Cacao-Tech Transparency Interface

Open-Source Implementation Guide

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Document information

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Abstract

This document describes how Cacao-Tech developed a consumer-facing transparency interface within the DRG4Food programmed. The interface translates verified data from cacao producers into a visual storytelling experience that connects farmers and consumers while applying the Digital Responsibility Goals (DRGs).

The guideline is intended for technical teams and researchers developing similar consumer interfaces. It includes Cacao-Techs design logic, ethical considerations, lessons learned, and technical notes to support replication.

Annex 1 contains screenshots of the developed consumer website and Annex 3 provides examples of aggregated quality and impact data.

1. Introduction

Cacao-Tech's transparency interface was built to bring the story of the cacao fruit closer to consumers while ensuring data responsibility. It aims to demonstrate how DRGs can be embedded in user-facing digital solutions without compromising privacy or oversimplifying scientific data.

The interface visualizes traceability data, environmental impact, and social indicators from the Cacao-Tech360 platform through storytelling. It was developed in Figma and piloted with

Pacha de Cacao, a start up in the Netherlands that valorizes cacao waste streams into drinks and ingredients, as a real use case in the European market.

The website is not yet live-connected to the Cacao-Tech360 backend. The current version operates as a functional prototype for testing, while full API integration is planned for the next phase.

2. Value Chain Context

The open-source Value Chain Analysis, conducted by Wageningen Economic Research in collaboration with Pacha de Cacao (within its own value chain) and CZU, was the backbone for the design of this consumer interface. The study mapped how data, value, and impact move through the cacao chain, identifying key challenges around transparency, data ownership, and communication.

The analysis highlighted a fragmented cacao sector with limited consumer awareness about the fruit and its environmental potential. Key findings informing this work included:

- 80 percent of the cacao fruit is discarded after bean extraction.
- Farmers rarely control how data about their production is shared or interpreted.
- Consumers lack understanding of how sustainability data is verified.
- Communication between producer and consumer is one-directional and often extractive.

These findings directly shaped the transparency interface, turning the insights from the Value Chain Analysis into a digital experience that connects verified data, visual storytelling, and human responsibility.

3. Design and Development

The interface was developed in Figma using modular components and reusable design tokens. Each section of the website corresponds to one or more DRGs, ensuring that ethical and usability principles are integrated from the start.

Development steps included:

- Defining goals aligned with DRG principles: Transparency, Privacy, Human Agency, and Data Fairness.
- Translating traceability data into human-centered visuals.
- Building a narrative structure: from awareness (the fruit) to impact (the product).
- Incorporating user research feedback for readability and visual clarity.
- Documenting every design decision for replication within the DRG4Food Toolbox.

4. Consumer Research and Insights

Consumer research formed the backbone of the design process. Our main insights:

- **Authenticity builds trust.** Participants preferred real images of cacao farms, people, and landscapes over stylized illustrations. Authentic photography was perceived as more credible and emotionally engaging.
- **Transparency must be layered.** Users wanted concise stories first, followed by optional deep dives through "read more" sections. Excessive data at once reduced clarity and comprehension.
- **Ethical storytelling increases confidence.** Clearly stating that data is aggregated and privacy-protected reassured users that ethical standards were respected.
- **Visualization enhances the understanding.** Infographics and icons simplified technical terms such as carbon impact or waste valorization.
- **Trust depends on the data source.** Linking the website to other documents for further reading, for example explaining the methodology for impact numbers, increased user confidence (though consumers do not necessarily use them).

5. Core Website Features

Educational Introduction

This introductory section explains the hidden potential of the cacao fruit and the importance of using it in full. While most consumers know cacao as the source of chocolate, they are often unaware that only the beans are used and that nearly 80 percent of the fruit — the pulp and husk — is discarded.

The design introduces this issue visually, using real images from the Cacao-Tech value chain to show both the problem and the opportunity. It highlights the environmental and economic impact of waste and frames cacao as a renewable, circular resource when processed responsibly.

The educational aim is to create awareness and curiosity: showing how the same fruit that produces chocolate can also generate natural ingredients for food and beverages, contributing to more sustainable livelihoods for farmers. In addition, a section was added about how digital tools were used in Cacao-Tech.

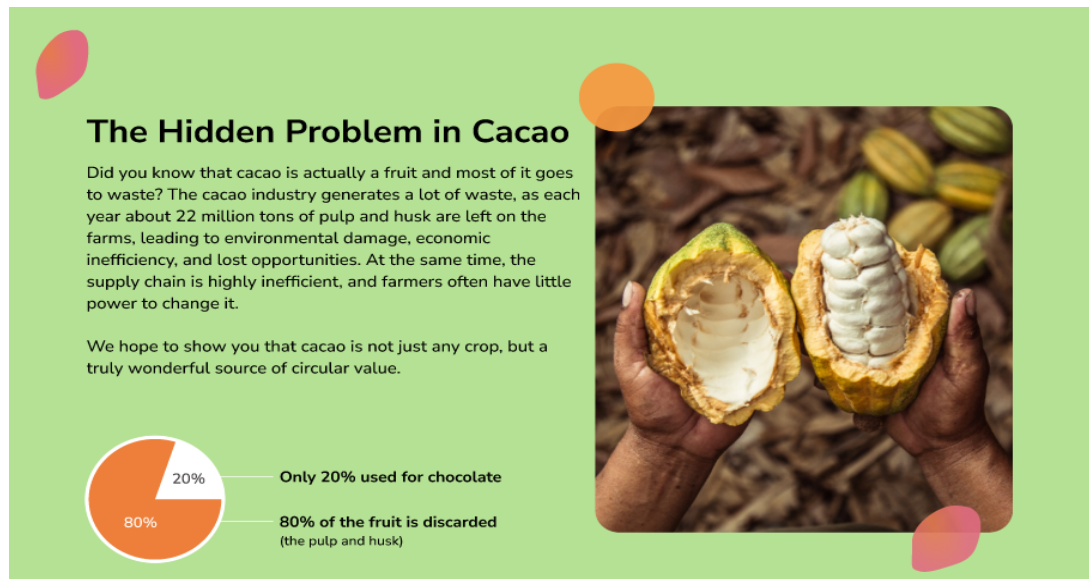*Image 1: Hero section from Annex 1 showing "The Hidden Problem in Cacao"*

The Hidden Problem in Cacao

Did you know that cacao is actually a fruit and most of it goes to waste? The cacao industry generates a lot of waste, as each year about 22 million tons of pulp and husk are left on the farms, leading to environmental damage, economic inefficiency, and lost opportunities. At the same time, the supply chain is highly inefficient, and farmers often have little power to change it.

We hope to show you that cacao is not just any crop, but a truly wonderful source of circular value.

20%
80%

Only 20% used for chocolate

80% of the fruit is discarded
(the pulp and husk)

Image 2: Hero section showing how we use digital tools in our cacao supply chain.

Traceable Supply Chain Using Digital Tools
Breaking barriers in cacao supply chain transparency with smart digital technology

Making cacao more transparent

The cacao supply chain is complex, with many different actors in a long supply chain. Without good information, it's hard to solve problems like waste, inefficiency, or poverty. There is little transparency..

That's why we have built our own smart digital tools to scan the quality and origin of the cacao fruit. This gives insights — data that we can also use to improve our practices, and farmers can also use it to improve their harvests and strengthen their position.

Great for you as well! It means that every product that is made with our cacao pulp ingredients can be traced back to its source. Read more about the impact that you're making by simply buying this drink..

Taste experience

Most consumers are unaware that cacao is a fruit. This section introduces the natural flavor and composition of the cacao pulp to make that connection visible. The design focuses on color, texture, and clarity to show that cacao fruit tastes light, fresh. Key nutritional elements are displayed in a clear, visual format to encourage curiosity and easy understanding. The photographs used are real, taken from farms within the Cacao-Tech value chain to ensure authenticity and traceability. Users can also download Pacha's Recipe Book**,** which offers simple ways to use cacao fruit at home and demonstrates its potential in food and beverages.

Image 3: Visualizing Taste
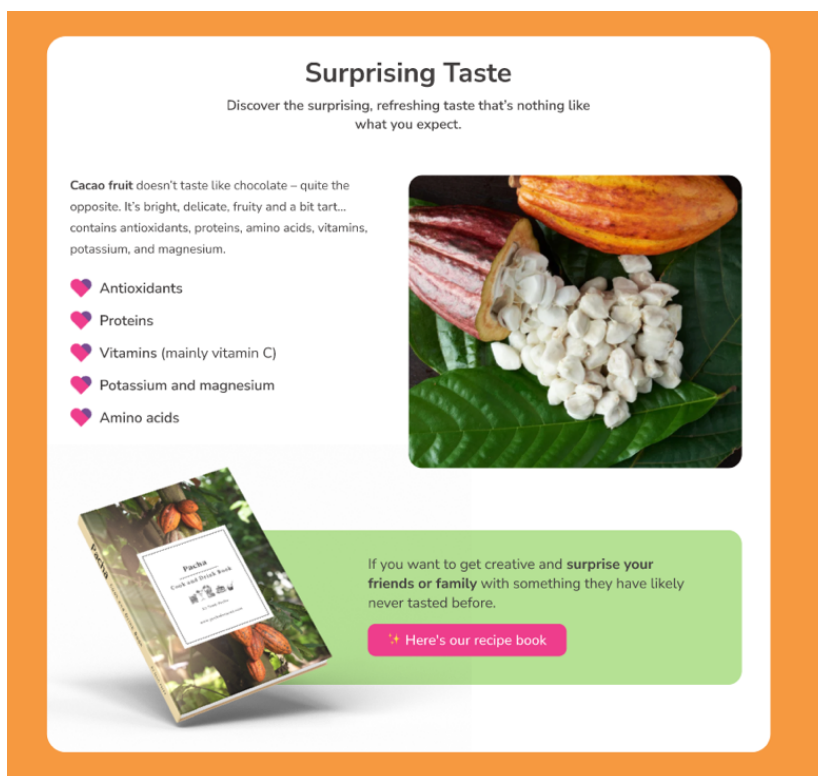
Farmer Passport and Send a Thank you

The Farmer Passport connects consumers to the origin of the cacao in a way that is transparent, respectful, and privacy compliant. Each passport shows anonymized data aggregated at cooperative level. It includes the region, agroforestry system, and one approved image from the cooperative or collection point.

Location data are displayed only as the aggregator address**,** which is already publicly available online. This ensures that the map gives geographical context without disclosing sensitive or traceable details that could identify individual farmers.

All visual and textual content shown in the passport has been shared with explicit consent. These consent records are stored and verified in Cacao-Tech360, ensuring that each story, image, or data point is traceable to a verified permission.

Consumers can click on the "Thank the Farmer" button to send a short message of appreciation. Messages are collected through an anonymized form and shared in batches with the cooperative, showing aggregated sentiment feedback rather than personal messages. This design enables two-way communication between consumers and producers while keeping farmer identities secure.

By combining geolocation, consent-based storytelling, and ethical interaction, the passport illustrates how digital tools can humanize supply chains without compromising privacy.

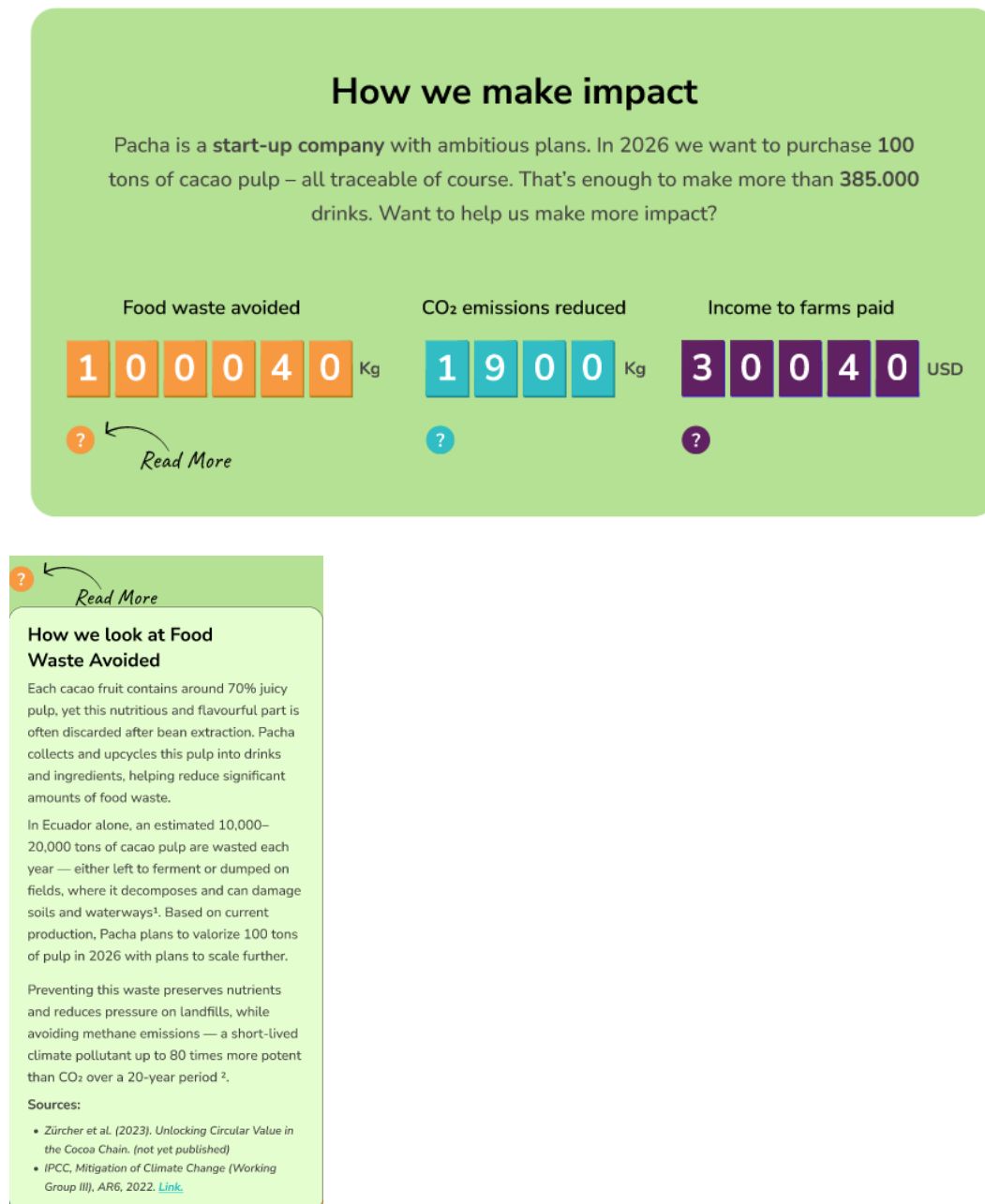*Image 4: Farmer Passport section with aggregated data example and Thank You note*

Live Impact Ticker

Shows key indicators (waste avoided, CO_2 saved, farmer income). Currently manually updated from validated datasets but built for later API linkage with Cacao-Tech360.

Image 5 + 6: Impact ticker display on website with the option to read more on the methodology

DRG Explanation Layer

The consumer interface includes an integrated explanation layer on data protection and the Digital Responsibility Goals (DRGs). A small icon in the top-right corner opens a pop-up where users can learn how data privacy, cybersecurity, and ethical communication are applied in practice.

This section explains that all data is handled according to GDPR and EU cybersecurity standards**.** Only essential information is collected, and sensitive data is aggregated or anonymized unless explicit consent has been given. Users are informed that farmers can withdraw their consent at any time and that no personal identifiers, GPS, or financial data are made public.

The GDPR explanation also clarifies that all processing follows Regulation (EU) 2018/1725**,** ensuring compliance with European data protection law. The pop-up includes a link to contact the project team for more information about how data is stored or used.

The expandable DRG text provides short, accessible summaries of the Digital Responsibility Goals implemented in the project — such as privacy, trustworthy algorithms, and data fairness — helping users understand why these principles matter in the context of transparency and food systems.

Image 7 + 8: GDPR explanation + pop up about GDPR and safe handling of data

6. Implementation Workflow

1. Definition of DRG focus areas (Transparency, Privacy, Human Agency).
2. Translation of Value Chain Analysis findings into website narrative.
3. Prototype design in Figma and iterative refinement.
4. Testing and UX validation.
5. Documentation and integration of privacy filters.
6. Feedback from consumers (outside of scope, may be scheduled for 2026).
7. Preparation for API connectivity with Cacao-Tech360 (outside of scope, may be scheduled for 2026).

8. Technical Overview

System Architecture

- Frontend built in React JS, currently hosted as a static site.
- No active connection to the Cacao-Tech360 database at this stage.
- Data imported manually from verified CSV exports of quality and impact reports.
- Structure designed to enable future API integration using REST architecture.
- All content stored locally in JSON files with embedded metadata and timestamps.
- Hosting under EU-based cloud service with HTTPS encryption.

Planned API Integration

The next phase will connect the transparency interface with Cacao-Tech360 through secure endpoints. Planned data flows include:

• /public/lots – Aggregated quality and batch data for transparency pages.
• /public/impact – Periodically updated environmental and social metrics.
• /public/farmers – Region-level farmer profiles with consent status.

For now, these endpoints are placeholders in the system design but not yet active. The architecture is modular, so once verified, the same interface can update automatically without structural redesign.

Data Governance and Privacy

Cacao-Tech designed its data governance approach around transparency, consent, and minimal exposure of farmers. Each decision in data handling was made to protect farmers' rights while keeping the system functional, verifiable and trustworthy.

Consent management
All farmer-related data that appears on the website is handled through internal Cacao-Tech workflows. Before publication, each cooperative or producer is asked to review and approve what information can be displayed. Consent is stored as a digital record in Cacao-Tech360,

linked to specific media items such as photos or quotes. Each record includes approval date, contact person, and duration of validity. When consent is withdrawn or expires, the associated content is automatically hidden from the interface.

Aggregation of data

To ensure privacy and fairness, data is presented at aggregated levels (cooperative, region, or lot group). GPS coordinates, personal identifiers, or financial records are never shown publicly. Instead, the system generates grouped data such as "total CO_2 savings from a specific harvest." This method balances transparency with data protection and complies with GDPR-like principles.

Metadata structure and FAIR principles

Each data file follows a standard metadata schema based on FAIR principles (Findable, Accessible, Interoperable, Reusable). This ensures that datasets can later connect with open research repositories or other DRG4Food tools without duplication. Metadata includes source, measurement method, validation date, and responsible entity.

Privacy and user protection

The public website does not collect or store any user data. There are no cookies, analytics trackers, or marketing scripts. Each page runs with a strict content security policy (CSP) and HTTPS encryption. This ensures that transparency toward consumers does not come at the cost of their privacy.

In the project, Cacao-Tech considered alternative options such as anonymization through external APIs or blockchain identifiers, but these were not adopted at this stage due to their higher energy use and complexity. The chosen solution remains adaptable for future integration while keeping the current interface lightweight, ethical, and replicable.

Accessibility and Performance

The transparency interface was developed in Figma as a high-fidelity prototype, not yet as a coded website. Accessibility considerations were already integrated during the design phase to ensure that future implementation can meet both WCAG 2.1 and ADA (US) legislation standards, as well as pending accessibility legislation in Europe.

The visual layout follows WCAG 2.1 guidelines for contrast, spacing, and hierarchy. Text and icons were tested for readability against different background tones, ensuring clarity even in low-light or high-glare environments. Font sizes and line spacing were designed to remain consistent across devices.

The prototype is responsive by design, meaning all sections such as the live impact ticker, farmer passport, and supply chain overview can adapt to different screen sizes without loss of functionality. This ensures that users accessing the interface on mobile phones, tablets, or desktop computers can experience the same level of transparency.

- Performance was simulated in Figma by testing load behavior on representative image and data samples.
- Image compression and lazy-loading logic were defined to be implemented during development.

- An average target load time of under two seconds on a 3G connection was established.
- Accessibility overlays will be added at the coding stage to support text-to-speech, keyboard navigation, and high-contrast modes.

These measures will ensure that once the interface goes live, it will provide an inclusive and efficient user experience in compliance with both digital responsibility goals and international accessibility standards.

9. Lessons Learned

- Simplicity is key to trust. Consumers engage longer when digital storytelling feels natural, not overly technical.
- Transparency requires design clarity. Too much detail can obscure meaning; layered information is more effective.
- Real visuals connect more, emotionally. Authentic images of farms and production sites outperform stock photography.
- Farmers' privacy must lead design decisions. Aggregation and consent verification are necessary to maintain dignity.
- Two-way communication matters. The *Thank You* feature is expected to demonstrate that engagement can be respectful and motivating without revealing identities (needs to be tested).
- Impact numbers need explanation. How are they build up? Consumers are likely to appreciate seeing methodology links beside live metrics.
- Cultural interpretation differs. Transparency must consider different expectations of fairness and recognition between global audiences.
- DRGs work as a communication tool. Explaining them in accessible language builds understanding and appreciation of ethical data design.
- Continuous testing is essential. Perceptions of trust evolve as users encounter new digital experiences.
- Transparency by design is scalable. The same model can apply to other agricultural value chains when localized correctly.

10.   Outlook

In the next phase, Cacao-Tech wants to integrate real-time data from Cacao-Tech360, perform consumer testing with QR-linked products in retail, and document (partly) open code snippets for reuse. The approach is intended to inspire responsible transparency across food sectors, linking DRG principles to measurable impact of food products.

References

- DRG4Food Toolbox (2025). Digital Responsibility Goals Framework. Link.
- Cacao-Techs contribution to the DRG4Food Toolbox. Link.
- Cacao-Tech and Wageningen University & Research (2025). Value Chain Analysis – Report. Link.