

# COM480 Milestone2

## Global Agricultural Trends & Sustainability Visualization

April 2025

### 1 Project Goal

The goal of our project is to provide novel visual insights into global agricultural production trends and their interactions with environmental sustainability. We aim to illustrate historical and contemporary agricultural patterns, resource utilization, and their environmental impacts through intuitive and interactive visualizations. This project seeks to aid policymakers, researchers, educators, and the general public in understanding and addressing global food security and sustainability challenges.

### 2 Outline

#### 2.1 Spatiotemporal Yield Distribution (Figure 1)

##### Objective & Significance

Employ a combined geographic and stacked area visualization to illustrate global yield distributions and continental yield trends over time, helping users identify critical agricultural events such as the Green Revolution.

##### Visualization Description

- Upper Section: World map with bubbles representing countries sized by yield and colored by crop type.
- Lower Section: Stacked area chart showing annual yields across continents, emphasizing continental yield shifts with interactive highlights.

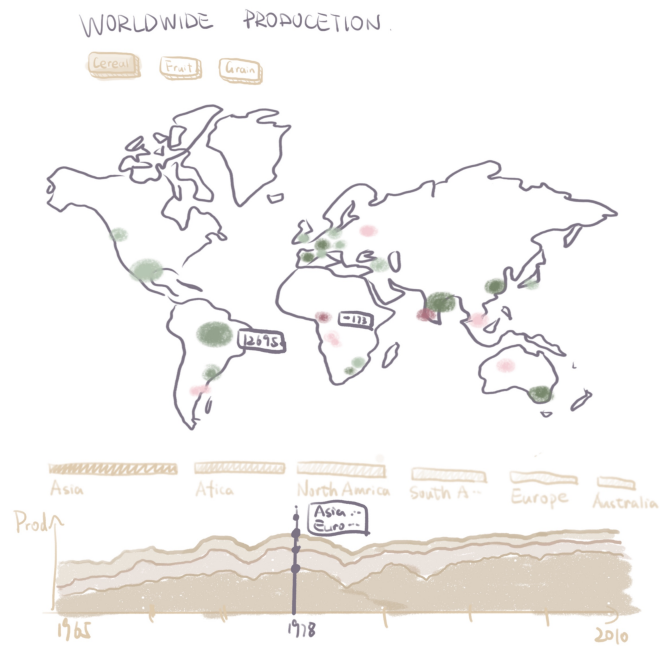


Figure 1: Spatiotemporal Yield Distribution

## 2.2 Dynamic Top 10 Countries Yield Ranking (Figure 2)

### Objective & Significance

Visualize dynamically the top 10 yield-producing countries for selected crops and years, illustrating shifts in global agricultural leadership clearly and interactively.

### Visualization Description

- Vertical animated bar chart ranking countries annually.
- Interactive year-slider and playback button.
- Mouseover tooltips providing detailed yield and regional information.

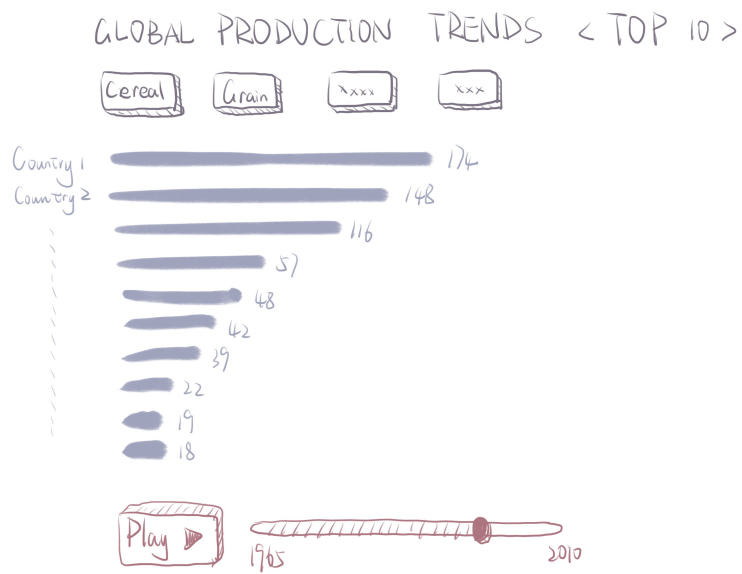


Figure 2: Dynamic Top 10 Countries Yield Ranking

## 2.3 Temporal Agricultural Resource Map (Figure 3)

### Objective & Significance

Interactive global map visualization that displays various agricultural resources over time, highlighting sustainability risks and regional resource advantages.

### Visualization Description

- Top interactive buttons for resource toggling (e.g., water, fertilizer).
- Color-coded continents indicating resource magnitude.
- Slider and playback controls for annual changes.

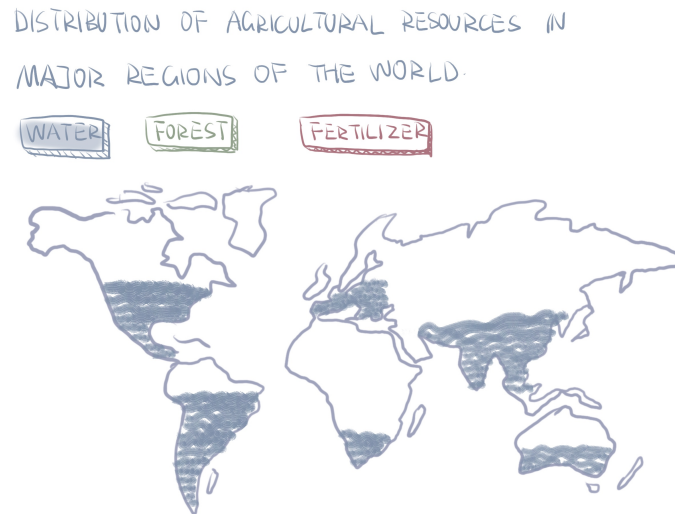


Figure 3: Temporal Agricultural Resource Map

## 2.4 Regional Multivariate Radar Comparison (Figure 4)

### Objective & Significance

Radar chart visualization comparing key normalized agricultural sustainability indicators across continents to facilitate strategic cross-regional analysis.

### Visualization Description

- Radar chart with axes representing indicators like water resources, fertilizer usage, forest cover, arable land, and CO<sub>2</sub> emissions.
- Interactive checkboxes for continent visibility.
- Mouseover tooltips displaying detailed data.

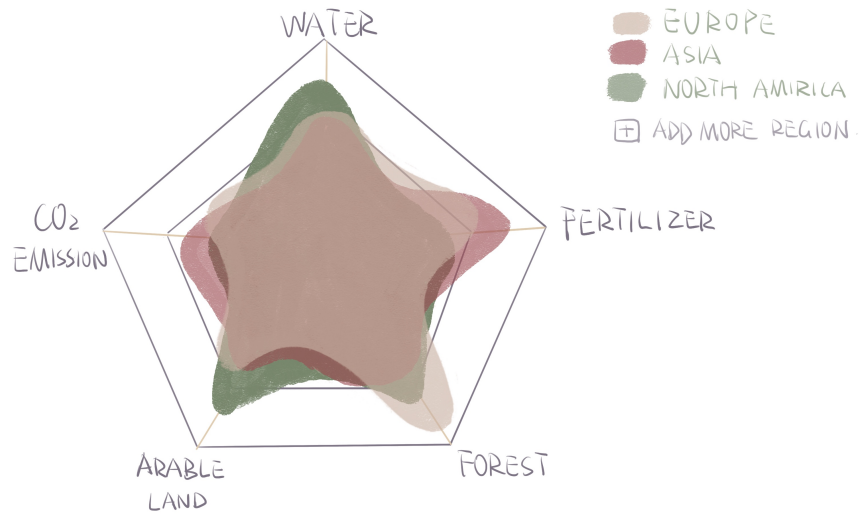


Figure 4: Regional Multivariate Radar Comparison

### 3 Technologies

- **Data Loading & Integration:** D3.js (`Promise.all`, `d3.csv`), TopoJSON (Lectures: 4\_2\_D3 – Data Loading)
- **Geographic Visualization:** D3.js (`d3.geoNaturalEarth1`, `d3.geoPath`) (Lectures: 8\_2\_Practical\_maps)
- **Color Mapping:** D3.js (`d3.scaleSequential`, `d3.interpolateGreens`) (Lectures: 6\_1\_Perception\_colors)
- **Interactive & Animated Charts:** D3.js (`d3.stack`, `d3.area`, `d3.transition`) (Lectures: 11\_1\_Tabular\_data, 5\_2\_More\_interactive\_d3)
- **Interaction Techniques:** Event handling (`on("mouseover")`, `on("mouseout")`) (Lectures: 5\_1\_Interaction)
- **Normalization & Polar Charts:** JavaScript (`Math.min`, `Math.max`), D3.js (`d3.scaleLinear`, `d3.lineRadial`) (Lectures: 4\_1\_Data, 11\_1\_Tabular\_data)

### 4 Additional Ideas

If time permits, we consider the following enhancements:

- Integration of predictive analytics into yield trend visualizations.
- Implementation of dynamic scenario analysis tools for environmental impact simulations.
- Expansion of interactive features such as drill-down detailed country-level statistics.