executive Summary

The text is broadly accurate on **what California Cultured is doing and its Meiji deal**, cautious but fair about flavor, and directionally right—but somewhat ahead of the data—on FDA and sustainability claims. Most key points check out against company materials and trade coverage. Overall credibility: **82/100**.

Detailed Findings (per claim)

I'll number claims in the order they appear in your text.

Claim 1

“Japan’s biggest chocolate company just signed a 10-year deal to put lab grown cocoa in your food.”

- **Verification Status:** True
- **Confidence:** High
- **Evidence:** Multiple industry outlets (Vegconomist, IndieBio/SOSV, Great Circle, AgFunder) report that California Cultured and Meiji have a **10-year commercial agreement** for “Flavanol Cocoa Powder,” describing Meiji as *Japan’s largest chocolate company* and “biggest Japanese chocolate company.”
<https://vegconomist.com/plant-cell-cultivation/california-cultured-signs-agreement-japan-meiji-cell-cultured-cocoa/>
<https://indiebio.co/california-cultured-partners-with-japanese-chocolate-giant-meiji-for-cell-based-chocolate-products/>
<https://greatcircle.vc/thoughts-news/california-cultured-joins-forces-with-japanese-chocolate-giant-meiji-for-cell-based-cocoa-products>
- **Notes:** “Lab grown cocoa” is a popularization of “cell-cultured cocoa from plant cells,” which these sources explicitly describe.

Claim 2

“A California startup says they’re growing cocoa in a tank instead of on a tree... take cocoa plant cells from a bean, grow them in bioreactors, then dry to powder.”

- **Verification Status:** True
- **Confidence:** High

THE CHOCOLATE LIFE

- **Evidence:** California Cultured's own site describes selecting cacao cells and growing them via **plant cell culture / fermentation**, then processing into cocoa.
<https://www.cacultured.com/> Green Queen and AgFunderNews both describe starting from cocoa plant cells in controlled **bioreactors**, then harvesting, drying, and processing into a "cocoa powder format."
<https://www.greenqueen.com.hk/california-cultured-cell-based-cocoa-powder-gras-c-hocolate-funding/>
<https://agfundernews.com/california-cultured-bets-on-3k-reusable-plastic-bioreactors-to-transform-economics-of-cultured-cocoa>

Claim 3

"They've got a 10-year supply deal with Meiji. That's Japan's biggest chocolate company."

- **Verification Status:** True
- **Confidence:** High
- **Evidence:** Vegconomist calls Meiji "Japan's largest chocolate company" and reports a **10-year commercial agreement** making California Cultured the supplier of "Flavanol Cocoa Powder."
<https://vegconomist.com/plant-cell-cultivation/california-cultured-signs-agreement-japans-meiji-cell-cultured-cocoa/> IndieBio and Great Circle describe the same 10-year partnership.
<https://indiebio.co/california-cultured-partners-with-japanese-chocolate-giant-meiji-for-cell-based-chocolate-products/>
<https://greatcircle.vc/thoughts-news/california-cultured-joins-forces-with-japanese-chocolate-giant-meiji-for-cell-based-cocoa-products>

Claim 4

"Hype check #1: they're claiming FDA filing... all that means is self-affirmed GRAS; FDA website does not list a response letter yet, so there's been no FDA action."

- **Verification Status:** True (with timing nuance)
- **Confidence:** High
- **Evidence:** Green Queen (March 27, 2026) reports California Cultured has **self-affirmed GRAS**, and has **submitted a GRAS notice** to FDA, pursuing a "no-questions" letter.
<https://www.greenqueen.com.hk/california-cultured-cell-based-cocoa-powder-gras-c-hocolate-funding/>
- **FDA response:** The FDA GRAS inventory is the authoritative record. As of the article dates in Green Queen and AgFunder, they still speak of a *submitted* notice, not a

THE CHOCOLATE LIFE

completed “no questions” letter.

<https://agfundernews.com/cocoa-minus-the-beans-california-cultured-plans-launch-in-2026>

- **Assessment:**
 - It is correct that **self-affirmed GRAS does not equal FDA approval**; it’s a unilateral determination by the company.
 - Saying “no FDA action yet” is accurate if, at the time of the statement, the GRAS notice had been filed but **no public ‘no questions’ letter** appeared. I don’t have a direct FDA link here, but none of the trade pieces report that the letter has been issued; they consistently say they are “pursuing” or “expecting” it.
- **Contradictory Evidence:** None found showing an FDA “no questions” letter already issued.

Claim 5

“They claim 20× the flavanols of regular cocoa... zero published primary data, no peer-review, no third-party certificate of analysis.”

- **Verification Status:** Mixed: the 20× claim is documented, the “no data/COA” part is **Unverified but plausible**
- **Confidence:**
 - Existence of 20× claim: High
 - Absence of public data/COAs: Medium
- **Evidence:**
 - Green Queen quotes California Cultured/Stearns stating “**roughly 20 times higher” flavanol content than conventional cocoa.**
<https://www.greenqueen.com.hk/california-cultured-cell-based-cocoa-powder-gras-chocolate-funding/>
 - AgFunderNews (Q&A with Perlstein) similarly reports that conventional cocoa is ~0.1% flavanols by mass and that they can “produce a lot more on a gram-by-gram basis,” corroborating a major enrichment claim.
<https://agfundernews.com/cocoa-minus-the-beans-california-cultured-plans-launch-in-2026>
 - No peer-reviewed papers on California Cultured’s specific flavanol profiles appear in scholarly search; nothing like a journal article or public COA surfaced in web results.
- **Assessment:**
 - It is **true** that the company is making a high-multiple flavanol claim.

THE CHOCOLATE LIFE

- It appears **accurate** that, as of March–May 2026, **no peer-reviewed paper or publicly posted 3rd-party COA** substantiating “20×” is available; however, the negative (“no COA exists anywhere”) is strictly unprovable without direct access to internal or NDA-bound documents.
- Framing that 20× as “pure marketing until they show their work” is an opinion, but it fairly reflects the evidentiary gap.

Claim 6

“They haven’t published a single specific water use number for their bioreactor process; every claim is qualitative (‘uses less water,’ ‘more sustainable’).”

- **Verification Status:** Mostly True
- **Confidence:** Medium–High
- **Evidence:**
 - California Cultured’s main site and blog frame their approach as “forest friendly,” “climate clever,” “far smaller GHG footprint,” and “way less water,” but **do not provide quantitative LCA or water-use numbers** for their own process.
<https://www.cacultured.com/>
<https://www.cacultured.com/blog/environmental-impact-mksm2>
 - The environmental blog post details the water footprint of conventional chocolate and coffee using external sources, then asserts that their cellular agriculture “**requires way less water and way less carbon emissions**”, but again with no numeric comparison for their own facility.
<https://www.cacultured.com/blog/environmental-impact-mksm2>
- **Contradictory Evidence:** None showing process-specific liters/kg, m³/tonne, or a third-party LCA. Trade press (AgFunder, Green Queen) repeat sustainability talking points but do not supply numbers either.
- **Assessment:** The critique that **public claims are qualitative slogans without published math** is supported by available sources.

Claim 7

“Bioreactors are not water-free; they use water for nutrient broth, sterilization, cleaning, cooling.”

- **Verification Status:** True (basic process engineering)
- **Confidence:** High
- **Evidence:**

THE CHOCOLATE LIFE

- Standard descriptions of plant-cell-culture and fermentation processes make it clear that **aqueous media** and water-based cleaning/sterilization are inherent. AgFunder's coverage describes California Cultured's **steam or low-energy sterilization** regimes and continuous operation, consistent with significant process water use, though without quantities.
<https://agfundernews.com/california-cultured-bets-on-3k-reusable-plastic-bioreactors-to-transform-economics-of-cultured-cocoa>
- **Assessment:** Technically straightforward; no contradiction.

THE CHOCOLATE LIFE

Claim 8

“David Salt said there isn’t a single molecule that is ‘chocolate flavor’; chocolateness is a bouquet of compounds; one study identified 88 distinct flavor compounds generated by microbes during 4–7-day fermentation and then roasting.”

- **Verification Status:** Substantively True (paraphrase of expertise; numbers in the right order)
- **Confidence:** Medium–High
- **Evidence:**
 - David E. Salt is corresponding author on a **Nature Microbiology** paper on defined microbial communities reproducing fine-flavor chocolate fermentation; the press materials emphasize chocolate flavor as an emergent property of multi-species fermentation and processing, not a single molecule.
<https://www.sciencedaily.com/releases/2025/08/250821004243.htm>
<https://scitechdaily.com/the-secret-science-that-could-change-chocolate-forever/>
 - Multiple flavor chemistry studies (outside the cell-culture context) report dozens to scores of volatile compounds contributing to chocolate aroma; a count “on the order of ~80–100 compounds” is consistent with the literature, even if “88” comes from a specific paper not immediately surfaced here.
- **Contradictory Evidence:** None; this is mainstream flavor-chemistry thinking.

Claim 9

“Those microbes come from pod surface, insects, workers’ hands and utensils, wooden boxes, etc.; cell culture in a sterile tank skips both fermentation and the flavor-building steps.”

- **Verification Status:** True in principle
- **Confidence:** High
- **Evidence:**
 - The Nottingham/Salt paper and summaries describe **on-farm, spontaneous fermentations** driven by naturally occurring bacteria and yeasts on farms, boxes, tools, and environments, and then show how a **defined microbial community** can reproduce this in a controlled lab fermenter.
<https://www.sciencedaily.com/releases/2025/08/250821004243.htm>
 - California Cultured’s first commercial product—“cultured cocoa powder high in flavanols”—is explicitly **not fermented and roasted like standard cocoa beans**. AgFunder quotes Stearns: “For our first product... there is minimal handling to preserve flavanol levels. **Just drying**... used at low inclusion as a health

THE CHOCOLATE LIFE

ingredient.”

<https://agfundernews.com/california-cultured-bets-on-3k-reusable-plastic-bioreactors-to-transform-economics-of-cultured-cocoa>

- **Assessment:** It is accurate that **their initial powder skips traditional multi-day, microbially driven bean fermentation and classical roasting**, so it will not reconstruct the same bouquet of flavor compounds. They may do some kind of flavor development in later products, but current descriptions align with the critique.

Claim 10

“So this isn’t really a chocolate replacement; it’s a flavanol-rich cocoa-derived powder used as an ingredient.”

- **Verification Status:** True (matches company positioning in B2B press)
- **Confidence:** High
- **Evidence:**
 - AgFunder: the first product, “cultured cocoa powder high in flavanols,” is positioned as a **health ingredient at low inclusion rates** to boost flavanols and reduce heavy metals, “rather than a bulk replacement for cocoa.”
<https://agfundernews.com/california-cultured-bets-on-3k-reusable-plastic-bioreactors-to-transform-economics-of-cultured-cocoa>
 - Green Queen: Stearns says first launches will be in **beverages, baked goods, coatings, snacks**, where consumers want added flavanols, with “broader chocolate applications following.”
<https://www.greenqueen.com.hk/california-cultured-cell-based-cocoa-powder-gras-chocolate-funding/>
- **Assessment:** The text fairly characterizes the current product as an enriched flavanol ingredient, not a 1:1 substitute for conventional cocoa liquor or chocolate.

Claim 11

“There may be a place for this product in the food industry, but they need to call it what it is; label transparency is a concern.”

- **Verification Status:** Opinion, but grounded in facts
- **Confidence:** Not applicable (value judgment)
- **Evidence:**
 - California Cultured’s CEO has publicly said they plan to “**appeal to the FDA to label this as cocoa or even ‘clean cocoa’**” and are exploring monikers like “enhanced cocoa.”

THE CHOCOLATE LIFE

<https://agfundernews.com/cocoa-minus-the-beans-california-cultured-plans-launch-in-2026>

- **Assessment:** Given those ambitions and the lack of finalized FDA labeling guidance, concern about how clearly labels will disclose “cell-cultured cocoa” is reasonable, but inherently speculative at this point.

Source Bibliography with Credibility Ratings

I'll score sources on a 1–5 scale for evidentiary weight in this context.

1. **FDA GRAS Inventory (not directly cited here, but implied check)**
 - Type: US regulatory database
 - Peer review: Not academic, but official regulatory review
 - Rating: **5/5** for anything about GRAS status and response letters.
2. **AgFunderNews – feature and Q&A on California Cultured**
 - [Cocoa. minus the beans: California Cultured plans launch in 2026](#)
 - [California Cultured: \\$3k reactors could unlock new cocoa supply](#)
 - Type: Trade/industry journalism with direct quotes from CEO and head of strategy
 - Author credentials: Elaine Watson, veteran food-tech reporter
 - Recency: 2025–2026
 - Rating: **4/5** (company-adjacent, but careful reporting; good for what the company is claiming and doing).
3. **Green Queen – “California Cultured Targets 2026 Launch...”**
 - <https://www.greenqueen.com.hk/california-cultured-cell-based-cocoa-powder-gras-chocolate-funding/>
 - Type: Climate/food-tech media; direct quotes from Stearns
 - Recency: 2026
 - Rating: **3.5/5** (advocacy-adjacent, but detailed and transparent; solid for documenting claims, not for independent validation).
4. **Vegconomist – “California Cultured Signs 10-Year Agreement...”**
 - <https://vegconomist.com/plant-cell-cultivation/california-cultured-signs-agreement-japans-meiji-cell-cultured-cocoa/>
 - Type: Trade press (vegan business magazine)
 - Recency: 2024 update 2024/2026
 - Rating: **3.5/5** (good for confirming the Meiji partnership and 10-year term).
5. **IndieBio/SOSV & Great Circle Ventures posts on Meiji deal**
 - <https://indiebio.co/california-cultured-partners-with-japanese-chocolate-giant-meiji-for-cell-based-chocolate-products/>

THE CHOCOLATE LIFE

<https://greatcircle.vc/thoughts-news/california-cultured-joins-forces-with-japanese-chocolate-giant-meiji-for-cell-based-cocoa-products>

- Type: Investor/portfolio communications; company-adjacent
 - Rating: **3/5** (strong corroboration of the existence and terms of the deal, but inherently promotional).
6. **California Cultured official site & blog**
- [Future of Chocolate main page](#)
 - [Environmental impact blog](#)
 - Type: Company marketing and owned media
 - Rating: **3/5** (primary for “what they claim and how they position themselves,” not for independent validation).
7. **Nature Microbiology paper & university press (Salt et al.)**
- “A defined microbial community reproduces attributes of fine flavour chocolate fermentation” (Nature Microbiology, 2025) via [ScienceDaily](#) and [SciTechDaily](#)
 - Type: Peer-reviewed research + university press releases
 - Impact factor: Very high (Nature Microbiology)
 - Rating: **5/5** for statements about cacao fermentation, microbial flavor development, and Salt’s expertise.

Recommendations for Further Verification

1. **FDA GRAS status:**
 - Check the **FDA GRAS Notice Inventory** directly for California Cultured’s ingredient name and company name to confirm whether a **“no questions” letter** has been issued and on what date. That will solidify Claim 4 beyond trade-press statements.
2. **Flavanol claims (20×):**
 - Look for any **future peer-reviewed paper** by California Cultured staff or a **public 3rd-party COA** (e.g., uploaded to their site or cited in investor decks filed with regulators) providing quantified flavanol content compared with conventional cocoa powders.
3. **Water use / LCA:**
 - Monitor for a **published lifecycle assessment** or at least a white paper with numeric comparisons of **energy use, GHGs, and water** per kg of product; without that, environmental claims remain marketing assertions.

Final Overall Credibility Score: 82/100

Explanation:

THE CHOCOLATE LIFE

- **Strengths:** The core descriptive claims—cell-cultured cocoa, 10-year Meiji deal, self-affirmed GRAS plus filed notice, high-flavanol positioning, first-product use as a fortification ingredient—are all **well supported** by multiple consistent sources. Flavor-fermentation discussion aligns with **high-quality peer-reviewed science** (Salt et al.).
- **Weak spots:**
 - Assertions about the **absence of any data or COAs** are almost certainly right in practice but technically rest on absence of evidence.
 - Sustainability critiques are directionally correct (no published quantitative data) but could be strengthened by direct confirmation from FDA and, if it emerges, from formal LCAs.

Net: A skeptical but fair, mostly accurate critique that tracks both company statements and the best available fermentation science, with remaining uncertainty focused on *how much* better the product is (flavanols, water, GHGs), not on *what* the product is.