Soil, Agriculture and our Food System


Jordan Davis
BUY DIRT
FT. LUKE BRYAN
Jordan Davis
BUY DIRT
2:48

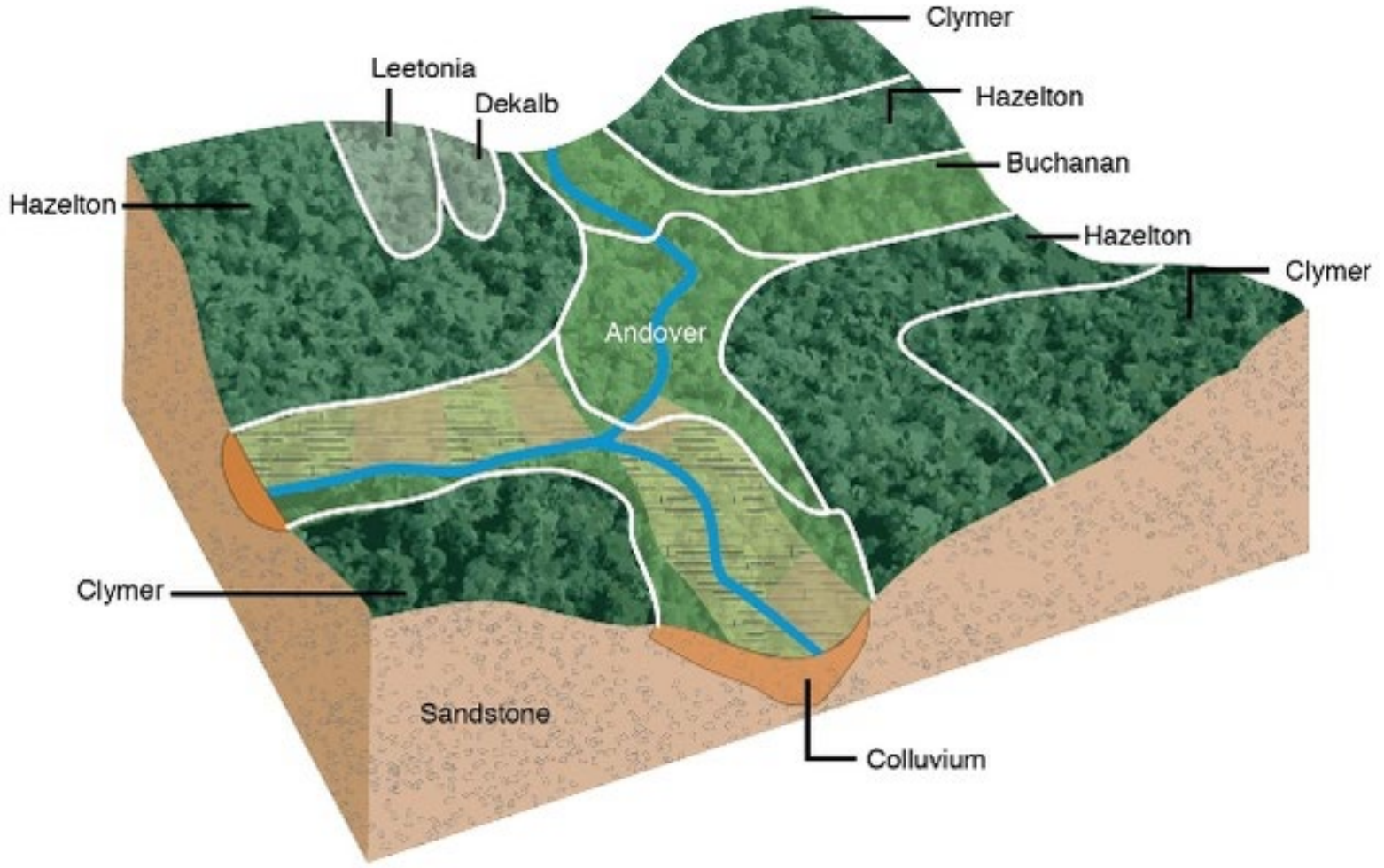
Soil? Responsibility Agriculture?

Starter questions for this week…

1. Why are the best soils on Earth being used to grow only two crops?
2. What is the difference between food and food products? Why do food products dominate the grocery store shelves?
3. How should land be valued?
4. How will climate change impact soil, agriculture and our food system?
5. Do we need to change course? If yes, How?

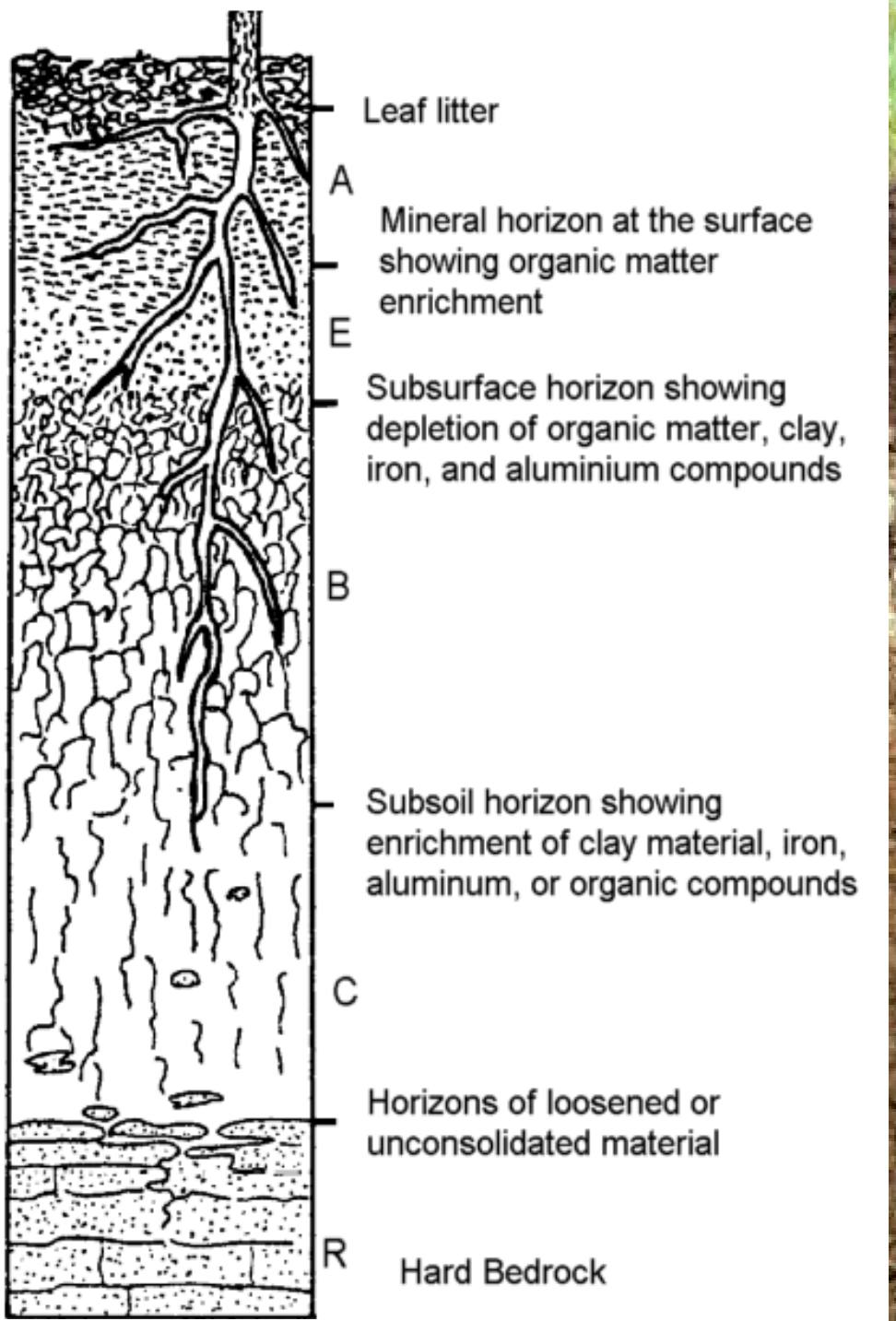
Soils Sustain Life On Earth

- 1000 to 10000 years to form
  - Non-renewable resource
- Vital to:
  - Life on Earth
    - All ecosystems
  - Agriculture & Food system
  - Construction
    - Homes, roads, businesses
  - Civilization as we know it



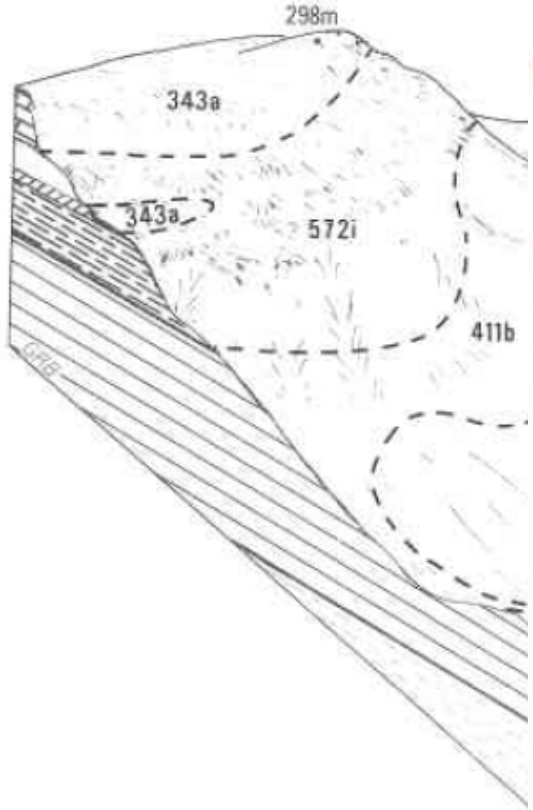
Soil development

- Cl, o, r, p, t
  - cl, climate
  - o, biotic influence
  - r, topographic relief
  - p, parent material
  - t, time
- Soils are products of weathering
  - Chemical
  - Mechanical
  - Biological



Biology

Geology



River alluvium

River terrace sands and gravels

Oolitic limestone (Inferior Oolite)

Upper Lias clay

Middle Lias sand and (including the Marlsto

Lower Lias clay

Mercia Mudstone

Summit

Clarion

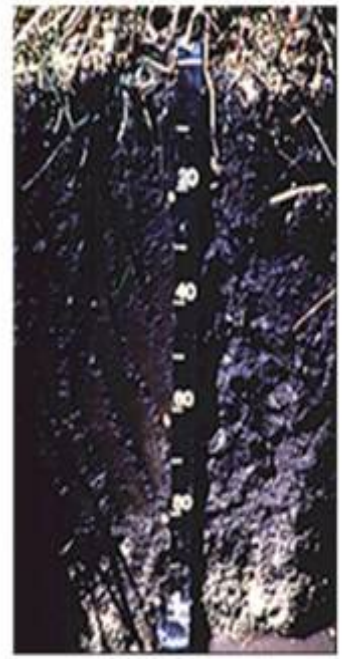
Shoulder

Nicollet

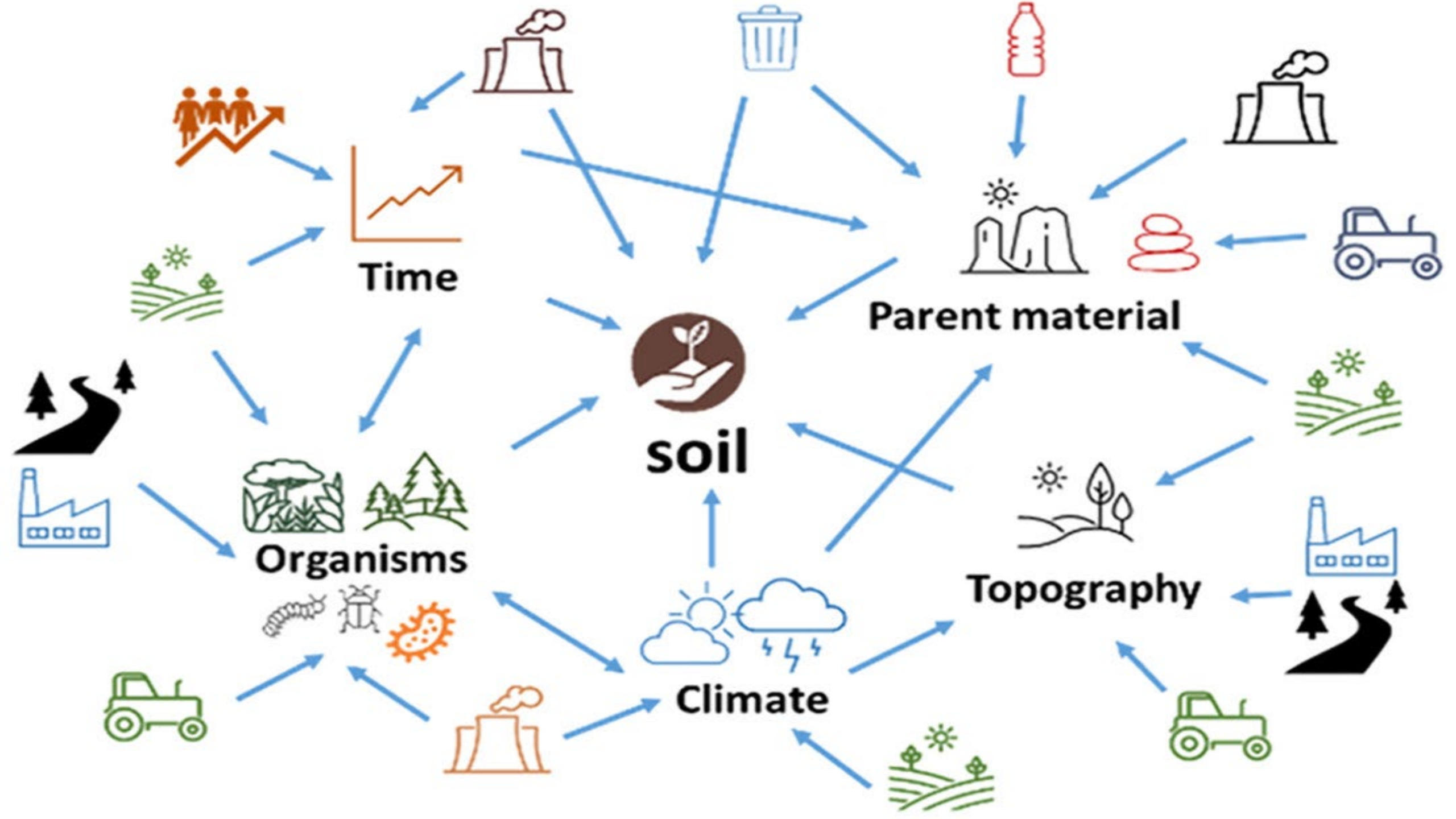
Backslope

Webster

Footslope



Glencoe


Time
Parent material
soil
Organisms
Topography
Climate

SUSTAINABLE DEVELOPMENT GOALS

Earth Science for a Sustainable World

AGI american geosciences institute
connecting earth, science, and people

EARTH SCIENCE WEEK

www.earthsciweek.org

This map shows the locations of a sample of initiatives that illustrate how the geosciences support specific Sustainable Development Goals (SDGs). Information about initiatives in these locations is provided through ArcGIS StoryMaps (see poster back).

Geoscience Supports the United Nations Sustainable Development Goals

Map: USGS/J. Cody. ESRI dataset with data from Airbus, USGS, NGA, NASA, NOAA, CGIAR, GEBCO, NCEAS, NLS, OS, NMA, Geodatastyrelsen, GSA, GSI and the GIS User Community

SDG 2: END HUNGER

Chicago, Illinois, USA — Innovative urban farming techniques expand agriculture and increase access to food while reducing human impacts on the environment. Urban farming projects are also occurring in New York City, New York, and Detroit, Michigan.

SDG 6: CLEAN WATER AND SANITATION

Santa Monica, California, USA — Urban Waters Learning Network (UWLN) engages communities in the restoration of waterways and improving urban water quality. Other UWLN restoration projects take place in Denver, Colorado, and Matawan, New Jersey.

SDG 7: AFFORDABLE AND CLEAN ENERGY

Cerro Pabellon, Chile — Multiple data sources have been used to locate areas that could harness and benefit from the use of geothermal energy as a renewable energy source. There is also data from Paraguay, Argentina, and Bolivia that supports the use of geothermal energy.

SDG 11: SUSTAINABLE CITIES AND COMMUNITIES

Sydney, Australia — Urban greening has occurred over the past three decades which has resulted in benefits to both the environment and human health. There are still improvements to be made and targets to reach in the future.

SDG 12: RESPONSIBLE CONSUMPTION AND PRODUCTION

Ningde, China — The largest lithium-ion battery manufacturing plant uses raw materials sourced from northern China, the Democratic Republic of the Congo, Chile, and Australia to produce rechargeable batteries. Recycling of lithium-ion batteries reduces the need for new raw materials.

SDG 13: CLIMATE ACTION

Hokkaido, Japan — Natural and artificial wetlands used as rice farms could help combat climate change by increasing biodiversity and providing material for biofuel. Although urbanization and modernization of farming techniques may impact the future of rice farms.

SDG 14: LIFE BELOW WATER

Illes Medes, Spain — The Marine Ecosystem Restoration in Changing European Seas (MERCES) Project works to restore marine ecosystems and populations that have been negatively impacted by human activity. Illes Medes houses 9 of the 128 MERCES project sites across 12 European countries.

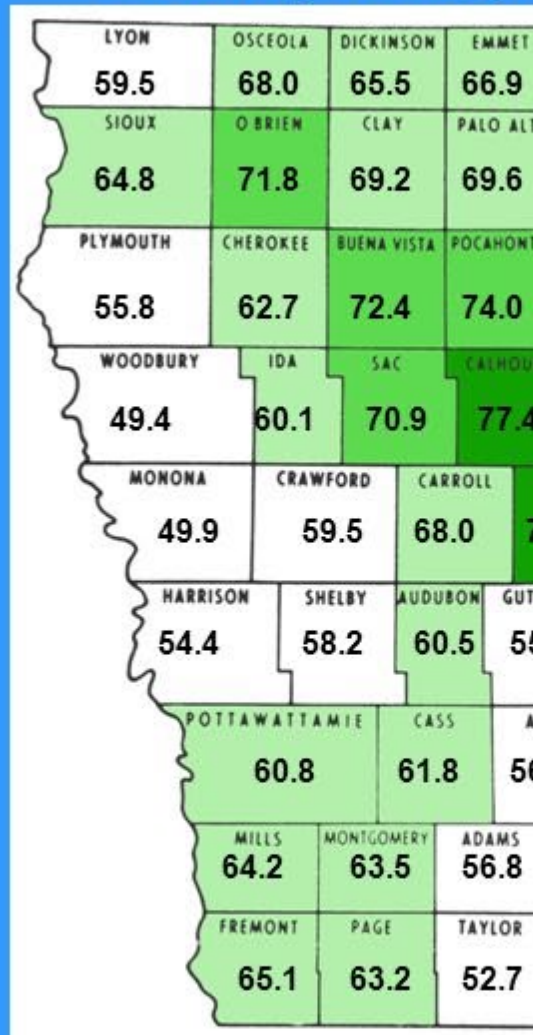
SDG 15: LIFE ON LAND

Kinshasa, Democratic Republic of the Congo — Environmental "hot spots" within tropical forests affected by deforestation are identified using quantitative and spatial data. Actions are being taken to reduce the destruction. Mitigation efforts are also taking place in Brazil and Indonesia.

After reviewing these initiatives, think about additional ways the geosciences can support these SDGs and others shown below.

https://sdgs.un.org/goals

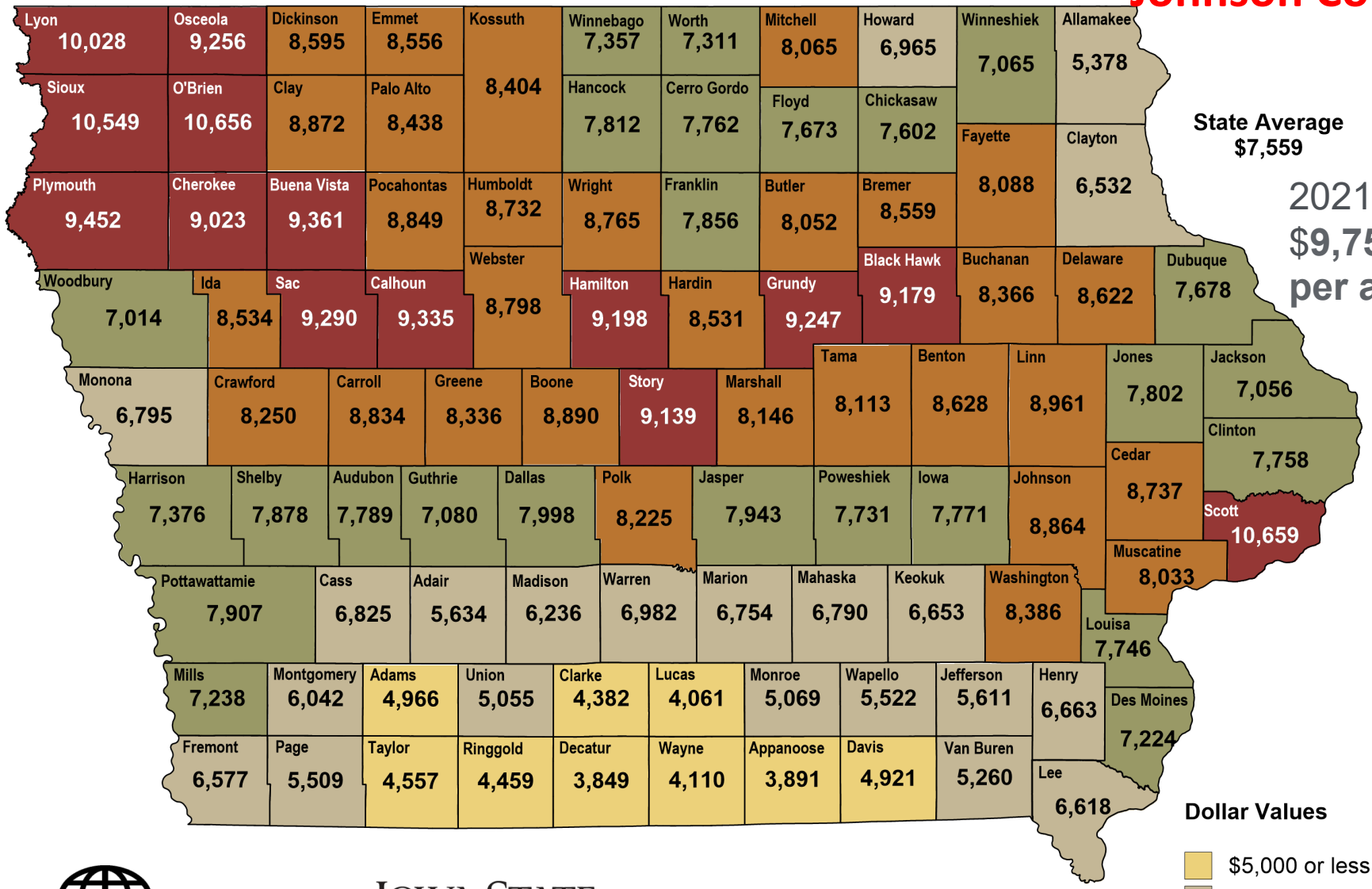
County Weigh



Calculated from acreages and CSR'
As of August 15, 2001
Prepared by Gerald A. Miller and Th
Department of Agronomy, Iowa Stat

2020 Iowa Land Values

$26,000 in 2021 Johnson Co.



State Average
$7,559

2021
$9,751
per acre

Dollar Values

- $5,000 or less
- $5,000–$7,000
- $7,000–$8,000
- $8,000–$9,000
- $9,000 or more

CARD
Center for Agricultural and Rural Development

Iowa State University
Extension and Outreach

Land values - What makes land cheap vs. expensive?

Native American Perspective on land

- Native Americans believed land belonged to the community, not to individuals. They didn't own land the ways homesteaders conceived of ownership.
- This conceptual difference raised conflicts between settlers and Native Americans. The 1862 Homestead Act increased the number of people in the western United States.

Provided that any adult citizen, or intended citizen, who had never borne arms against the U.S. government could claim 160 acres of surveyed government land. Claimants were required to live on and "improve" their plot by cultivating the land.

1862 = 160 acres in Grundy Co. – Given for 'free'

160 years

2022 = 160 acres $1.6 to $2.4+ million

Today, IoT has many use cases in Agriculture

The Smart Agriculture market is expected to reach $18.45 Billion in 2022, at a CAGR of 13.8%

- Business Intelligence

DRONES

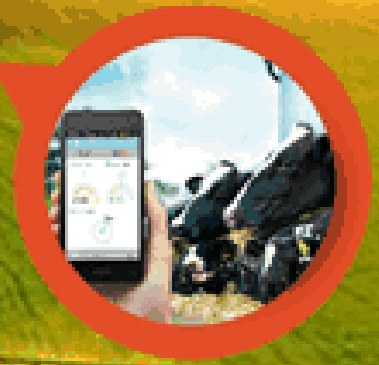
Health assessment, irrigation, crop monitoring, crop spraying, planting, and soil and field analysis

Precision Farming

With IoT, all data from different sensors is accessible to the agriculturist on their mobile phones

Soil Management

Analyze soil status, temperature and humidity



Livestock Management

Monitor livestock productivity and health

Water Management with Automated Irrigation

Our Food System

Apply critical thinking to be wise consumers

U.S. CORN USAGE

ETHANOL & FUEL
27%

FEED
39%

EXPORTS
16%

FOOD & INDUSTRIAL
9%

RESIDUAL
9%

U.S. FEED USAGE

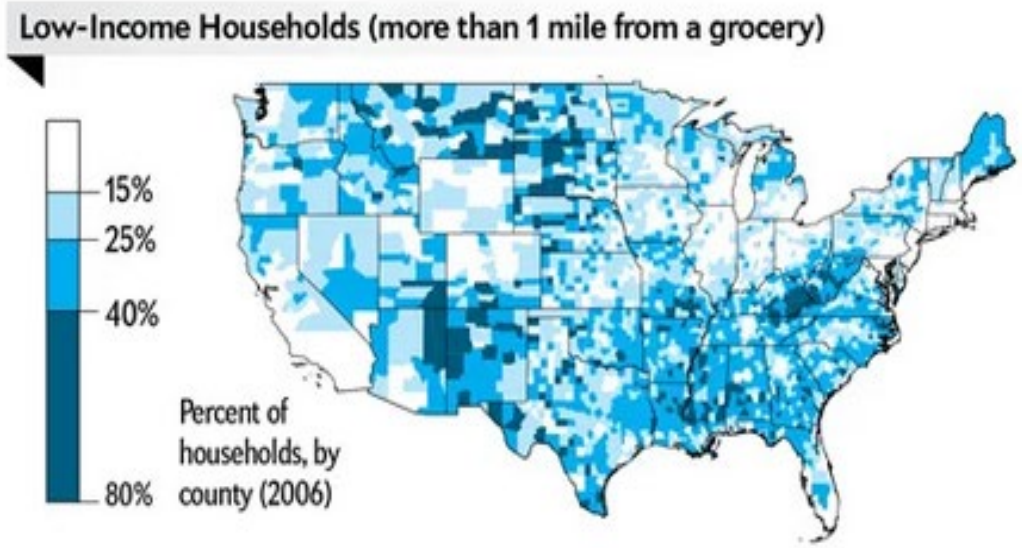
BEEF — **27%** 1.12 BILLION BUSHELS

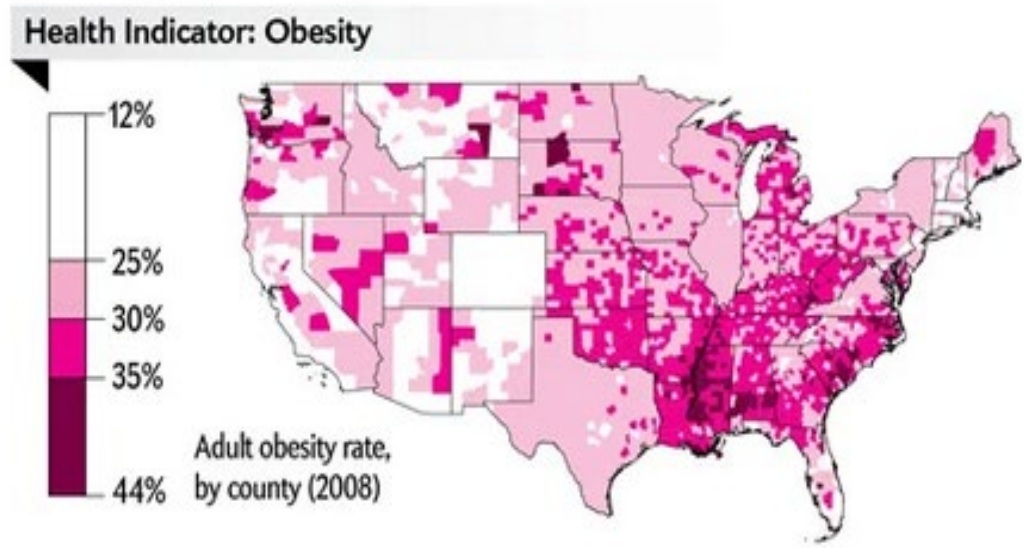
DAIRY — **19%** 793 MILLION BUSHELS

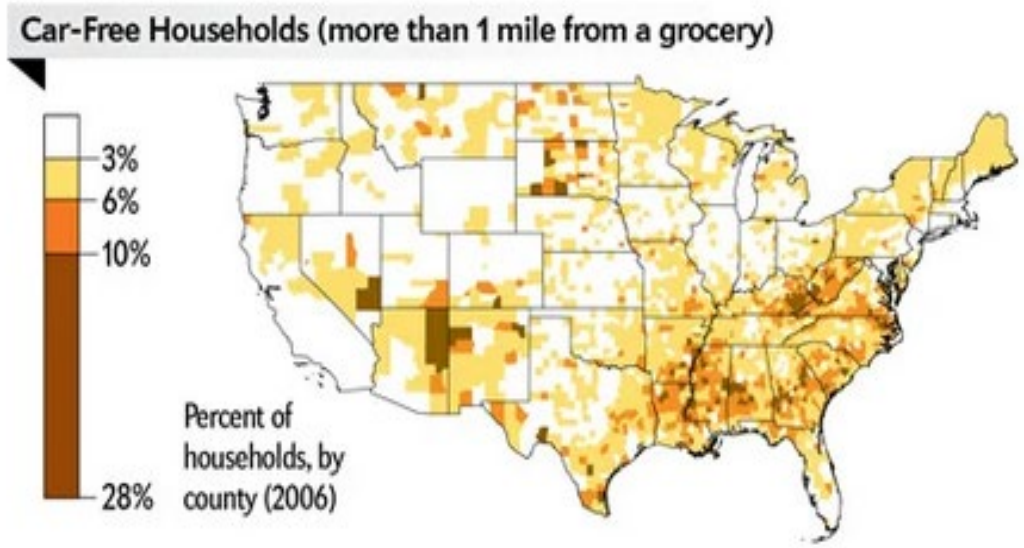
SWINE — **24%** 1 BILLION BUSHELS

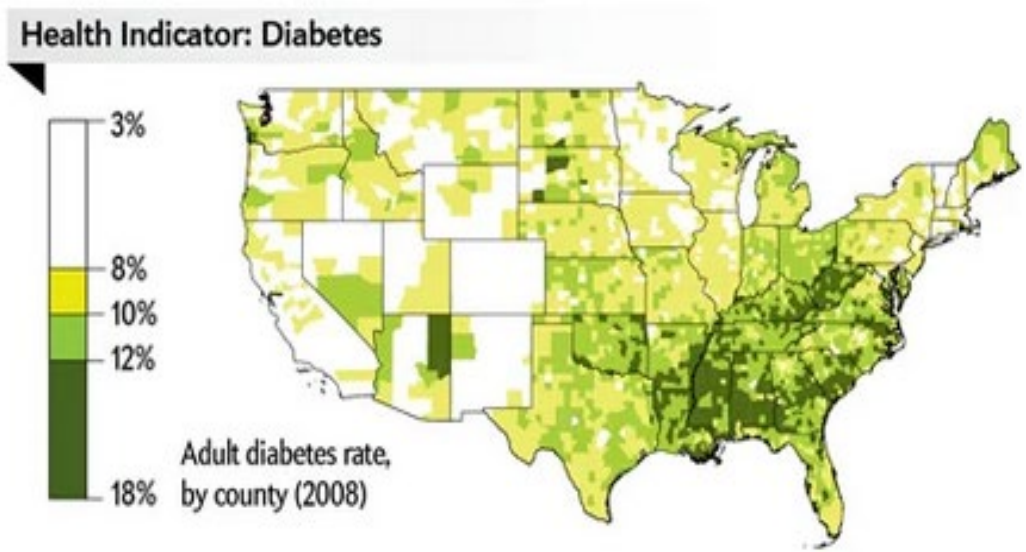
POULTRY — **28%** 1.17 BILLION BUSHELS

OTHER — **2%** 95 MILLION BUSHELS









Source: Food Environment Atlas, U.S. Department of Agriculture, Economic Research Service

Food security vs Food Sovereignty

- **Food sovereignty** is rooted in grassroots **food** movements. **Food sovereignty** highlights the need for a democratic **food** system, one that involves inputs from citizens as well as producers.

- **Food security** is concerned with the protection **and** distribution of existing **food** systems.

Fair Trade Products

https://www.fairtradecertified.org/

When you see a product with the Fair Trade Certified seal, you can be sure it meets rigorous social, environmental, and economic standards. That means:

- Safe working conditions
- Environmental protection
- Sustainable livelihoods
- Community Development Funds

‘Organic’…. ‘Sustainable’…

Lodi Rules

Low Input Viticulture & Enology (LIVE)

Demeter Certified Biodynamic

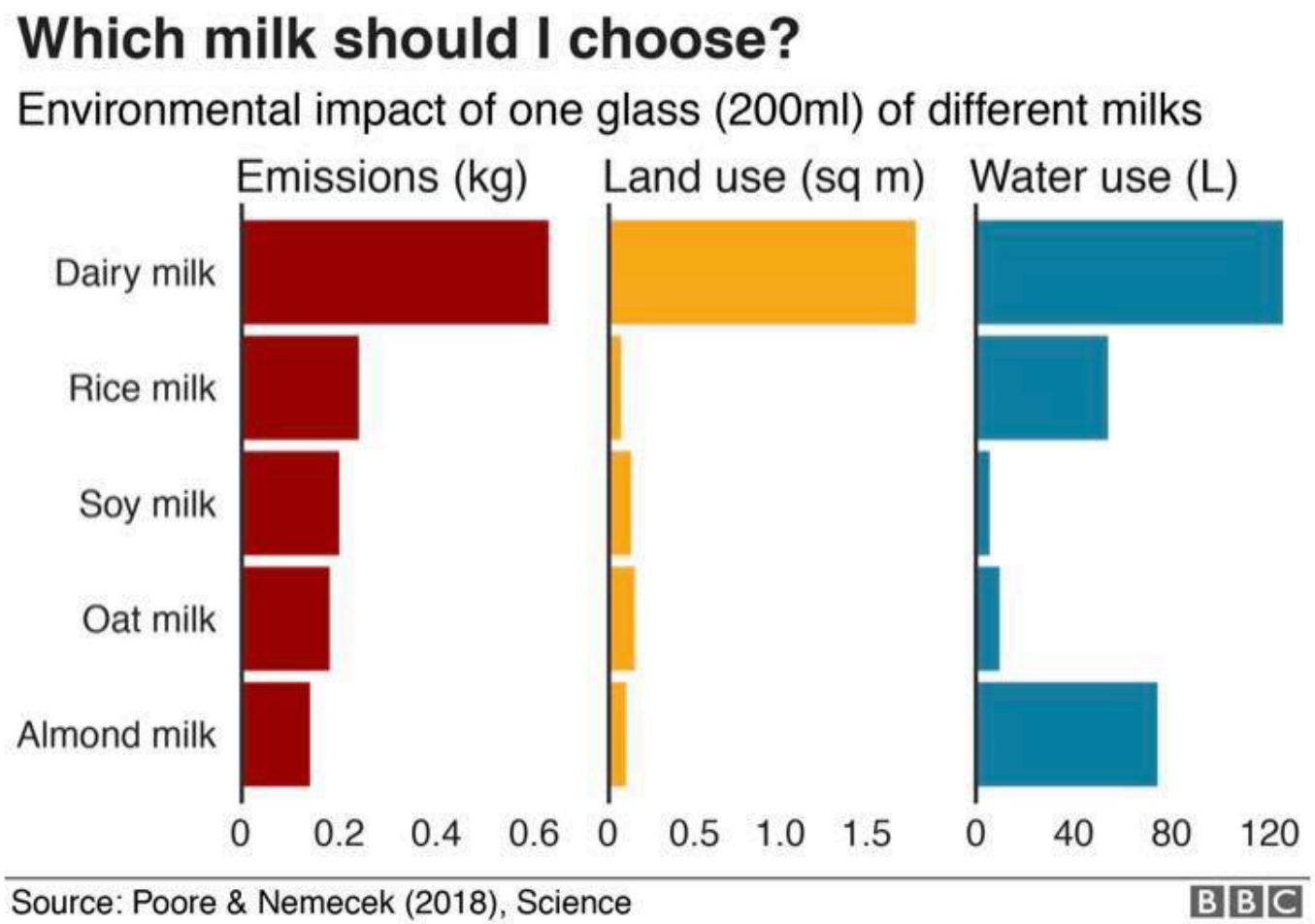
Sustainability in Practice (SIP)

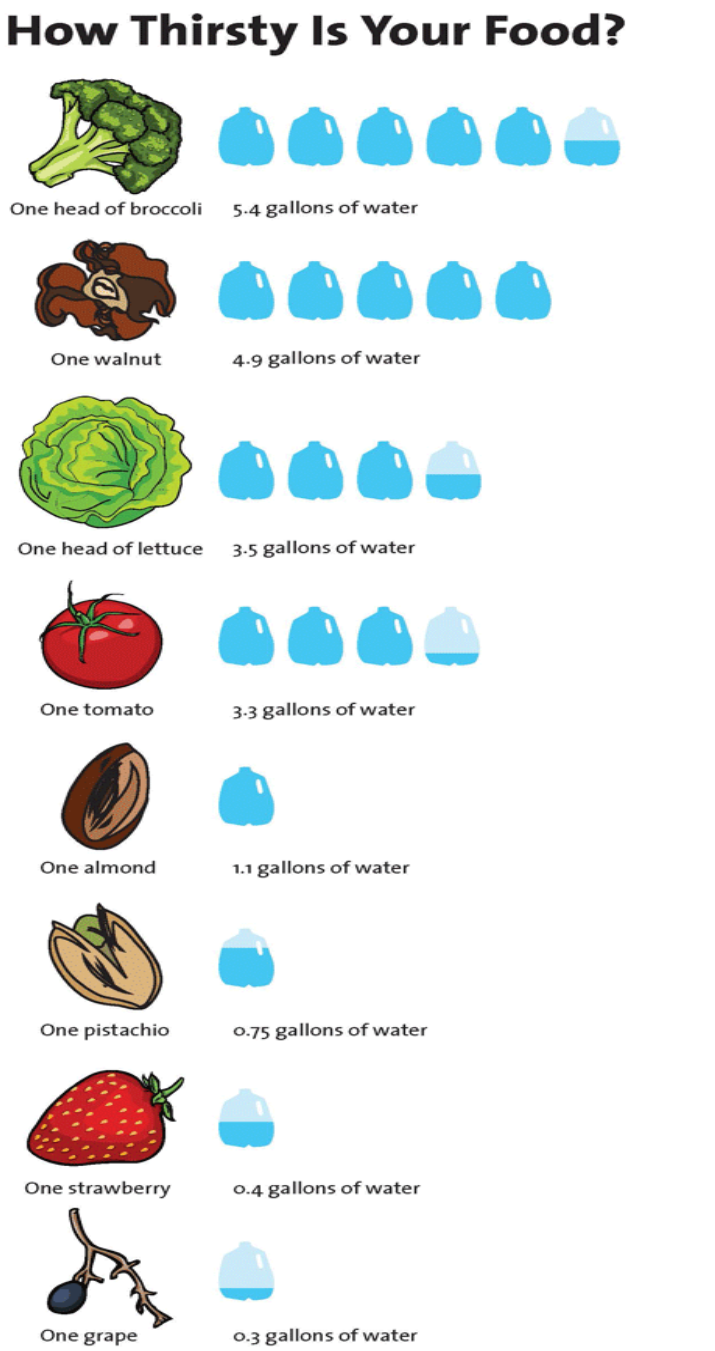
Certified California Sustainable Winegrowing

Certified Organic

Leadership in Energy & Environmental Design (LEED)

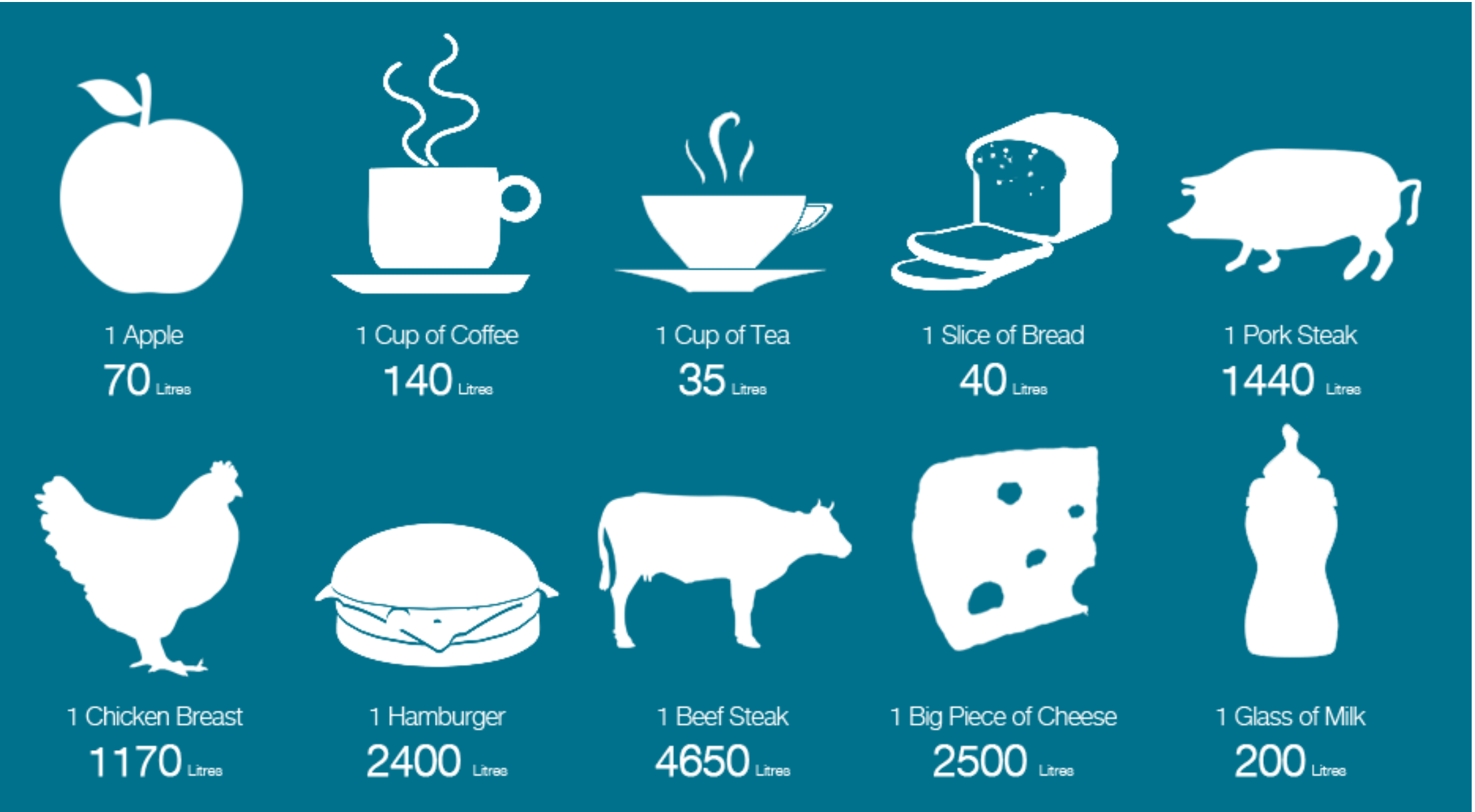
Water and Food

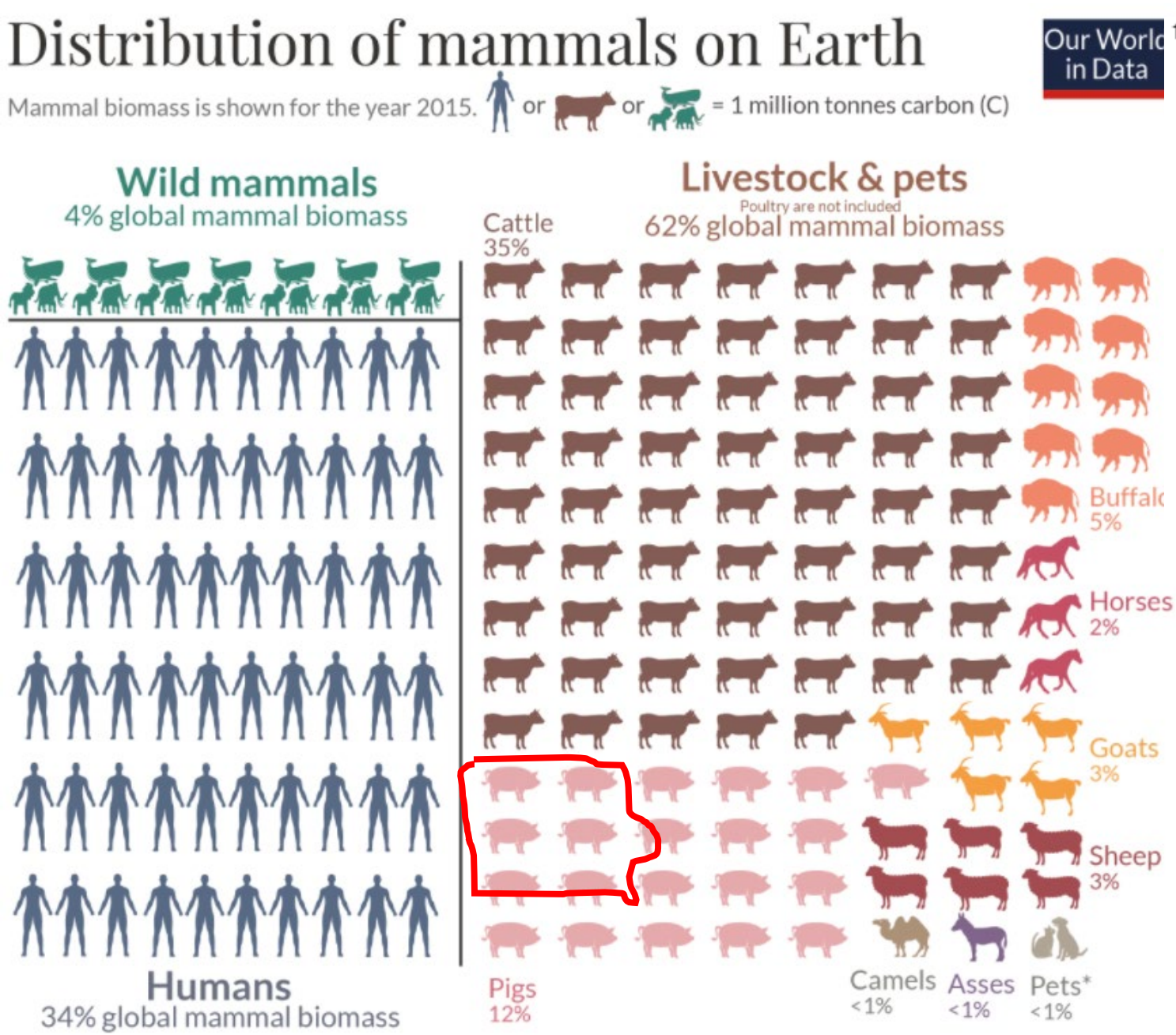


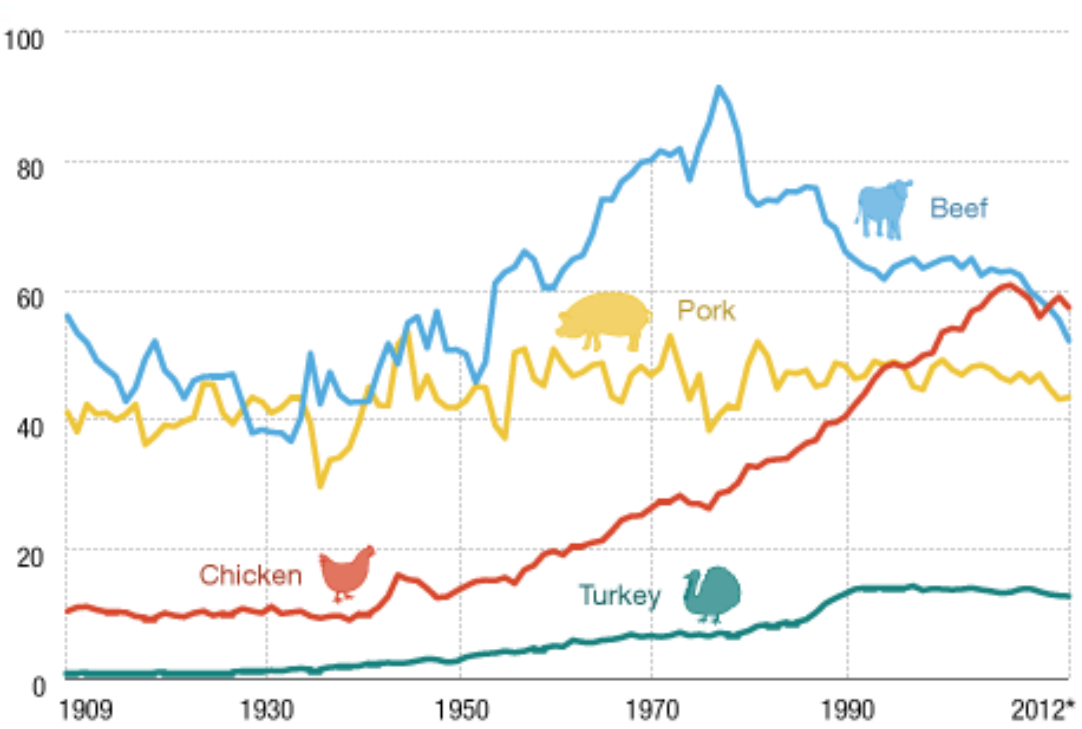


https://www.watercalculator.org/

Water and Food

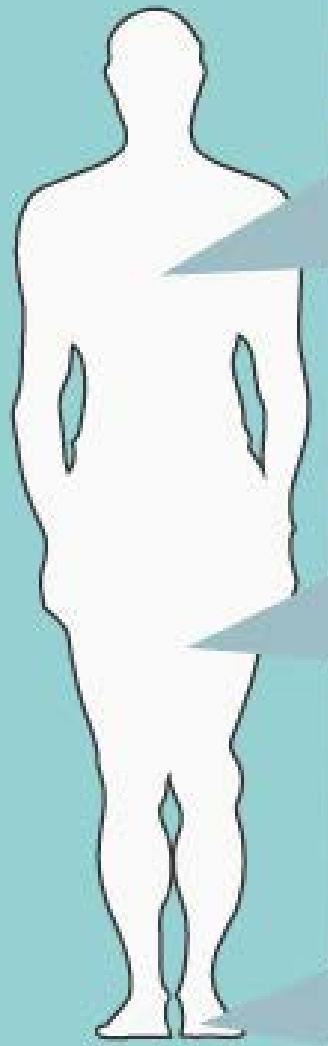




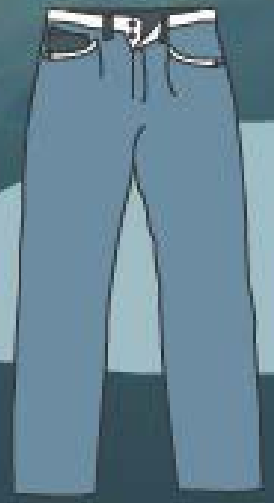


- https://ourworldindata.org

There's water in the making of your clothes...



It takes approximately **1,000** gallons of water to produce the half a pound of cotton it takes to make a single T-Shirt.



It takes approximately **1,500** gallons of water to produce the 1.5 pounds of cotton it takes to make a pair of jeans.

It takes approximately **2,000** gallons of water to produce all of the necessities for making a pair of tennis shoes.

What can you do?

Not saying you shouldn't buy clothes.

We all need to stay clothed of course. But you could look into purchasing second hand or even water efficient clothing! This is somewhat of a drastic life change so why not try and conserve the small amount of water we have in an easier way?

Become aware.

Awareness is the first step. Learn about water usage in the home and around the community. Measure the amount of water you use in a single day. Research how much water is used in objects of your everyday life.

Aware those around you.

Spreading this knowledge to friends and family is next. How much water do they use each day? If more people know about water usage, people will change their behavior.

Conserve.

Check pipes for leaks. Shorten showers. Turn off the faucet while brushing your teeth. These are all ways to conserve water.

The hidden water usage in food, clothing and material production is extremely consumptive, yet this water use is invisible. Water is a limited resource. It is the next oil. Become intelligent about water.

Bottled water

RETAILER MARK UP 30%+

ENVIRONMENTAL COSTS

WATER

It takes 3x the amount of water to produce one bottle of water

CO2

5 ounces CO2 produced for every 1 ounce of PET

OIL

1/4 bottle full of oil is used to fill, transport, cool, and dispose of 1 bottle

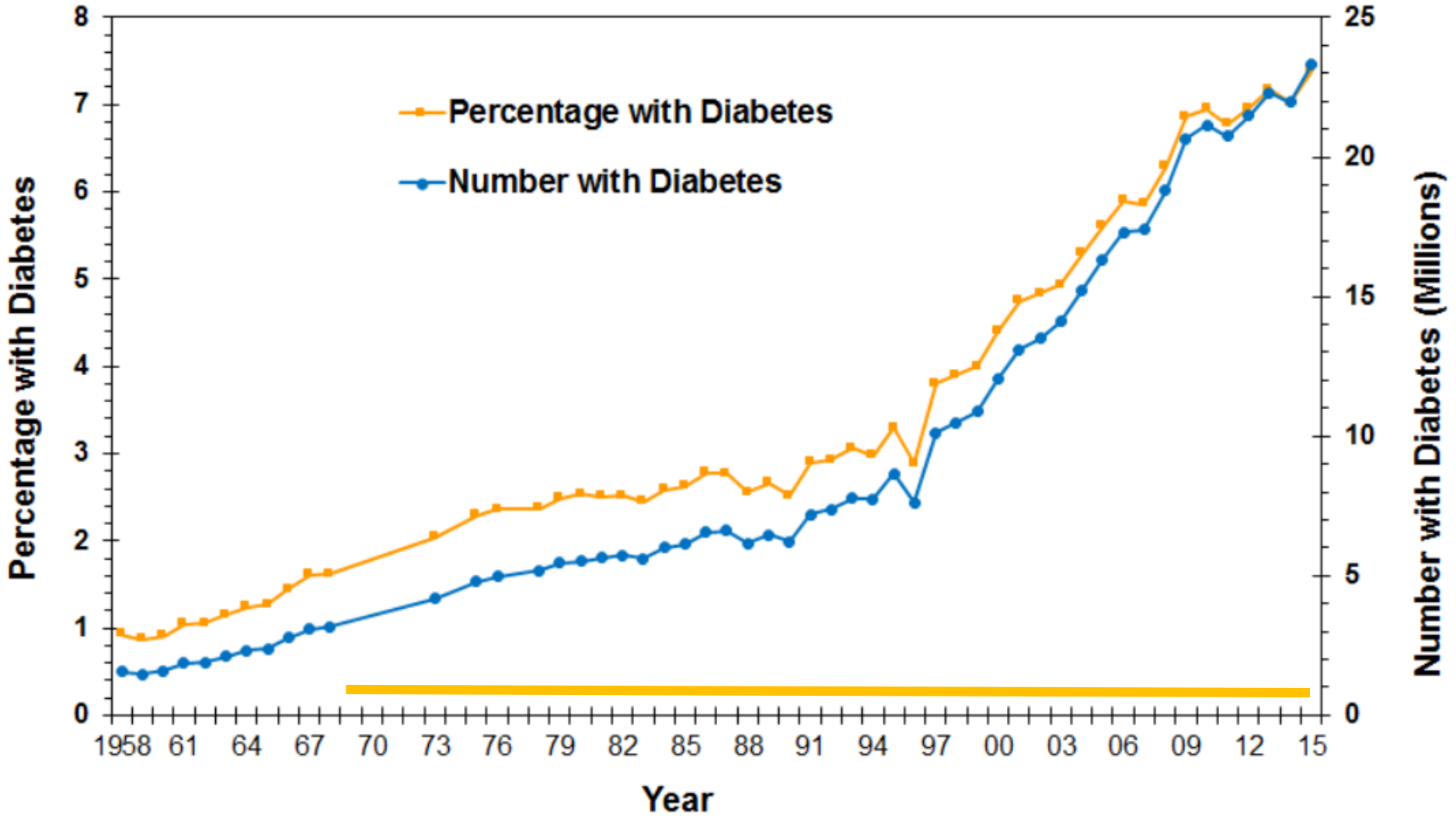
Resulting in 15-20% profits...for a bottle often with a product cost of less than $0.00001

Palm oil

https://www.worldwildlife.org/pages/which-everyday-products-contain-palm-oil

HCFS

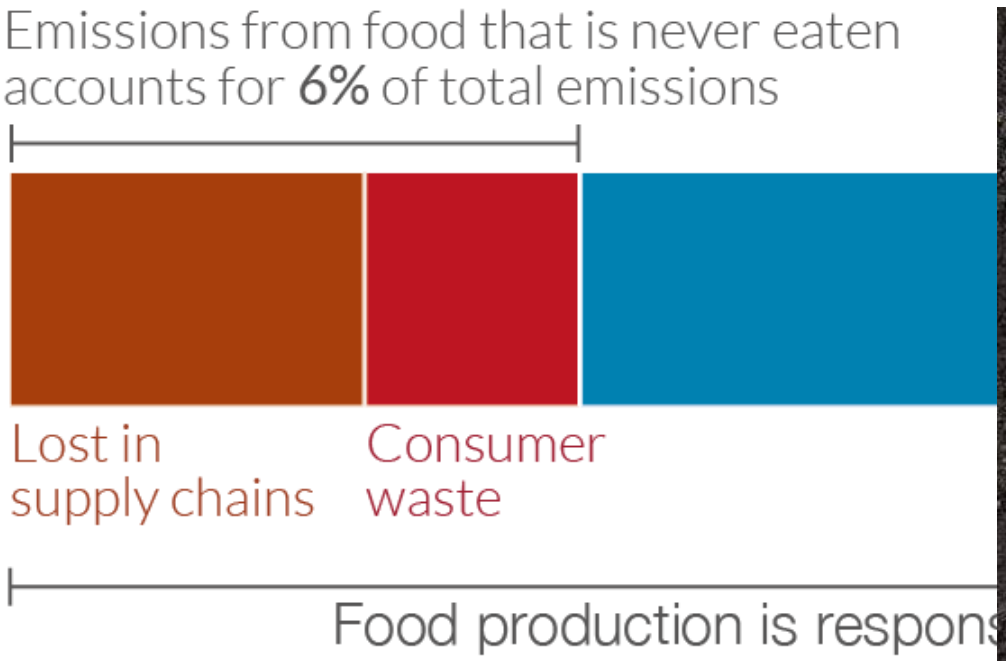
Number and Percentage of U.S. Population with Diagnosed Diabetes, 1958-2015



CDC's Division of Diabetes Translation. United States Diabetes Surveillance System available at http://www.cdc.gov/diabetes/data

6% of global greenhouse gas emissions come from food losses and waste

Our World in Data



https://ourworldindata.org/food-waste-emissions

https://www.theguardian.com/environment/2016/jul/13/us-food-waste-ugly-fruit-vegetables-perfect

Fast Food

VS.

Slow Food

Fast Food	Slow Food
Cheap and quick.	Food purchased locally to support local growers.
Unhealthy processed ingredients.	Celebrates the meal, takes time gathering with family and friends.
Purchased on the go without much thought.	Values the taste of the food.
Eaten in a hurry.	Embraces the preparation and cooking of the meal.

More about Ag.

- Antibiotics
- Hormones
- Genetically modified organisms (GMO)
- Community supported agriculture (CSA)
- New agriculture
  - Lettuce in NJ
  - Marijuana in CO