

From Global to Local

Reconnecting Land and Community With a New Vision for Agriculture



The Big Soil Health Event
Cedar Falls, IA
December 5, 2022

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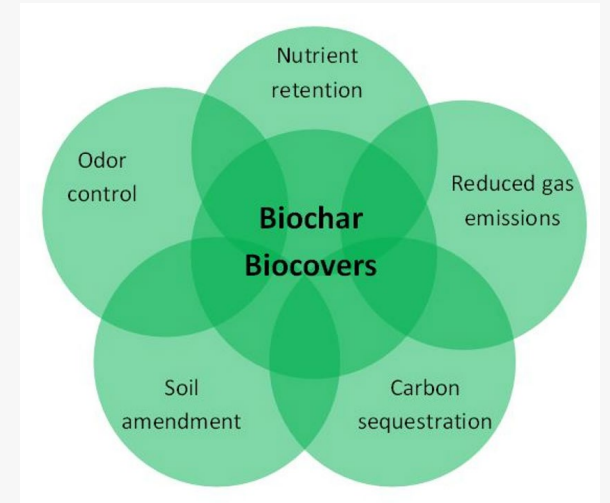
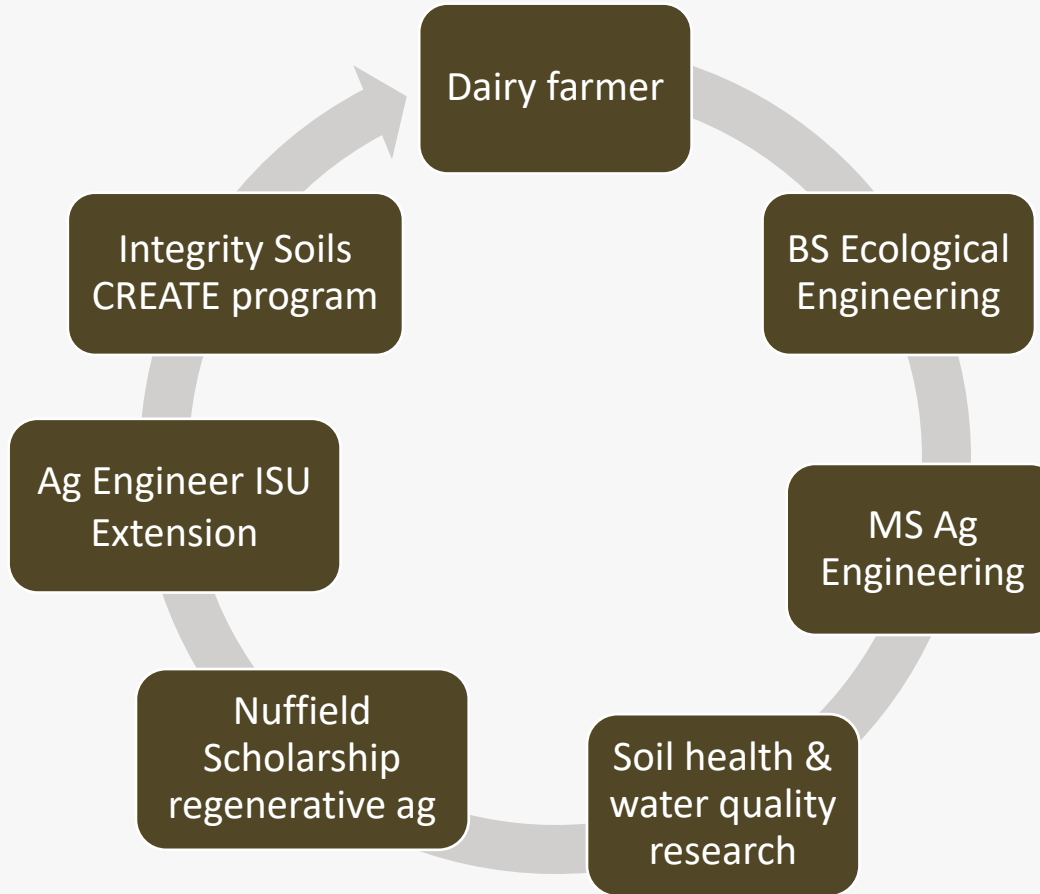




8 ft of snow + \$12 milk = Midlife crisis



Who am I and why am I here?



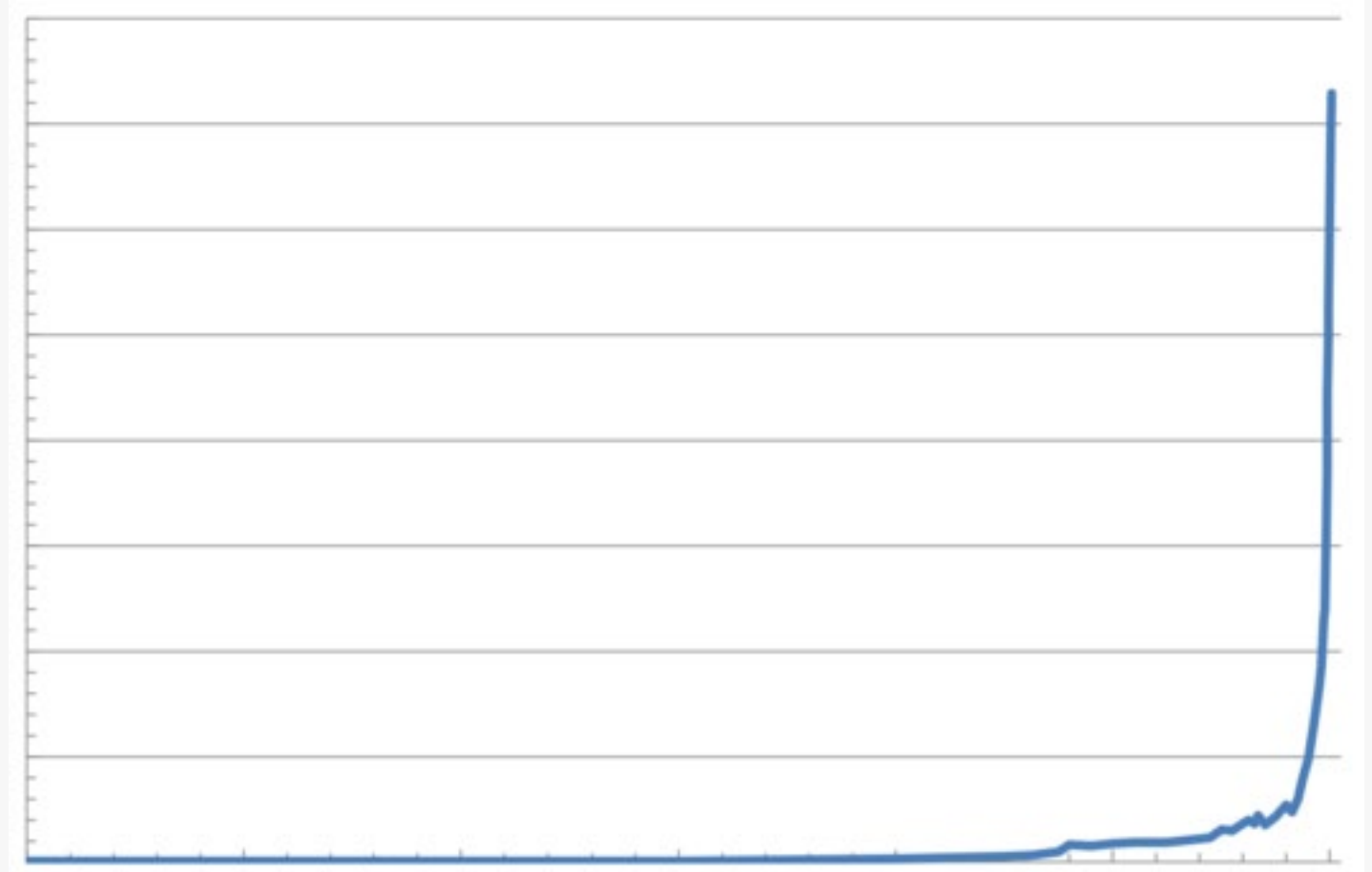


Overview

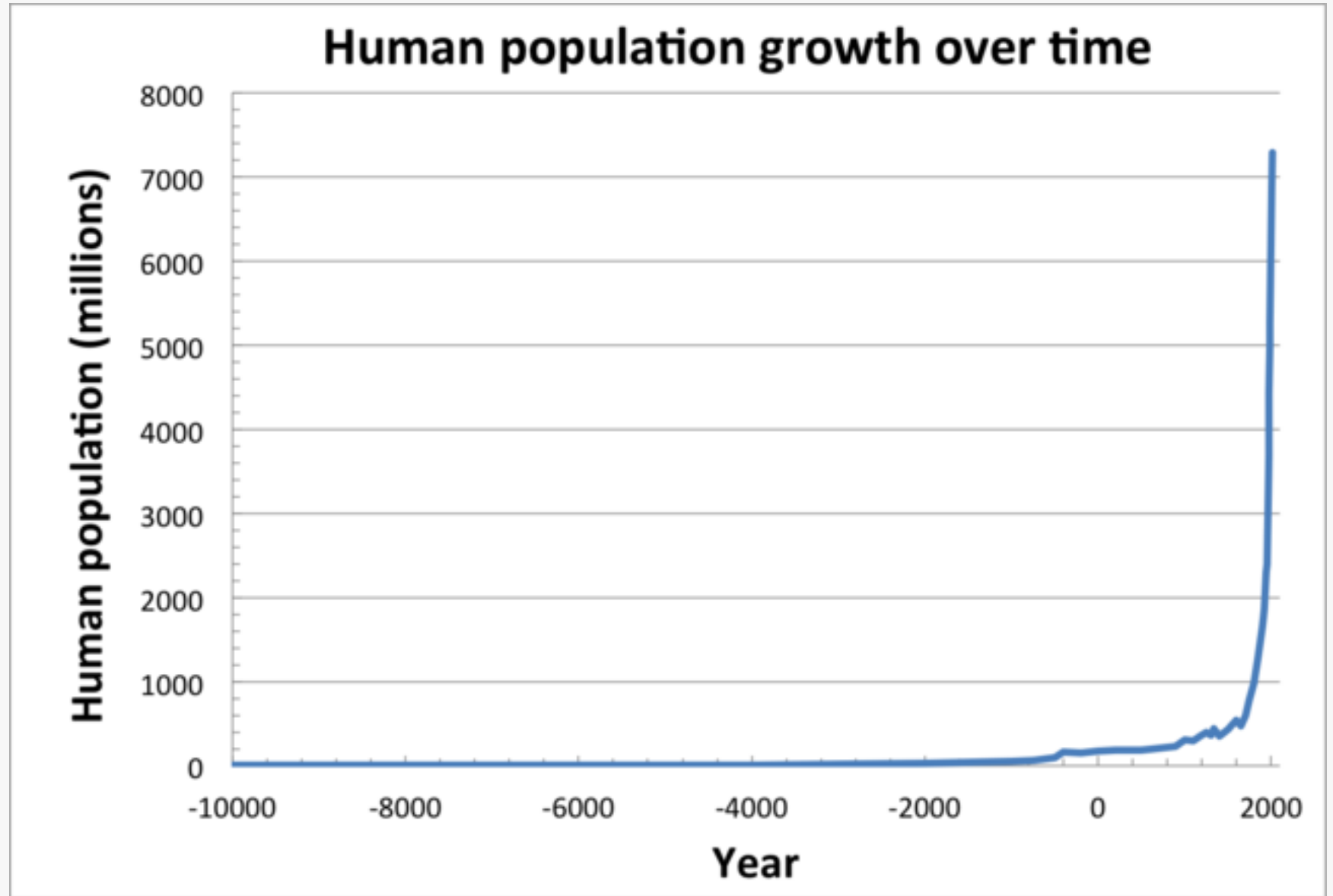
- Why we need a new vision for agriculture.
- Transitioning to a regenerative food system.
- Reconnecting land, people, and communities.

Why do we need a new vision for agriculture?

What is this?

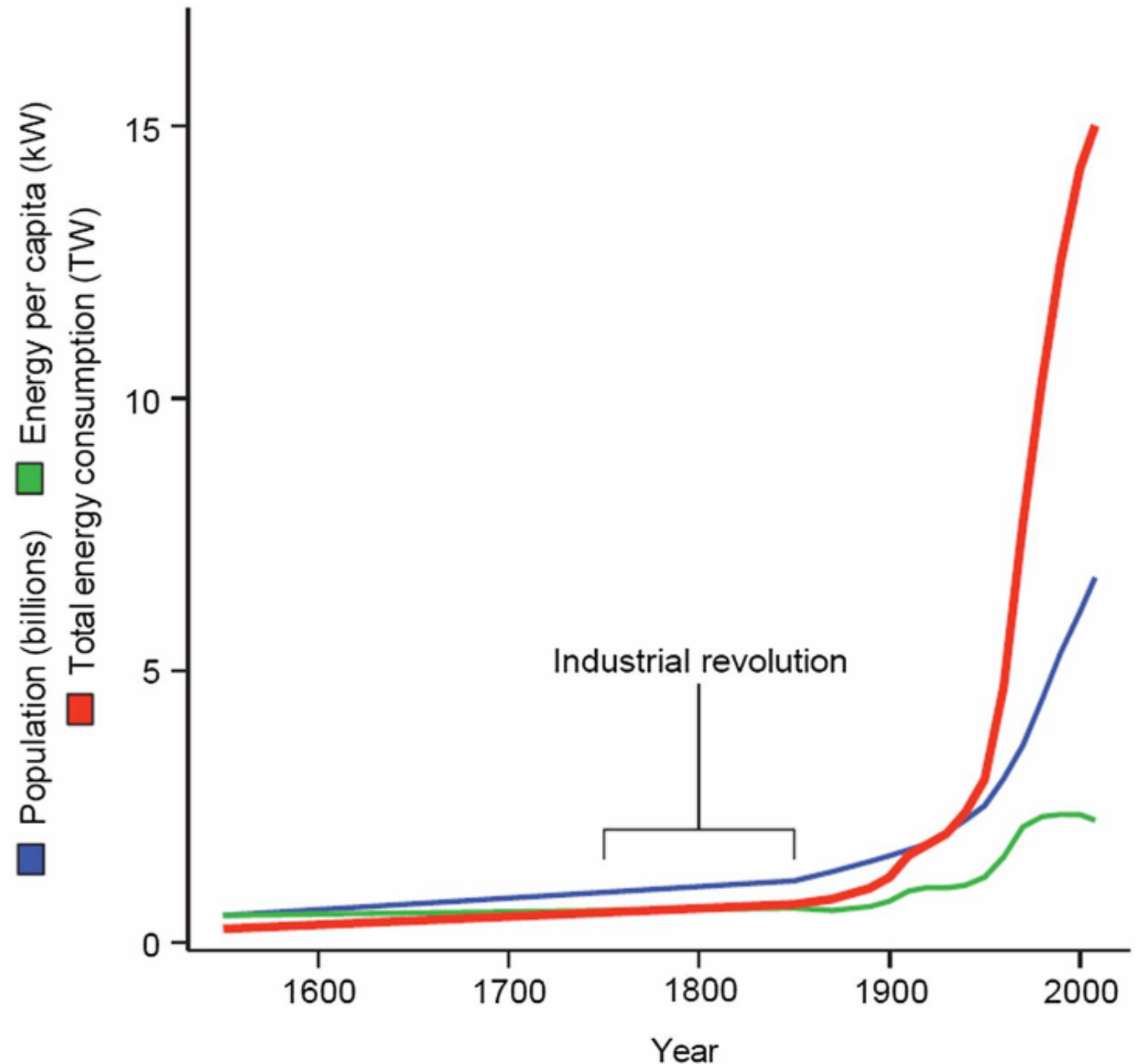


Population Growth



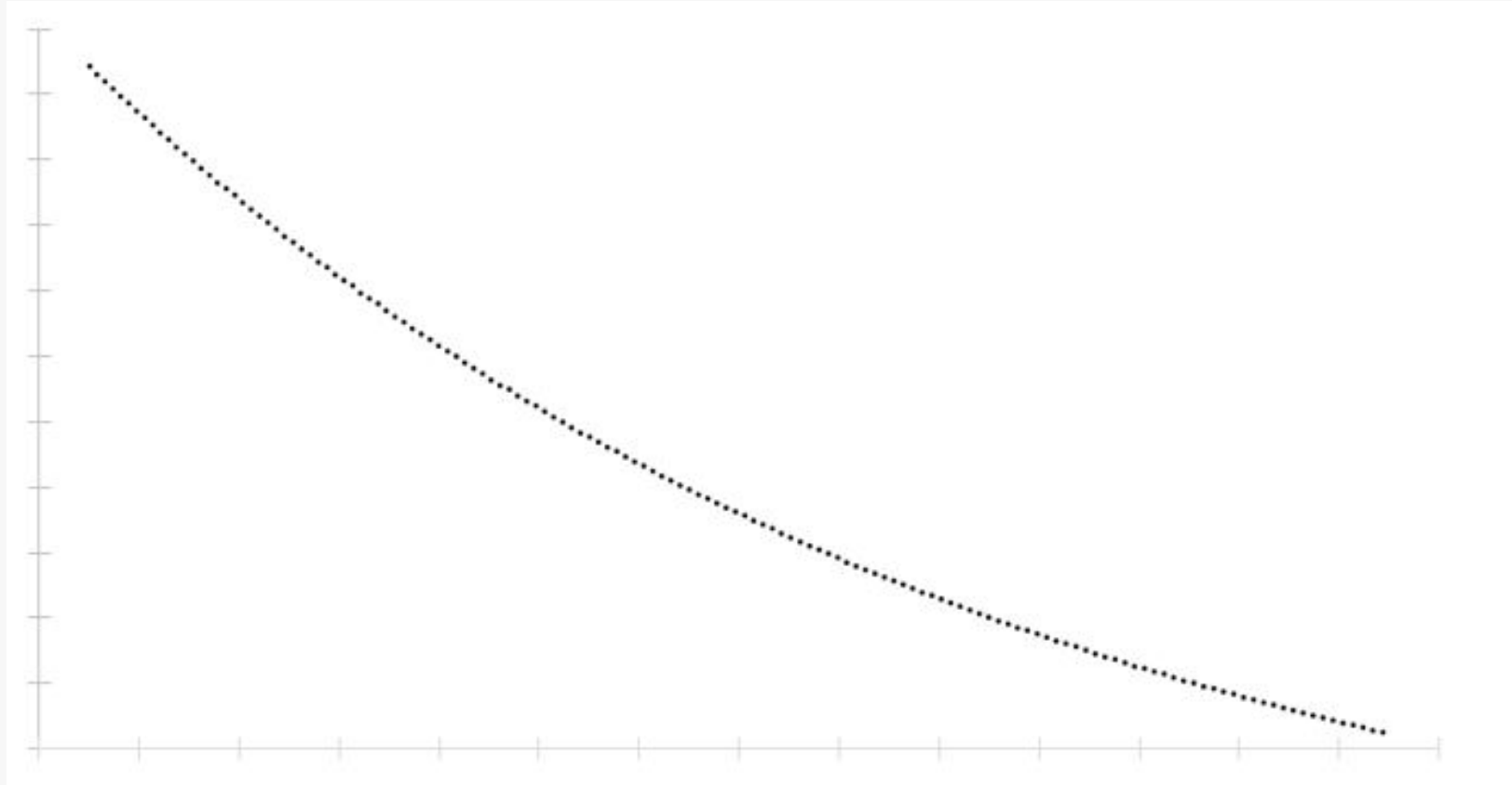
Energy Use

- Growth is *exponential*.
- Used ~19 TW in 2021.
- Population ~ 8 billion.
- 5 – 10 TW may be sustainable long term.

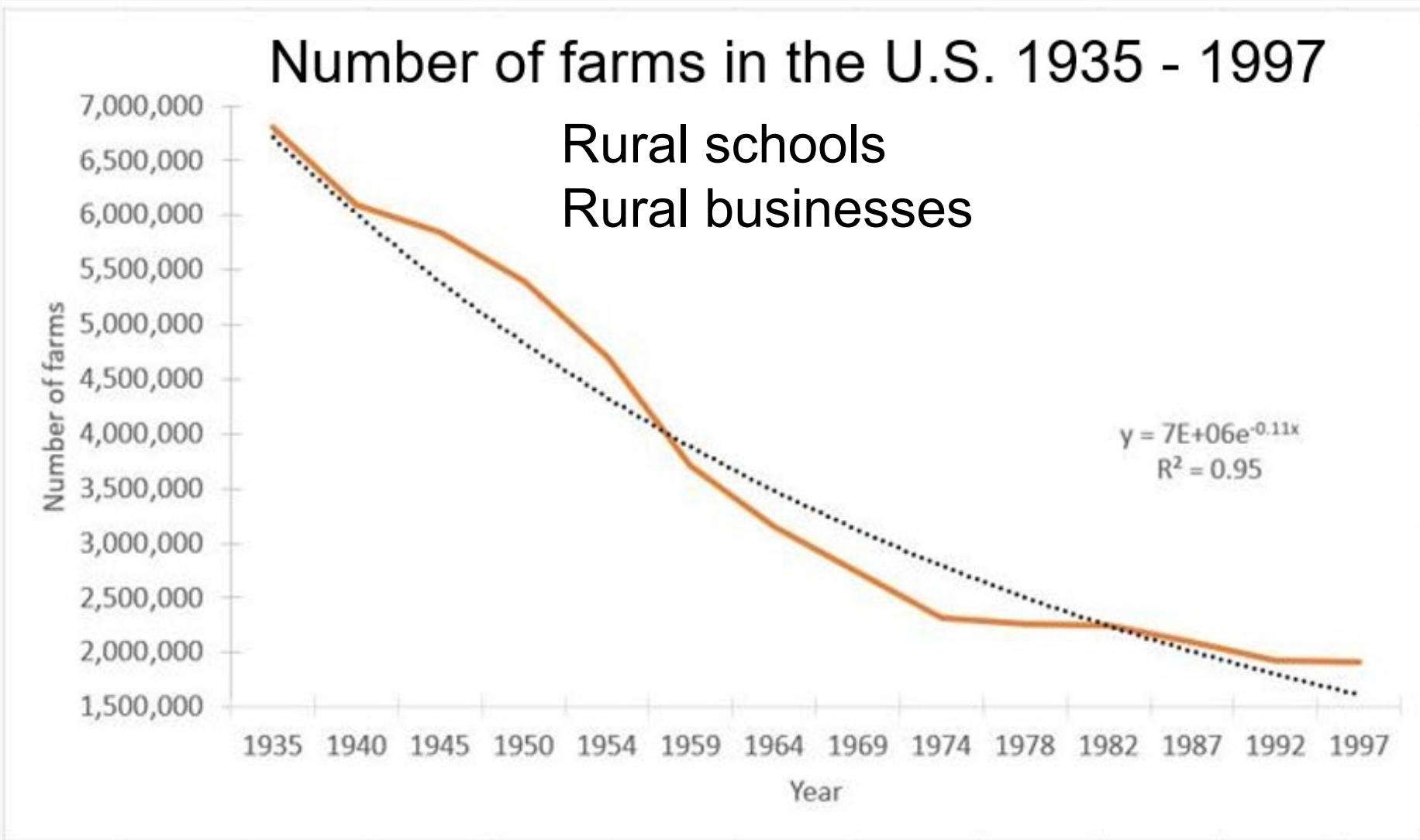


Source: Schramski et al. (2015) Human domination of the biosphere: Rapid discharge of the earth-space battery foretells the future of humankind. PNAS 112 (31) 9511-9517.

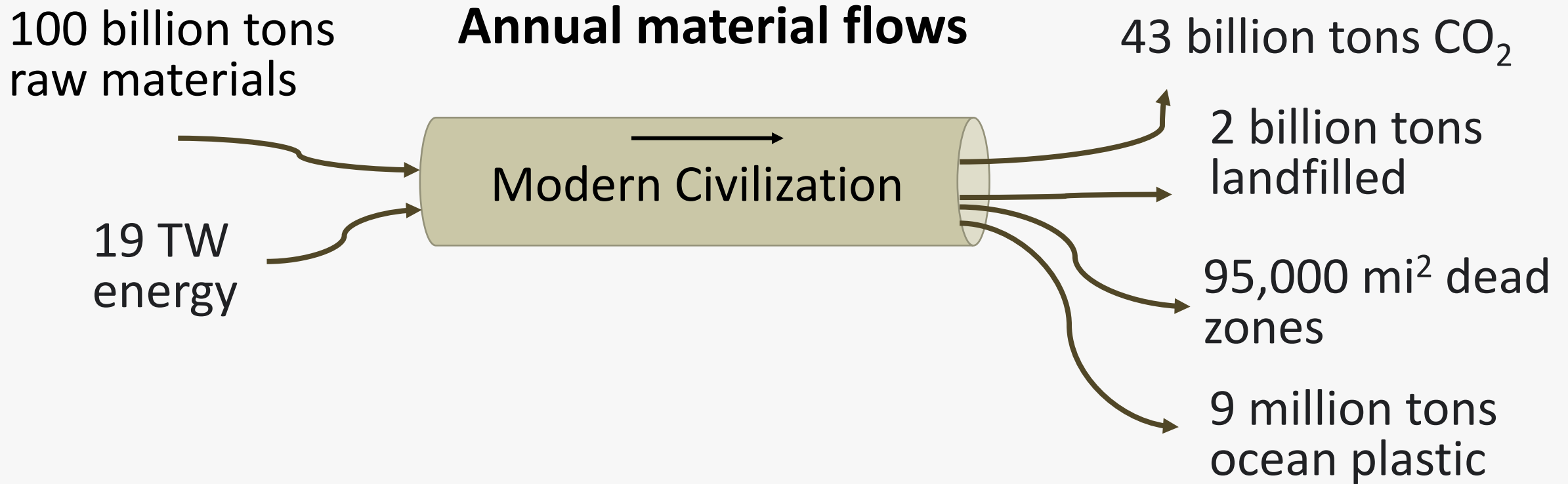
What is this?



Rural America is in exponential decay



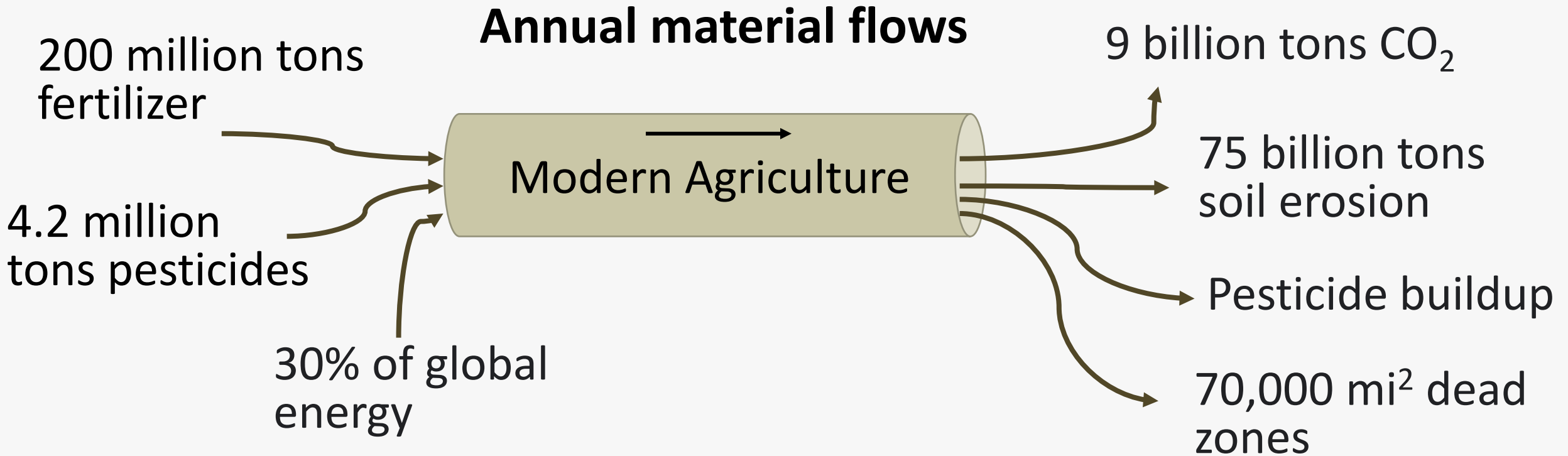
Modern society is a linear input-output system



Numbers predicted to DOUBLE by 2050

Sources: *Civilization Critical: Energy, Food, Nature, and the Future* by Darrin Qualman
Global Energy: <https://www.theworldcounts.com/challenges>

Modern agriculture is linear input-output system



Numbers predicted to increase ~60% by 2050

Efficiency will NOT save us

Jevons Paradox:

The more efficient it is to produce something, the more resources we use to produce it.

Fewer resources/less energy per unit drives down cost, new markets develop, and overall resource/energy use *increases*.

Efficiency of food production

Pre-industrial era:

1 calorie of energy to produce 5 calories of food.

Current U.S. food system:

13.3 calories of energy to produce 1 calorie of food.

Current system is ~66x LESS EFFICIENT at converting energy to food.

In nature, organisms that require more energy to find food than the food contains will die.

Annual fossil fuel use vs rate of formation

Coal: 200,000 x

Oil: 2.5 million x

Natural gas: 3.4 million x

Estimated oil production peaks

| Product | Peak year |
|--|-------------|
| Conventional oil (easy stuff) | ~2019 |
| Light-tight (fracked) oil | 2022 - 2025 |
| Orinoco oil and tar sands (extra/extremely heavy crude sources) | ~2030 |
| Global 'all liquids' production | ~2040 |

Cheap
Higher
EROI
(~20:1)



Expensive
Lower
EROI
(~5:1)

Estimates from Laherrere et al. (2022) How much oil remains for the world to produce? Comparing assessment methods and separating fact from fiction. CRSUST Vol. 4 DOI: 10.1016/j.crsust.2022.100174

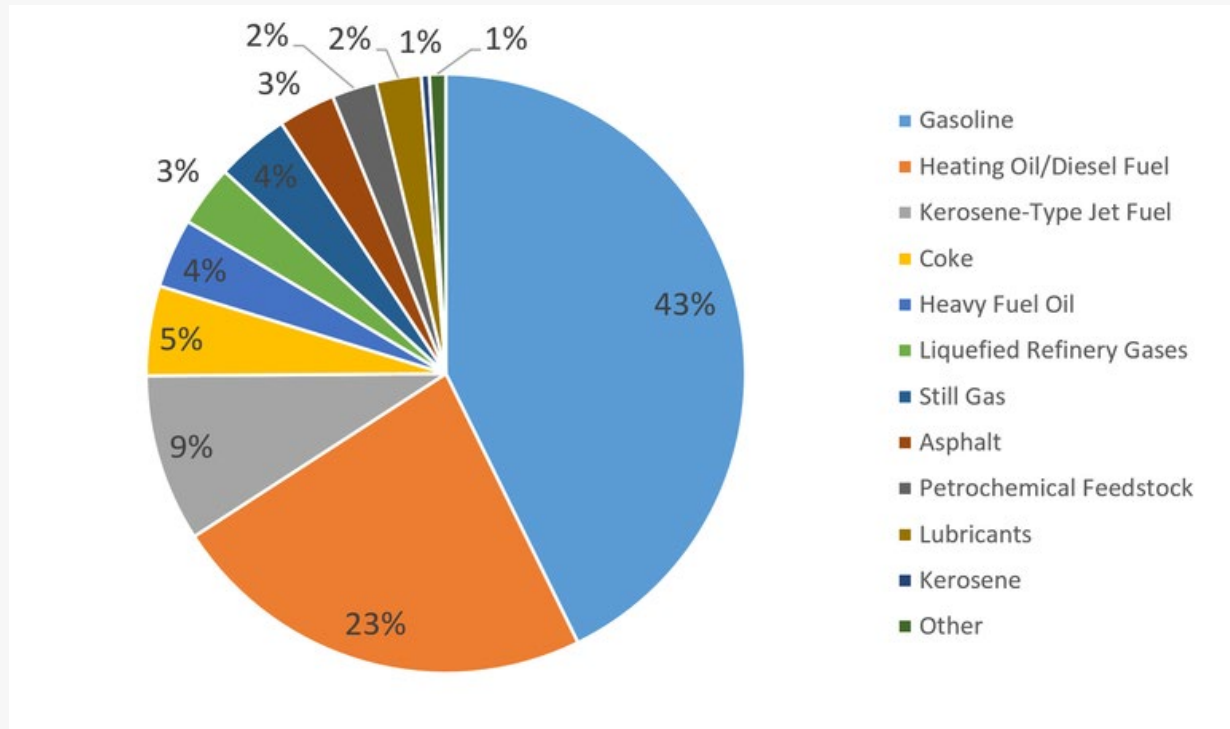
Peak oil is like peak beer



Why not just electrify everything?

We can make electricity ~sustainably for thousands of years **BUT**

- Still need oil/metals to make the stuff to make the electricity
- Still need oil for the ~ 6000 other products made from it



“We’re electrifying the Titanic”.
- Patrick Ophuls

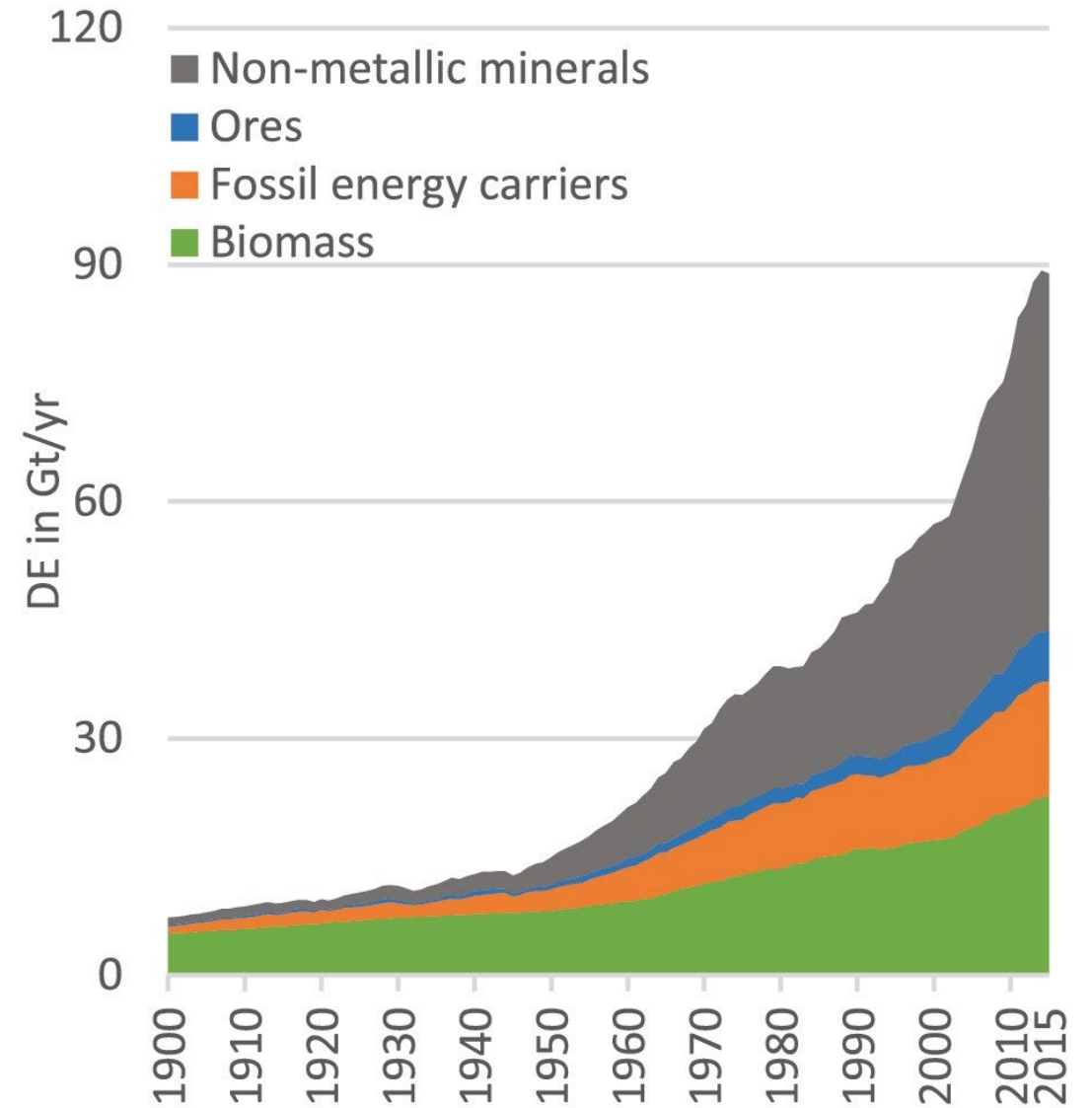
Materials consumption

Materials, energy, and GDP are 95+% correlated.

At 2 - 3% annual growth, doubling time is ~25 to 35 years.

Source: Krausmann et al. (2018) From resource extraction to outflows of wastes and emissions: The socioeconomic metabolism of the global economy, 1900–2015.

A Extraction (DE)



Technology/innovation won't save us either

Technology = Energy + Materials

Technology is an expression of the available energy we can exploit.

Technology can buy time, but it doesn't remove limits to growth.

There are no technological solutions to a collective action problem.

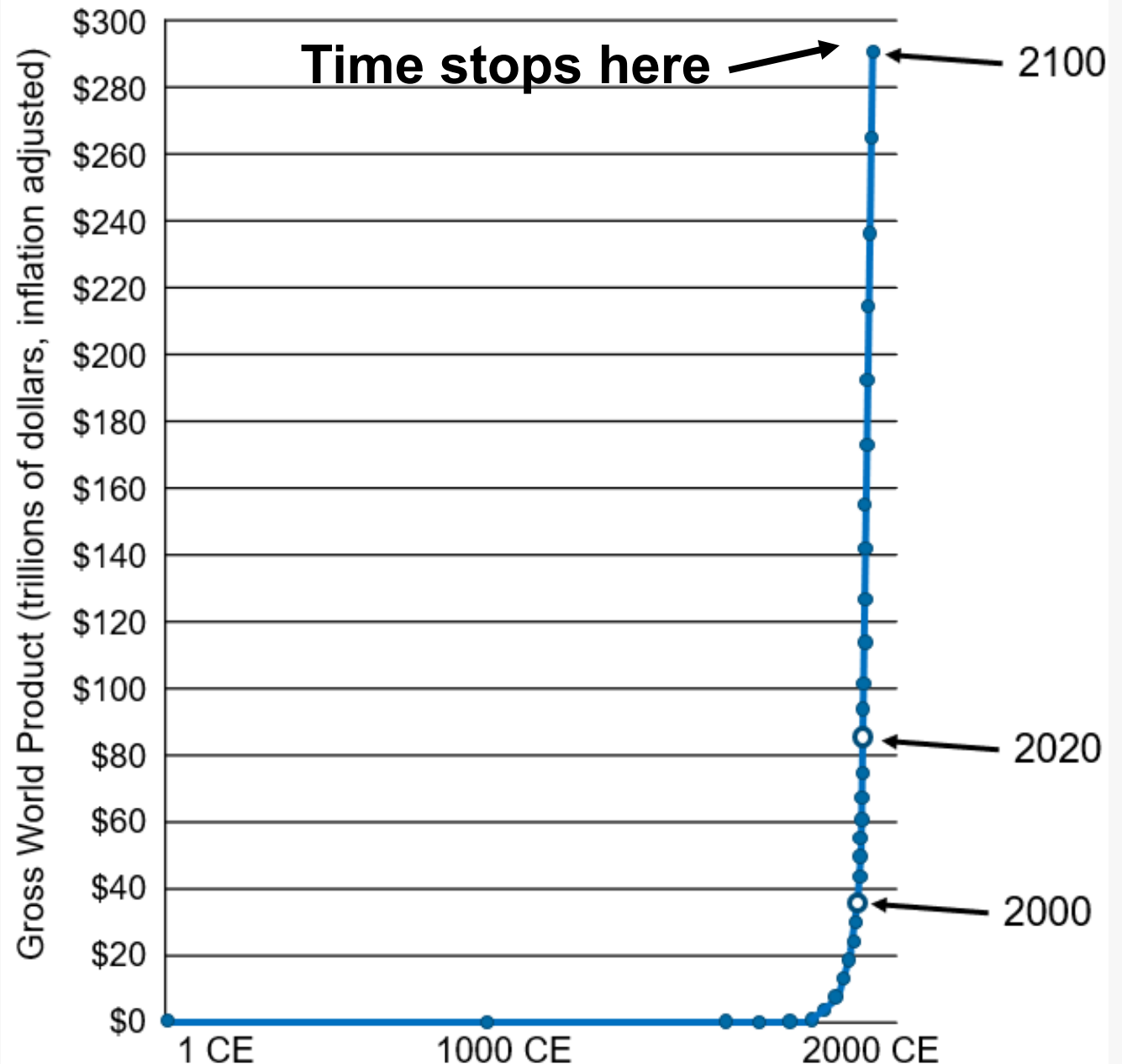
'Sustainable' growth?

We can have a sustainable civilization.

We can have 2% growth.

We cannot have both.

Reproduced from: *Civilization Critical: Energy, Food, Nature, and the Future* by Darrin Qualman.



Why linear systems will fail

- Fossil energy temporarily disconnected us from supporting ecosystems across space and time.
- We will eventually bear the externalized costs of our actions.
- There is no ‘away’. Consequences accumulate.
- Perpetual growth is *impossible* on a finite planet.

Why our linear economy will fail

- Society runs on materials and energy, not money.
- Money is created, not lent out from existing wealth.
- Money creation is not tied to energy availability or cost.
- Created money is spent on a good or service that contains embodied materials and energy.
- Money is a claim on materials and energy¹.
- Labor and capital cannot be substituted for energy.
- Debt is a claim on *future energy that may not exist*.

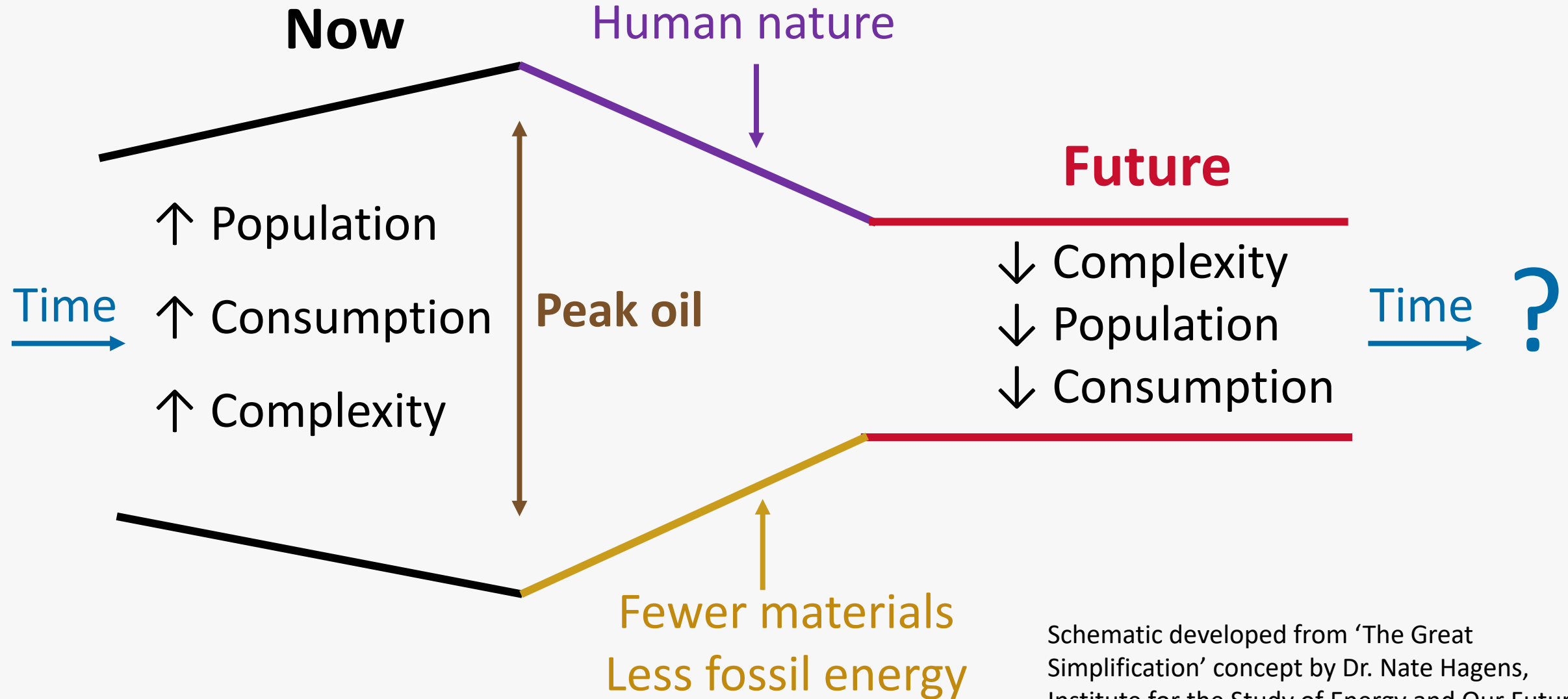
Why our linear food system will fail

Nutrient and water cycles are broken on a global scale.

We are on a collision course with the biophysical limits of the planet.

The fossil energy needed to continue farming as we do now **DOES NOT EXIST.**

The Great Simplification



Schematic developed from 'The Great Simplification' concept by Dr. Nate Hagens, Institute for the Study of Energy and Our Future.

**You are
here**



Linear agriculture: global to local

Our **GLOBAL** problem is also our **LOCAL** problem:

- Number of farms and farmers are dwindling worldwide.
- Young people have few opportunities to start farming.
- Small towns are struggling or disappearing.
- Farmers realize **the current linear food system is broken.**

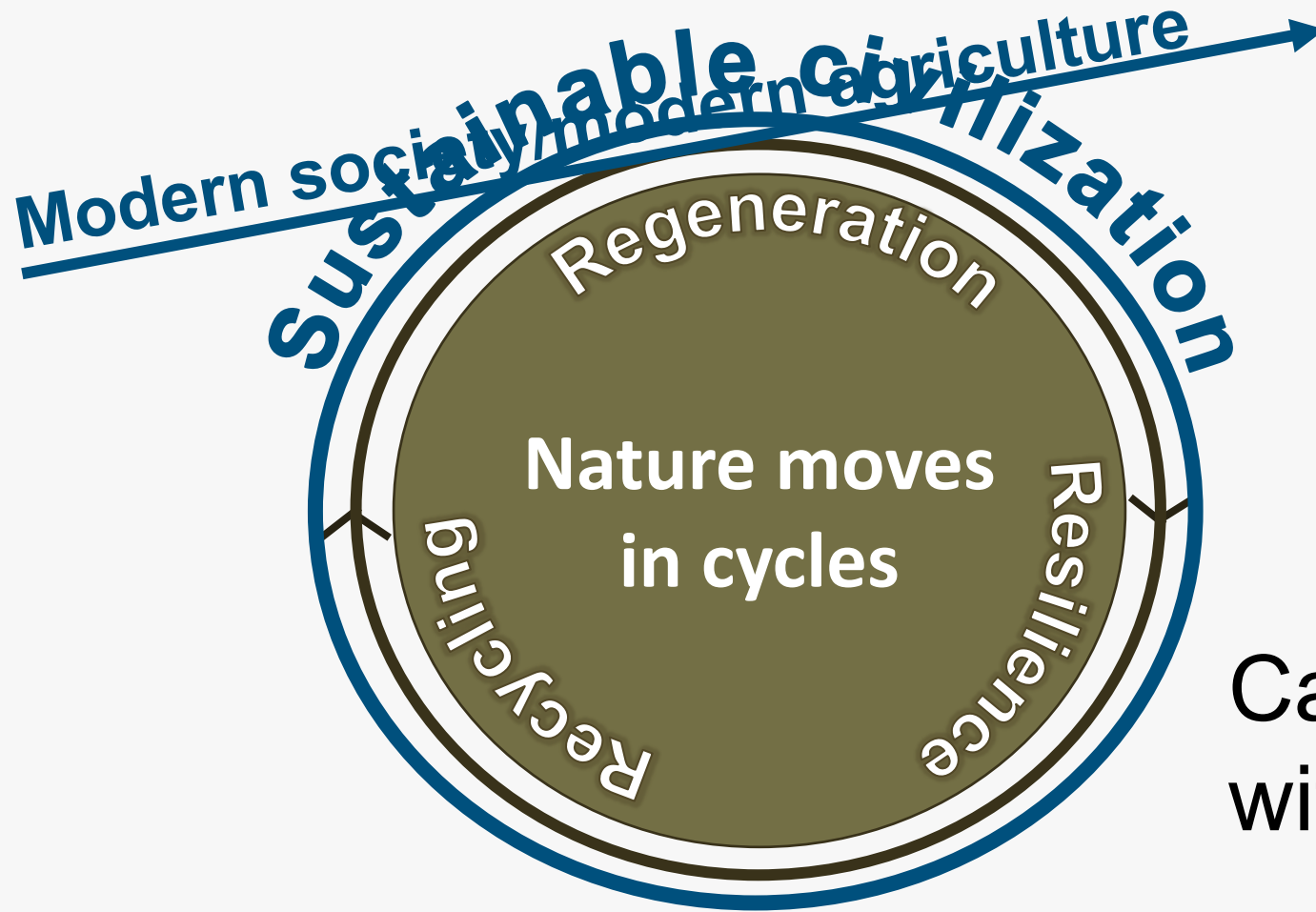
Linear agriculture: global to local

Our **GLOBAL** problem is also our **LOCAL** problem:

- Linear food production is *designed* to extract resources for wealth accumulation elsewhere.
 - Exports nutrients, soil, and people
 - Drives farmers out of business
 - Shrinks rural communities

Commodity farmers are on the wrong end of the line!

Transitioning to a circular farming system

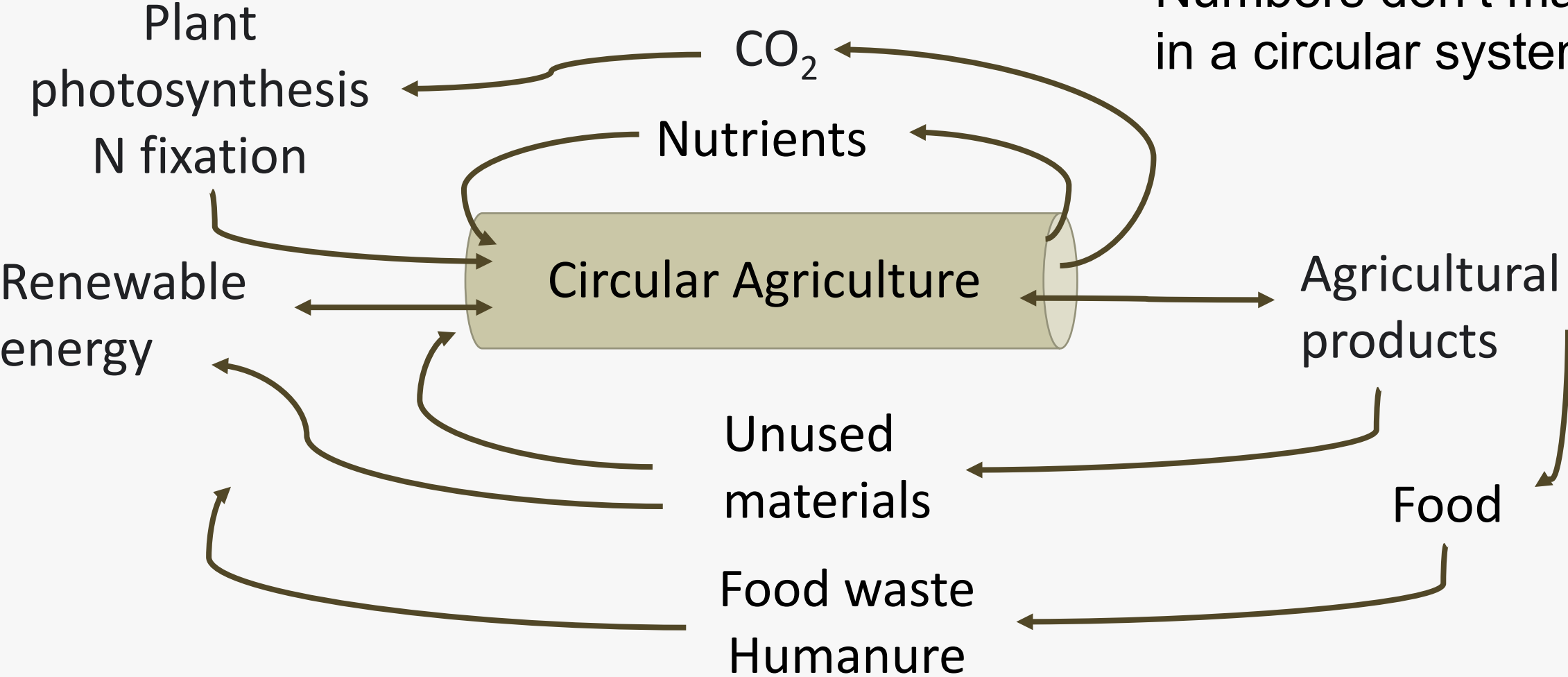


Can we bend without breaking?

Agriculture in a circular world

Annual material flows

Numbers don't matter
in a circular system!



What is regenerative agriculture?

Regenerative agriculture is a local solution to our global problem.

What is regenerative agriculture?

Regenerative agriculture uses **biological** principles to reconnect broken nutrient and water cycles.

Biology: 'bios' = **life** 'logos' = **logic**

What is regenerative agriculture?

Regenerative agriculture uses **social** principles to reconnect land to people and communities.

How do we transition to a circular regenerative system?

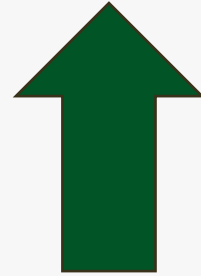
WORK TOGETHER using the **LOGIC of LIFE** to transform how we support both farmers and local communities.

**This is an incredible
opportunity for agriculture.**

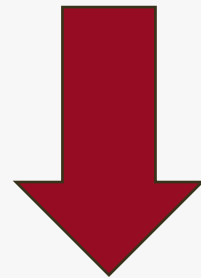
It all starts with the soil.

**Healthy soil is the foundation of
resilient farms, healthy people, and
revitalized communities.**

Regenerative (bend)

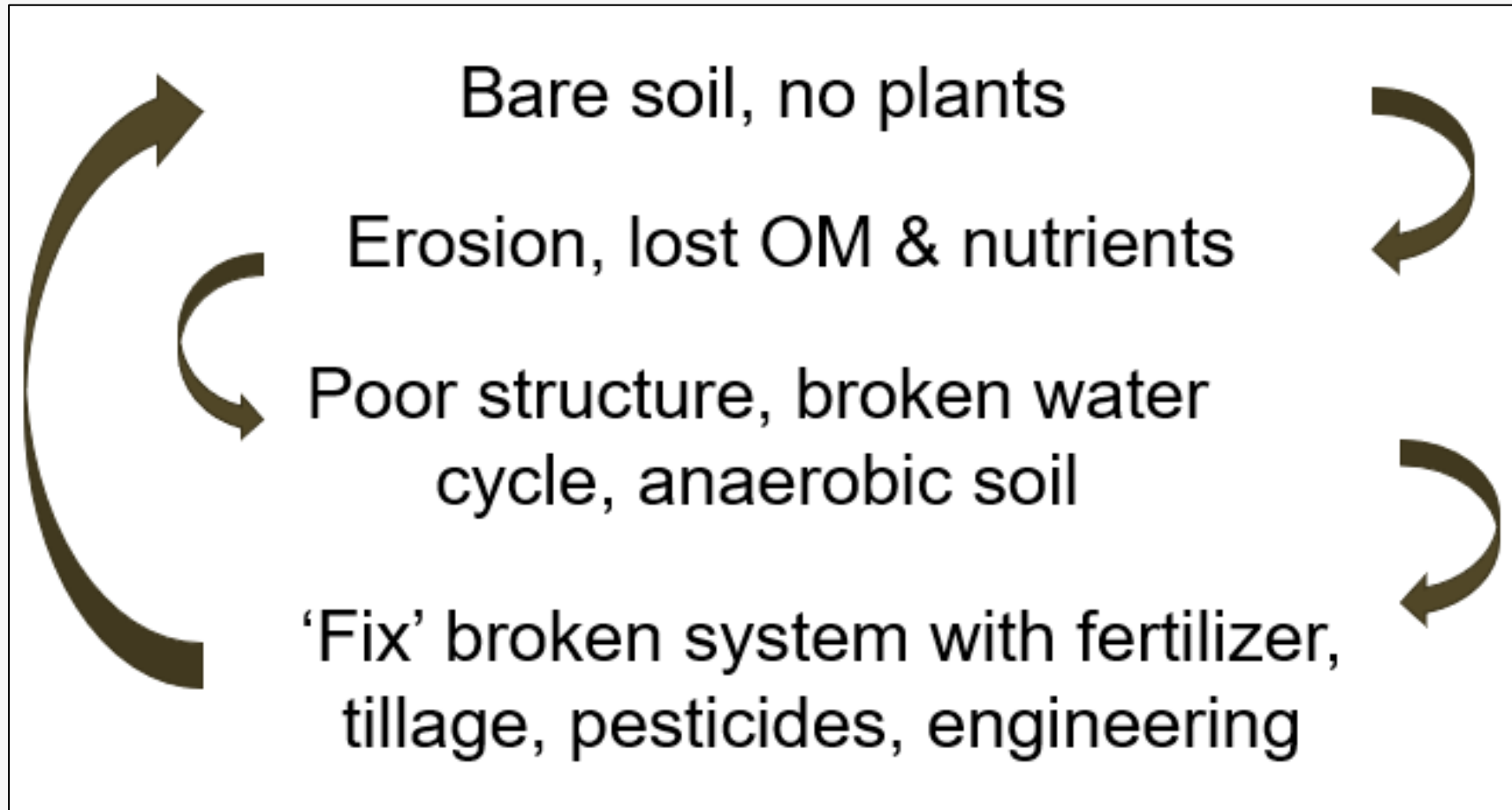


Direction is a *choice*



Degenerative (break)

Management determines direction



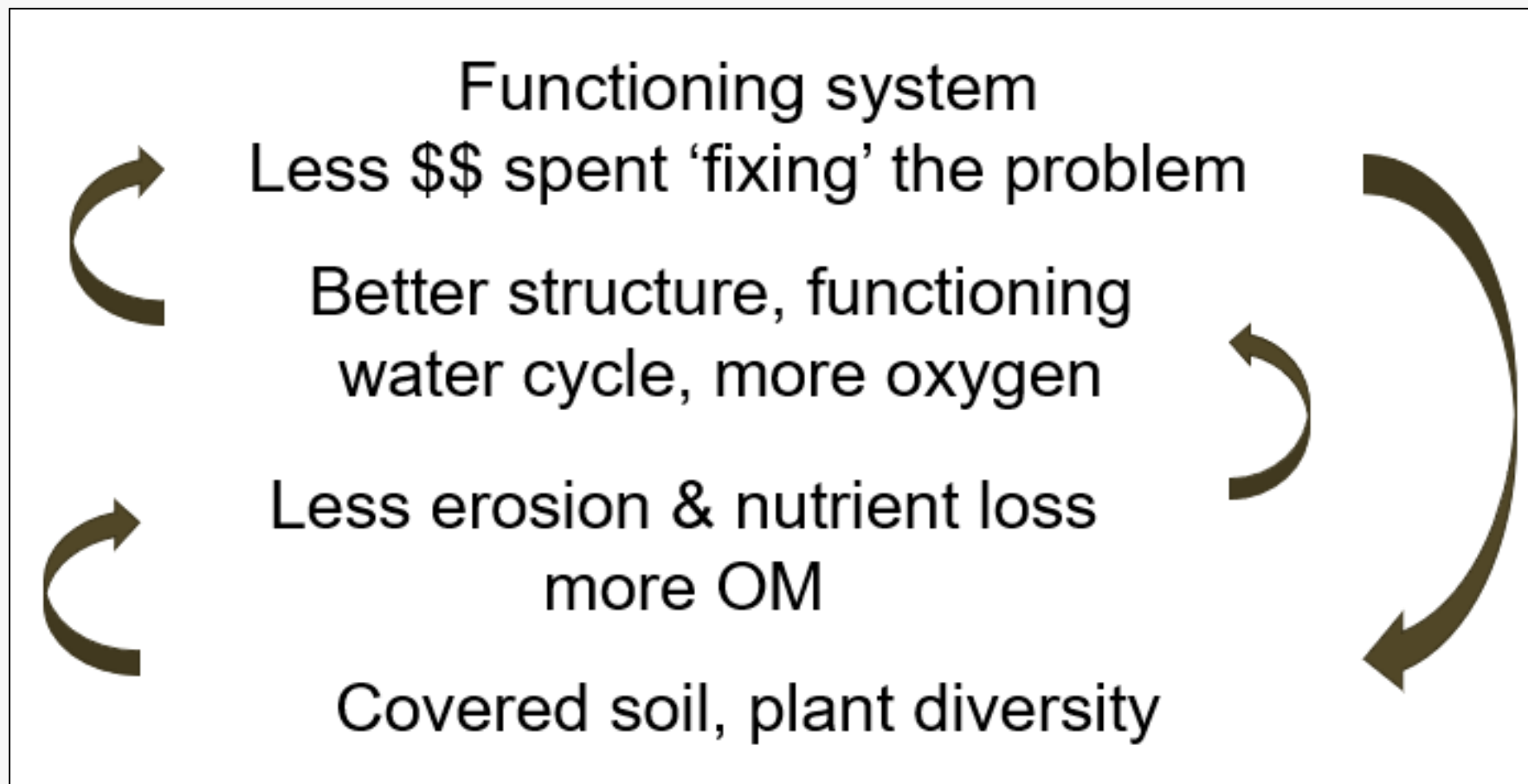
Degeneration



Death cycle of a linear farm

Management determines direction

Regeneration



Life cycle of a circular farm

Soil is the battery of life – recharge it



Photosynthesis

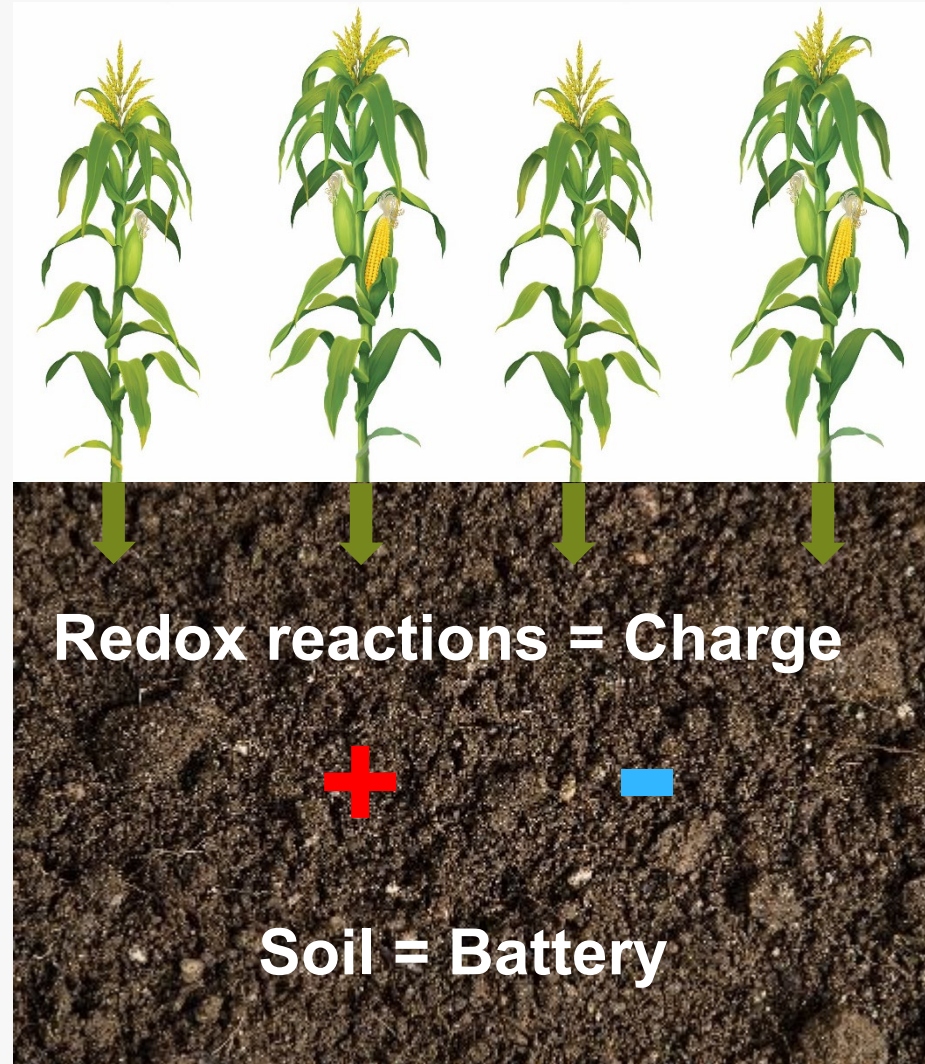


Respiration



Accessible carbon + biological activity = charge level

Stable carbon = charge storage



Plants = Solar panels

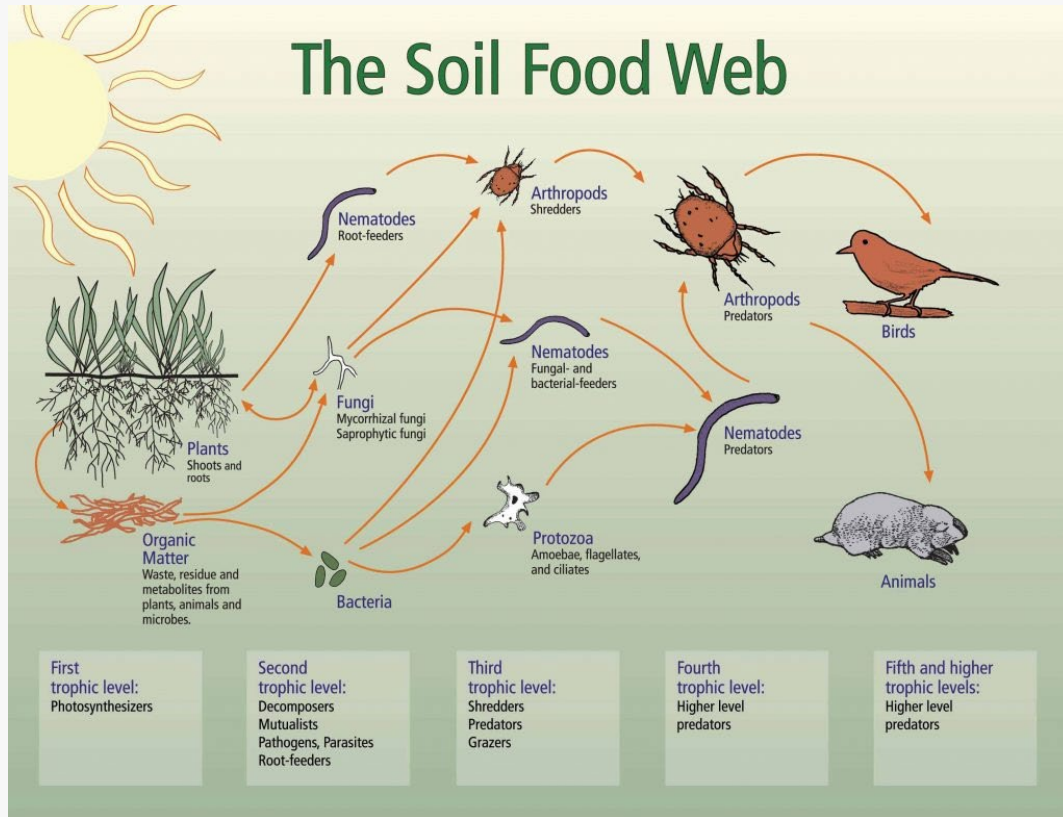
Soil is the engine of life – rebuild it

- **Soil aggregates** are the engine of **functional, healthy soil**.
- **The soil microbiome/food web** is what puts the engine together.
 - Soil communications system
 - Soil transportation network
 - Plant digestive system
 - Plant immune system
 - Recycles death into life



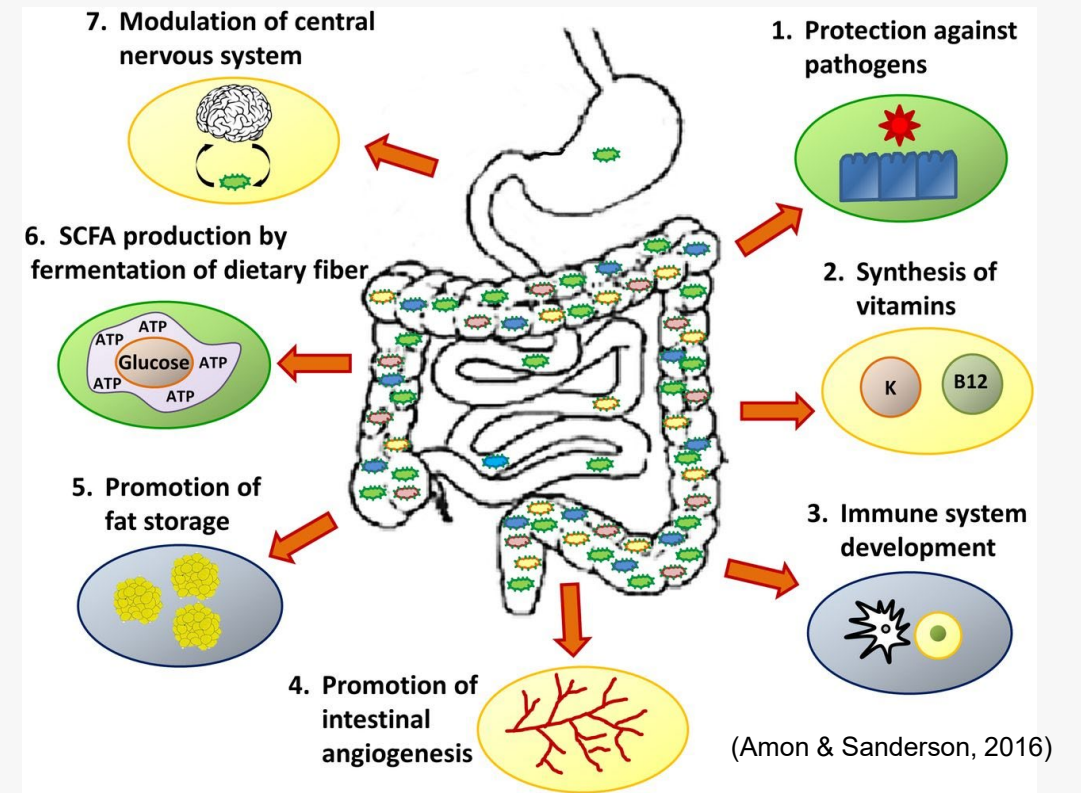
Soil is the web of life – reweave it

Soil microbiome



Human gut microbiome

=



All we need to know about soil we learned in kindergarten

Corn = Cheese
Soybeans = Hot dogs
Pesticides = Antibiotics
Fertilizer = Cocaine
Crop residue = Leftovers

} 3 months

All we need to know about soil we learned in kindergarten

Soil erosion and water pollution = Diarrhea

Edge-of-field practices = Butt plug

Cereal rye = Lettuce salad

Multispecies cover crop = Veggie buffet

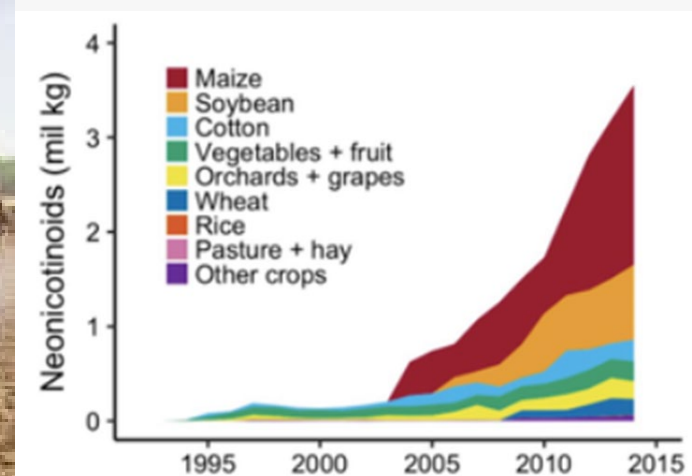
Diverse crop rotation = Balanced diet



NOTICE



THE BEATINGS WILL
CONTINUE UNTIL
MORALE IMPROVES



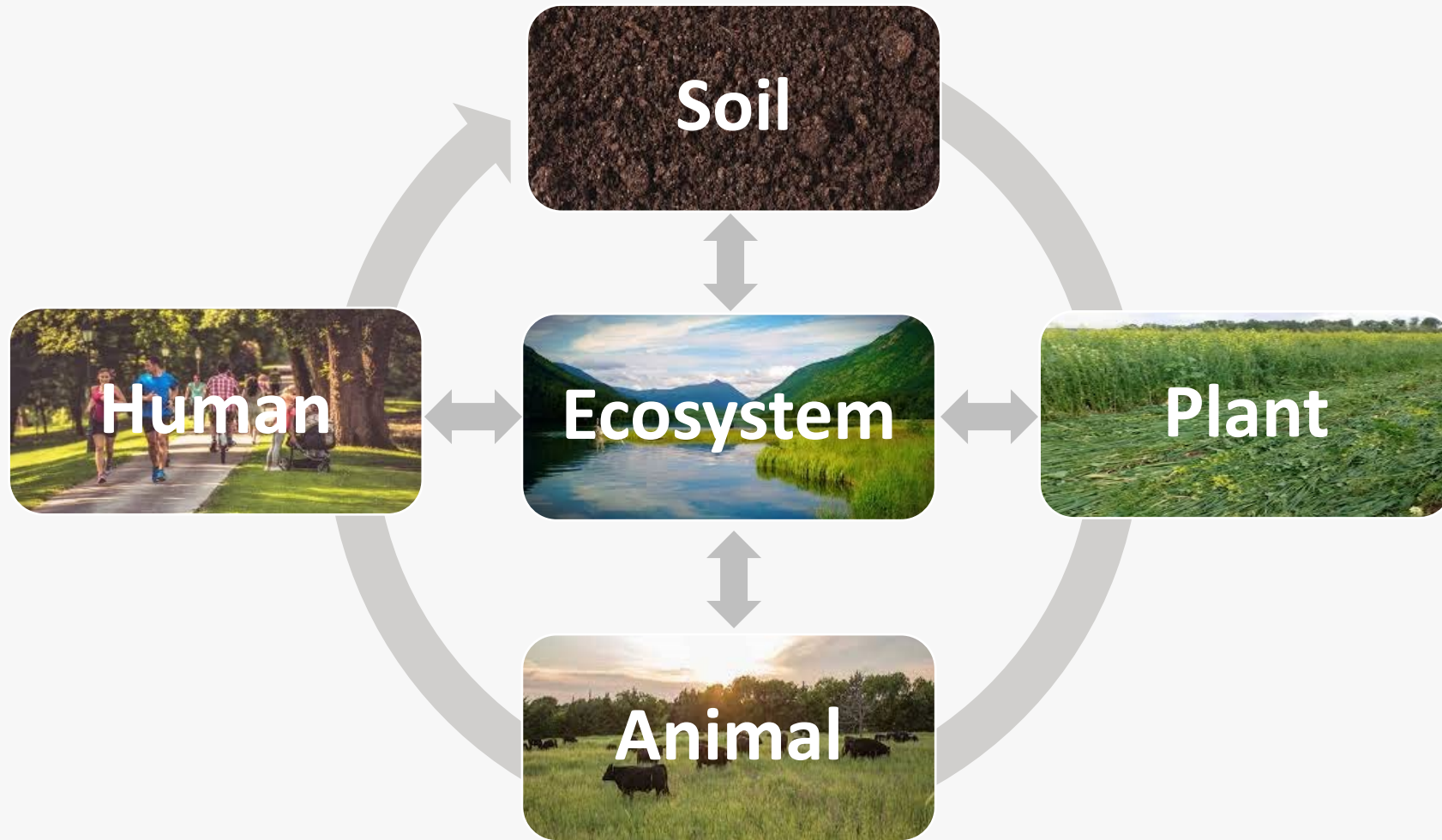
Fertillicide

The excessive use of fertilizers, tillage, or pesticides as a means to control nature in pursuit of food and wealth, ultimately leading to the demise of civilizations due to the degradation of ecosystems that support life.

Circular crop protection

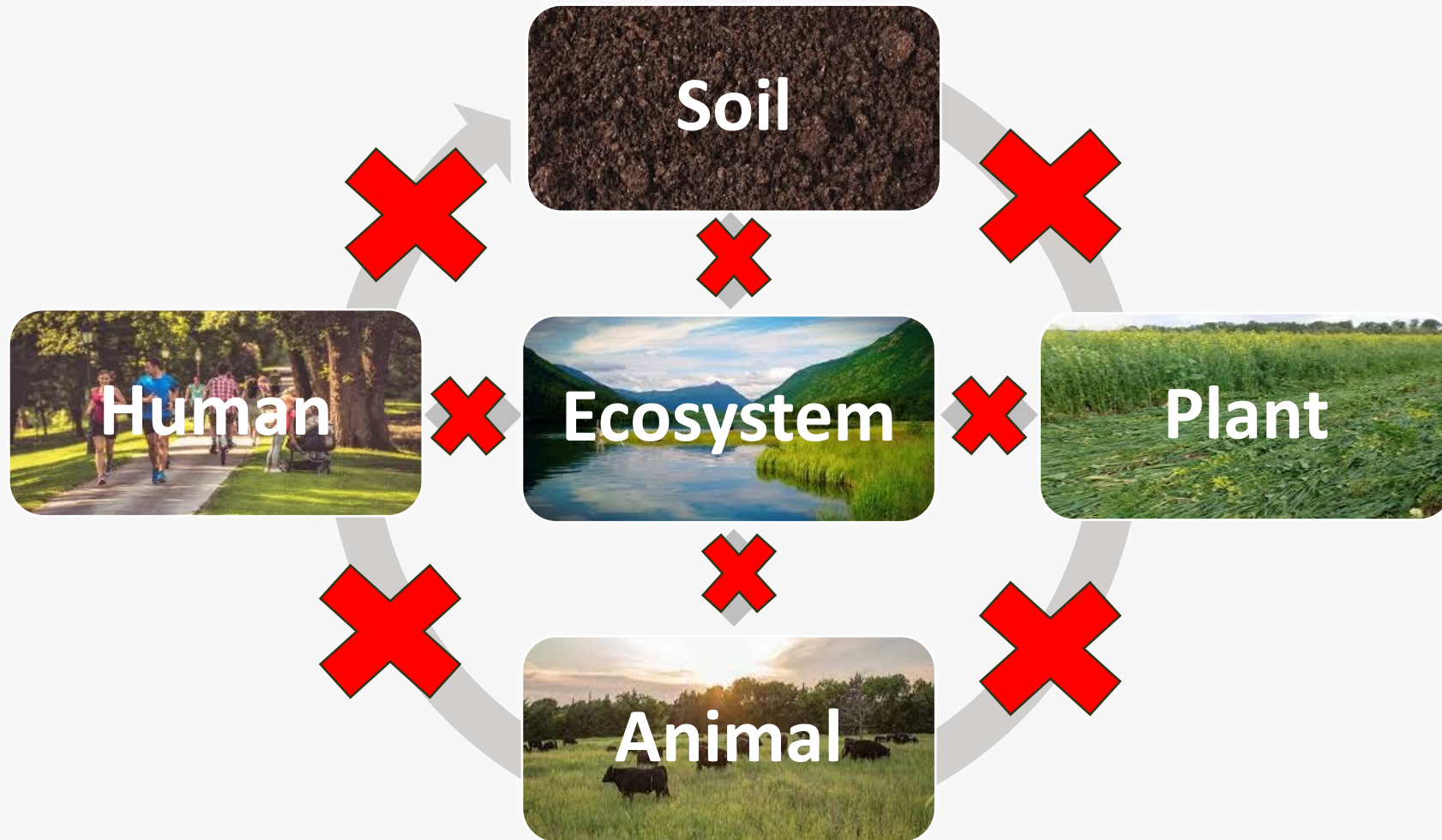


Circular soil-plant-animal-human ecosystem

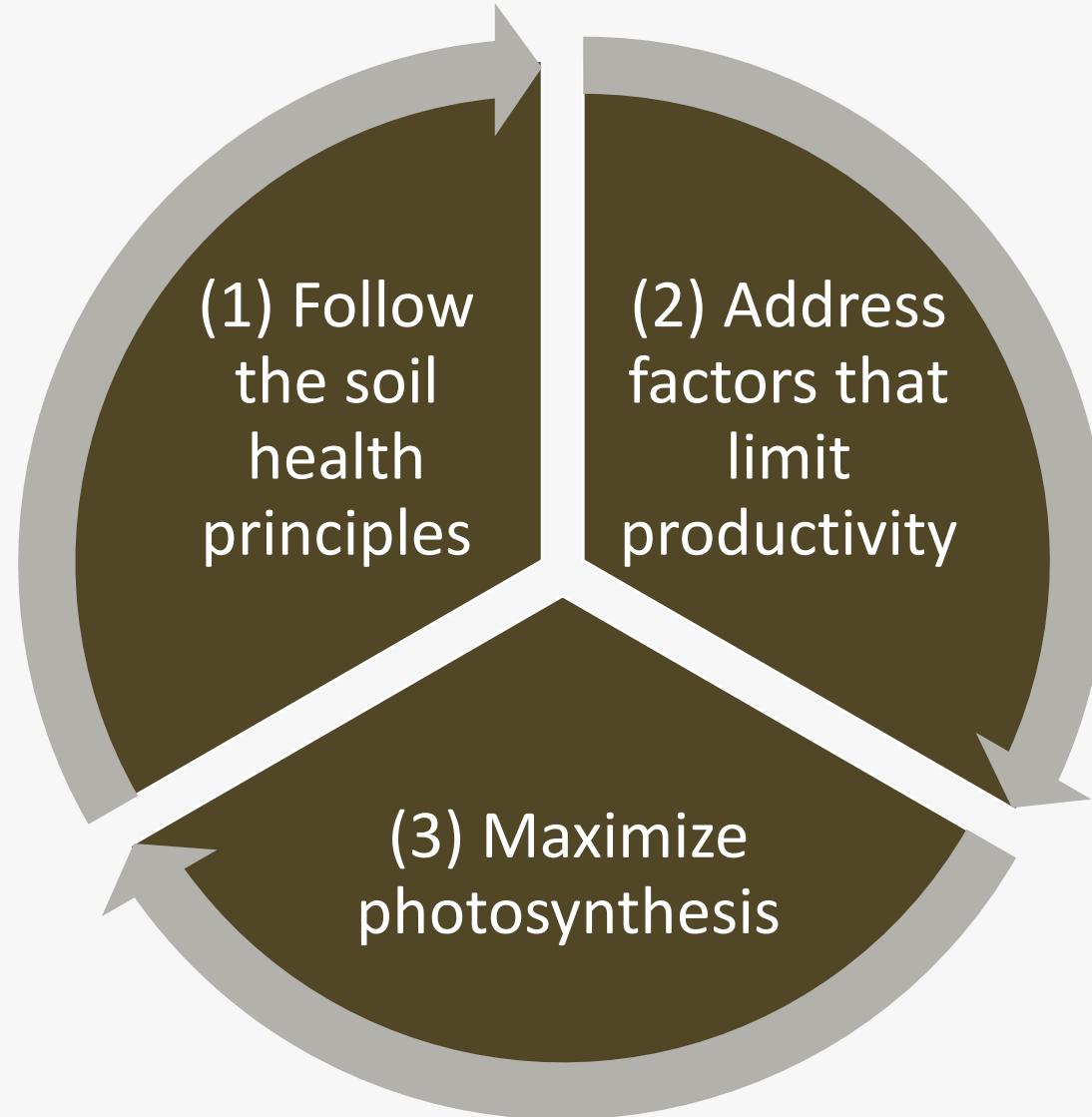


Natures model for capturing energy and recycling nutrients

Linear systems break links



Reconnecting Soil Plant links



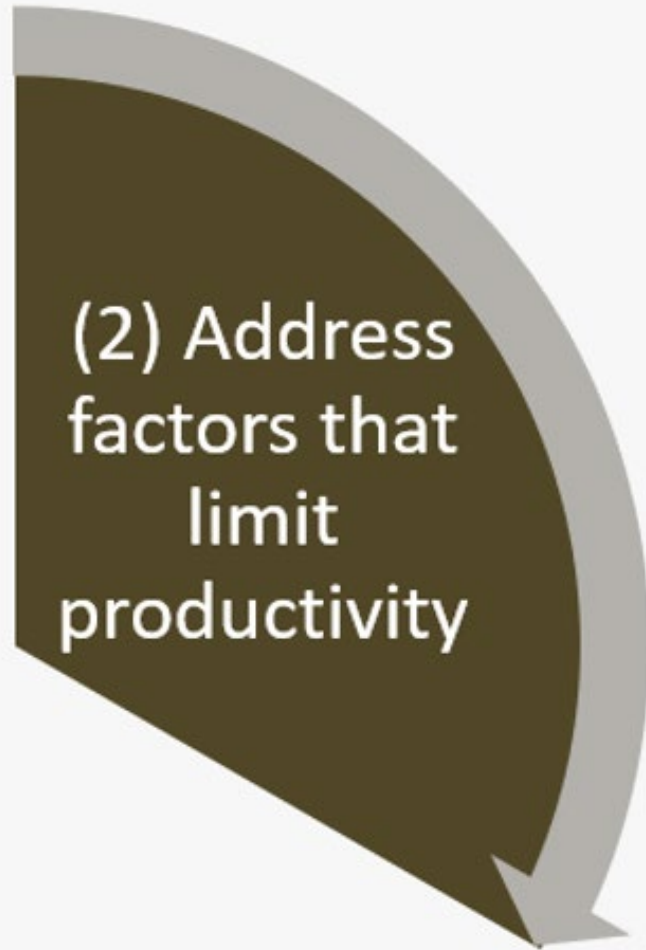
Follow the soil health principles



Learn to **NURTURE THE SOIL FOOD WEB**

- Wean off fungicide slowly
 1. Eliminate fungicides
 2. Eliminate seed/insecticide treatments
 3. Reduce herbicide rates
 4. Reduce purchased fertilizer inputs


Address factors that limit productivity



USE BIOLOGY to address limiting factors

- Fix compaction and build aggregates
 1. Air
 2. Water
 3. Decomposition
 4. Nutrients

Maximize photosynthesis



(3) Maximize photosynthesis



Use **CONTINUOUS DIVERSE PLANT GROWTH** to boost photosynthesis

1. CO₂: Increase soil respiration
2. Water: Build aggregates
3. Energy capture: leverage plant spacing and diversity
4. Nutrients

Reconnecting Plant Animal links

Grow

Grow healthier plants to feed healthier livestock.



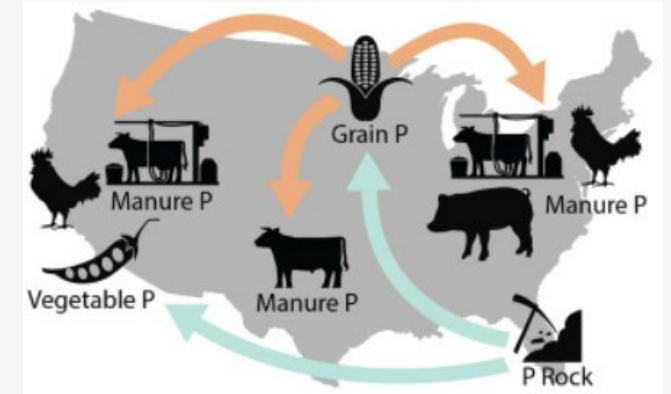
Move

Move animals out of confinement and back onto the landscape.



Redistribute

Redistribute livestock and manure nutrients.



Reconnecting ↔ links

Raise

Raise healthy products for your local community.

Buy

Buy food from local regenerative producers.

Build

Build local processing capacity.



Reconnecting Human ↔ Soil links



Recycle

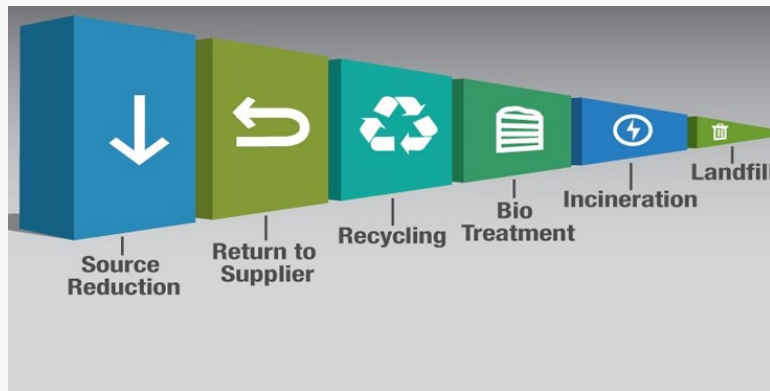
Landfill diversion and waste-to-soil projects.

Compost

Return human and food waste back to the land.

Reconnect

Reconnect people with soil and nature.



Reconnecting broken links

Plant

Keep soil covered and plant trees to buffer weather extremes.



Catch

Install distributed water catchment systems.



Restore

Landscape scale restoration and revegetation projects.



Prepare for an uncertain future

- Survival depends on your ability to **change**, **adapt**, and **manage** an evolving system. Never stop learning.
- **Prepare now** for eminent energy and material constraints.
- **Prepare now** for a fundamentally different economy.
- Harness **BIOLOGY** to power your farm.
- The most valuable capital in the future will be **social** capital.
- The most valuable skill in the future will be **cooperation**.
- The most valuable institutions will be those that are **anti-fragile**.

Use the power of scenius to solve problems

Scenius is collective genius applied to problem solving.

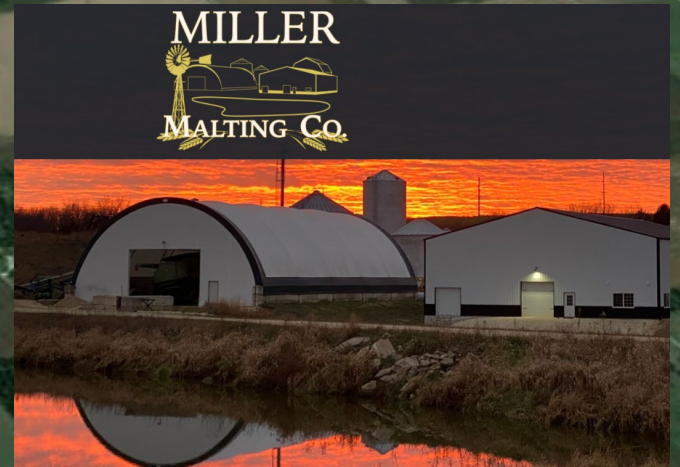
1. Mutual appreciation for the problem.
2. Rapid exchange of tools and techniques.
3. Network effects: success is celebrated by everyone.
4. A flourishing space for nonconformity: renegade, maverick, unusual, and revolutionary ideas are encouraged.



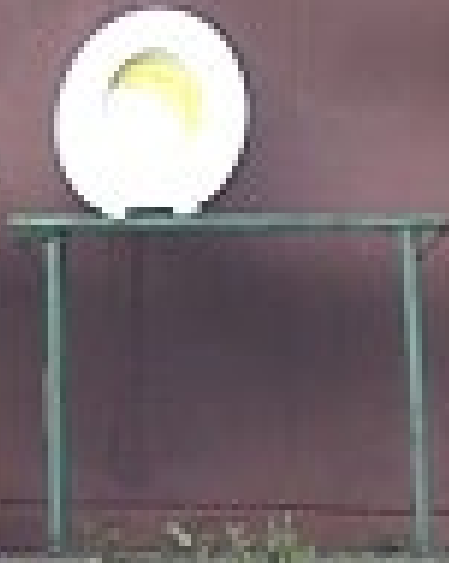
A new vision for agriculture

- ✓ Healthy, well aggregated soil on every farm.
- ✓ Functioning soil-plant connections and biological N cycling.
- ✓ Soil battery charged by continuous plant growth.
- ✓ Livestock managed for maximum ecosystem health.
- ✓ Renewable energy generated locally.
- ✓ Nutrients recycled locally.
- ✓ Farms fully integrated with their local communities.
- ✓ Farms and people are part of nature, not separate from it.

A new vision for agriculture

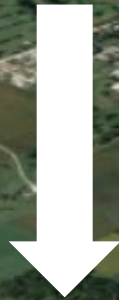


WORLD'S LARGEST OUTHOUSE



An aerial photograph of a rural landscape. The foreground and middle ground are dominated by a patchwork of green and brown agricultural fields, separated by thin white lines representing roads or fences. In the upper center, a small town or village is visible, with a cluster of buildings and a road network. The overall scene is a typical agricultural region.

Grow our farms from the top down



A regenerative vision for agriculture



**Support our communities from
the bottom up**

Thank you!

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