EPFL
COM-480

30.5.2025

Eco Bite

Explore the hidden cost of every bite

Process Book

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1. Introduction

The "Eco Bite" project was conceived to create an engaging and interactive data visualization platform. At its heart is the "Banana Index" created by The Economist, a novel concept designed to make complex environmental data more relatable and understandable to a broad audience. Our primary aim is to illuminate the environmental impact and resource requirements associated with food production, using the banana as a familiar reference point.

The website is driven by several key educational and awareness goals:

1. To educate users about the diverse resources that are consumed in the production of various common foods
2. To provide clear, comparative visualizations of the environmental impact, including carbon emissions, of different food types
3. To illustrate global food production patterns, showcasing the geographical distribution of where our food comes from
4. To allow users to explore changes in food production patterns over a significant historical period, from 1961 to 2023

Ultimately, the goal is to increase awareness regarding sustainable food choices and empower users to make more informed decisions about their personal food consumption habits.

2. Data processing

For data processing, we employed **Python** with **Pandas** for cleaning and preprocessing our datasets. This was done in a Jupyter notebook. Our datasets consisted of a food production dataset from FAOSTAT and an emission comparison index developed by The Economist called the Banana Index

We combined the two datasets and found that there are only 49 foods in the intersection between the FAOSTAT database and the Banana Index database by The Economist, which represent only 16.2% and 30.6% respectively of the whole food diversity per database. However, taking into account that not all the food items have the same representation in the FAOSTAT, we found that we can link **24.7%** of the total entries of the FAOSTAT database with the Banana index database.

For our design process, we utilized Figma for wireframes and mockups, informed by user interface design materials. For deployment, GitHub Pages will host our application, applying concepts from deployment and publishing lectures.

3. Visualizations

3.1. Visual identity of the website

Green was selected as the main color due to its strong association with ecology and nature, reinforcing the project's environmental focus. **Brown** and **yellow**, inspired by bananas, were chosen as the secondary and accent colors. These colors provide high contrast with each other and with the primary green, aiding visual hierarchy and drawing attention to key elements.

For the background and text, we opted for colors close to white and black for the background and main text, rather than stark absolutes. This decision was made to prevent these elements from overtly standing out and to ensure they felt more in harmony with the main color scheme.

Our choices for fonts and avatars were centered around being fairly playful and friendly. This was done to make the subject as approachable as possible. However, anything too informal would have taken away from the seriousness of the subject.

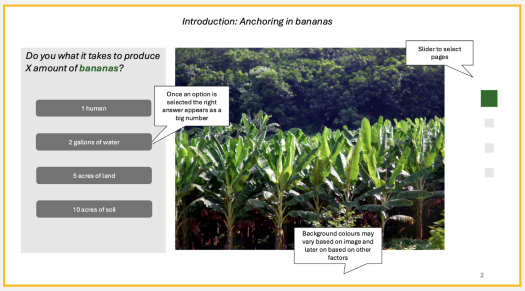
3.2. Cover page and navigation

Goal: A cohesive website structure with intuitive scrolling/clicking to navigate between different visualization sections

Square indicators were placed on the left side of the interface, clearly marking the different parts of the website. This was implemented to facilitate straightforward navigation among the various sections.

The hero section was designed to be immediately engaging and to clearly communicate the project's core theme. Hints related to bananas were strategically placed "everywhere" in the hero section. This was to establish the "banana index" as a central hook and recurring motif from the outset.

Sketch overview



Result overview

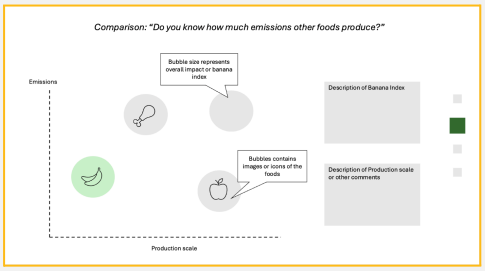
3.3. Chart and plot comparisons through resources and emissions

Goal: Interactive module showing how many resources (water, land, human labor) are needed to produce bananas compared to other common foods

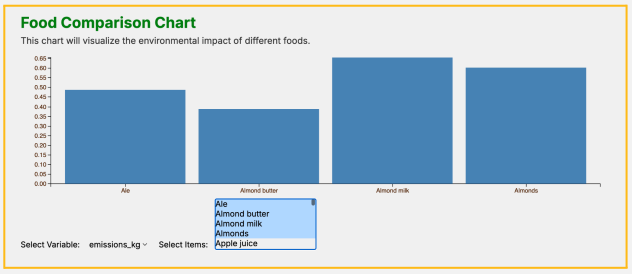
We wanted the user to be able to play around with different foods to compare the resources needed to produce them. This was planned to be incorporated into the scatter plot, but we found it more insightful to put it into its own chart.

The issue with putting everything in the same chart was that it was very cluttered for the beginning, which was supposed to be engaging and capture the attention of the reader. Thus we broke up the emission and land use comparison into its own section.

Sketch version



Final version



Goal: Bubble chart visualization comparing the carbon footprint of various foods, with bubble size representing the overall "Banana Index" impact

The original plan was to plot CO2 emissions against food production, with the size of bubbles representing the banana index. However, we discovered that

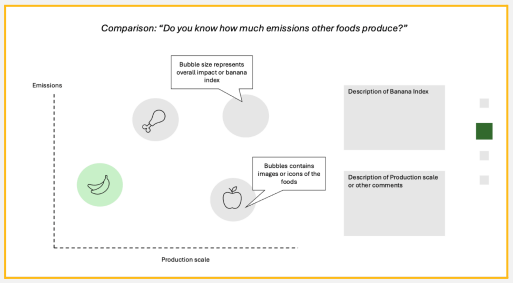
emissions were highly correlated with the banana index – a larger emission value generally meant a larger bubble. This redundancy made the visualization less insightful and hindered interoperability between the metrics. To avoid this, the visualization was changed to directly plot the banana index against food production, offering a clearer, more direct comparison.

The values for food production and the banana index covered a very large range and were not distributed sparsely enough to be effectively displayed using a normal linear scale. The data is plotted using a logarithmic scale on both axes.

This approach helps to "fill" most of the plot area, making the distribution of data points more apparent and comparisons more meaningful. Additionally, to prevent user confusion and make the logarithmic scale explicit, a grid corresponding to the log scale is shown in the background of the scatter plot.

To improve the selection experience, an invisible Voronoi map is layered on top of the data points. This technique means a user can select a point simply by placing the cursor as close as possible to their desired target, without needing to be exactly over the visual representation of the point itself.

Sketch version



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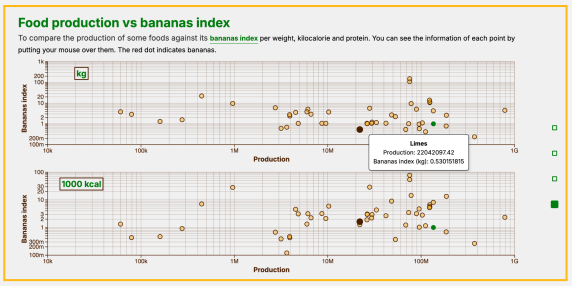


3.4. Map of global production and time series

Goal: Interactive world map showing where different foods are produced, with options to filter by food type

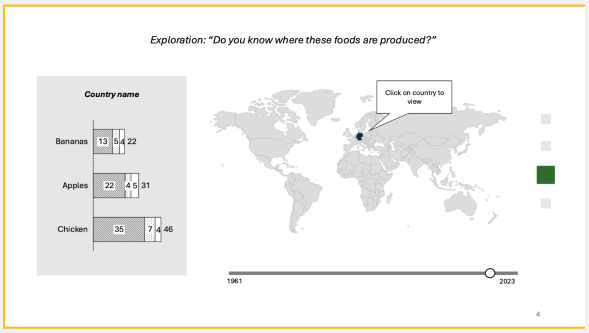
A key challenge was the size limitation. We wanted users to be able to compare both bar charts simultaneously, and for the bar chart to visibly update when a country was selected on the map. This necessitated that the map itself be relatively small.

The small map size made selecting many countries difficult, particularly smaller ones. To address this, a magnifier feature was added. The colors within the magnifier are more vibrant than those on the small map, but the color scheme remains consistent to avoid confusion.

The country highlighted by the magnifier is the one the user's mouse is currently hovering over. This feature was specifically designed to make interaction easier and to allow users to know exactly which country they are pointing to, especially when dealing with very small nations.

Some food item names on the bar chart were too long for the available space. The value is displayed inside the bar using the same color as the chart background. However, if a bar is too small for the value to be legible inside, the value is displayed outside the bar, using the same color as the bar itself for contrast and clarity.

Sketch version



Final version

Goal: Simple slider or timeline allowing users to view changes in production patterns between 1961-2023

Some countries lacked data for certain years, often because they did not exist in their current form or were part of other nations (e.g., Russia in earlier periods). Political changes also led to inconsistent M49 codes for some countries (e.g., Sudan and South Sudan). These inconsistencies were addressed through manual data cleaning and correction.

Instead of showing an empty or broken chart, a message is displayed indicating that information is unavailable for the selected criteria. This then updated as the user filled in different countries and dates.

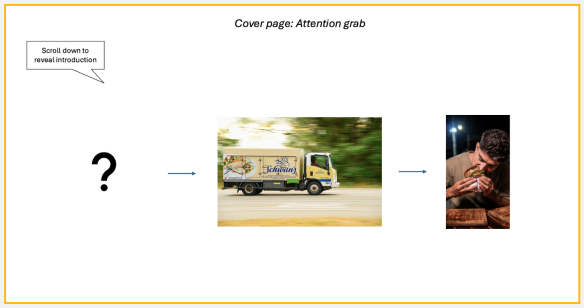
Lastly, we implemented a final view of the full history between 1961-2023 in a separate dynamic visualization. This will be covered within the next section.

4. Storytelling and flow of the website

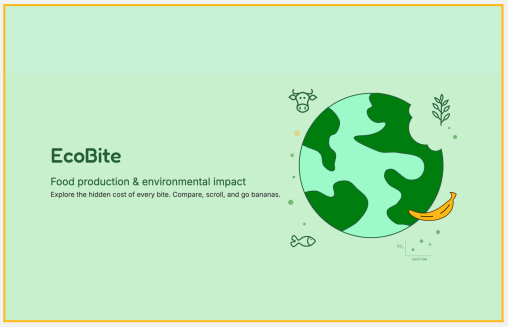
With the storyline of the website, we wanted to first get the reader curious with something that grabs their attention and presents an interesting question. We then build on this question by providing different visualizations.

Instead of only having a series of events, we opted to have a visually appealing hero page with an interesting call to “explore the hidden cost of every bite”. We then build on this idea by presenting key data in order to allow the reader to explore and find crucial insights.

Beginning sketch



Beginning result

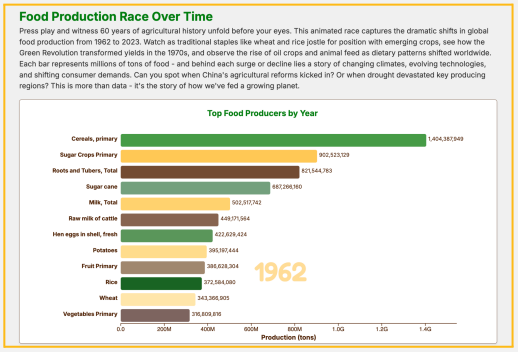


Towards the end, we wanted to close with something that tries to impact the user to take action in his own life. Instead of ending with a call to action, we made a visualization of the race of food production to create a sense of urgency for the reader and call his focus to the most critical foods.

We also highlight the critical element, which is *change*. The production of foods has always change and the reader should get a sense that he can also change as the different times change around him. This an important ending to close by making the reader reflect based on all of the data he’s read about emissions and costs.

Ending sketch

Ending result



5. Tools and lectures utilized

5.1. Main tools

For visualization, we leveraged D3.js for custom interactive components including bubble charts and timelines, drawing on lectures about data visualization fundamentals and interactive web visualizations. Core web technologies (HTML/CSS/JavaScript) formed the foundation of our site, building on web development basics and frontend framework lectures. SVG enabled custom vector graphics and transitions, utilizing skills from vector graphics lectures, while Chart.js provided simpler visualizations where appropriate.

5.2. Main lectures

We drew insights and methods from several important lectures. Lectures covering data visualization ethics, narrative visualization techniques, interaction design principles, color theory, and animation in data visualization ensured our final product was both visually compelling and ethically sound.

The main ones utilized are described below:

4.1. Data
4.2. D3.js
5.1. Interactions
7.2. Dos and don'ts
8.1. Maps
11.1. Tabular data
12.1. Storytelling

6. Division of work

We held several meetings throughout the project to structure our work and come up with ideas together. Everyone also presented written proposals for project ideas and sketches through our common chat. We then divided the work into more and less technical portions according to each one's interests such that *everyone contributed equally*.

Main responsibilities:

- **Mikael:** Sketchbook and process book, storyline and bar chart visualization
- **Heikel:** Insightful texts, descriptions, and food production race visualization
- **Osvaldo:** Core website flow, data preprocessing, scatter plot and map visualization