What we can do for healthy soil and a healthy planet

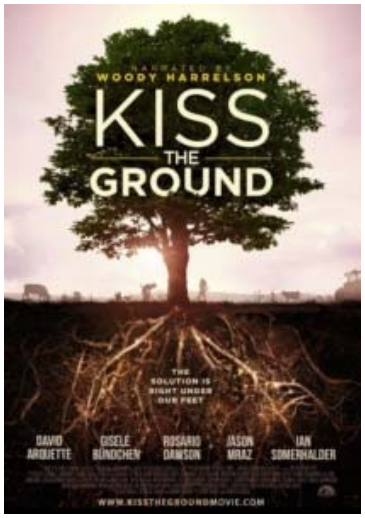
7-8:30 p.m., Thursday, April 22, Earth Day

Presented by the Earthcare Team

St. Benedict's Episcopal Church, Los Osos, CA

Faith Climate Action Week

Interfaith Power & Light



Available on Netflix or for free screening online through April 26 at
https://www.faithclimateactionweek.org/featured-film-kit/

The New York Times

Why Is Fashion Talking About Regenerative Farming?

Topics and presenters

How we manage our lands and grow our foods can heal the planet. Role of regenerative agriculture.

- **Tim LaSalle**, co-founder, Center for Regenerative Agriculture & Resilient Systems, Adjunct Professor of Agriculture, CSU Chico

What we can do in our own backyards and beyond.

- **Teresa "Tree" Lees**, garden educator, permaculture advocate

What we can do to expand healthy soils for carbon sequestration to heal the planet. Legislative advocacy.

- **Greg Haas**, District Representative, Congressman Salud Carbajal (CA 24th District, member of House Committee on Agriculture)

Sacred Ground

What we can do for healthy soils and a healthy planet

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AND RESILIENT SYSTEMS
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Wlp #DdVdoh/#SkG

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Dgmxqfw#Surihvvru/#FVX#Fklfr

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Soil Carbon Capture

Jcredd#whfkqlfdg#
srwhqwldo#ri#
whuuhvwuldo#F#
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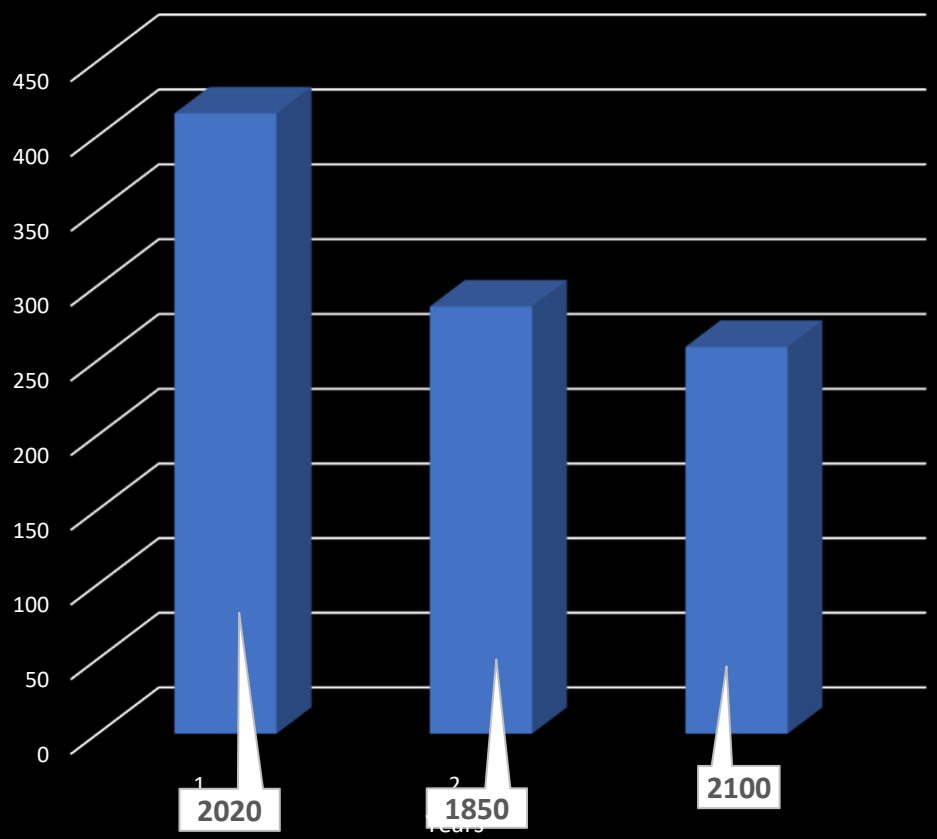

Existential Crisis

Point of No Return

"If we do not change course by 2020, we risk missing the point where we can avoid runaway climate change."

António Guterres, United Nations Secretary General

Sept. 2018

Climate Change

Is this the
New Normal?

Climate scientists say:
No, it is going to get worse.

Under 10 years!!!

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Reuters
SUSTAINABILITY

Only 60 Years of Farming Left If Soil Degradation Continues

Generating three centimeters of top soil takes 1,000 years, and if current rates of degradation continue all of the world's top soil could be gone within 60 years, a senior UN official said

54 years!!! 2015

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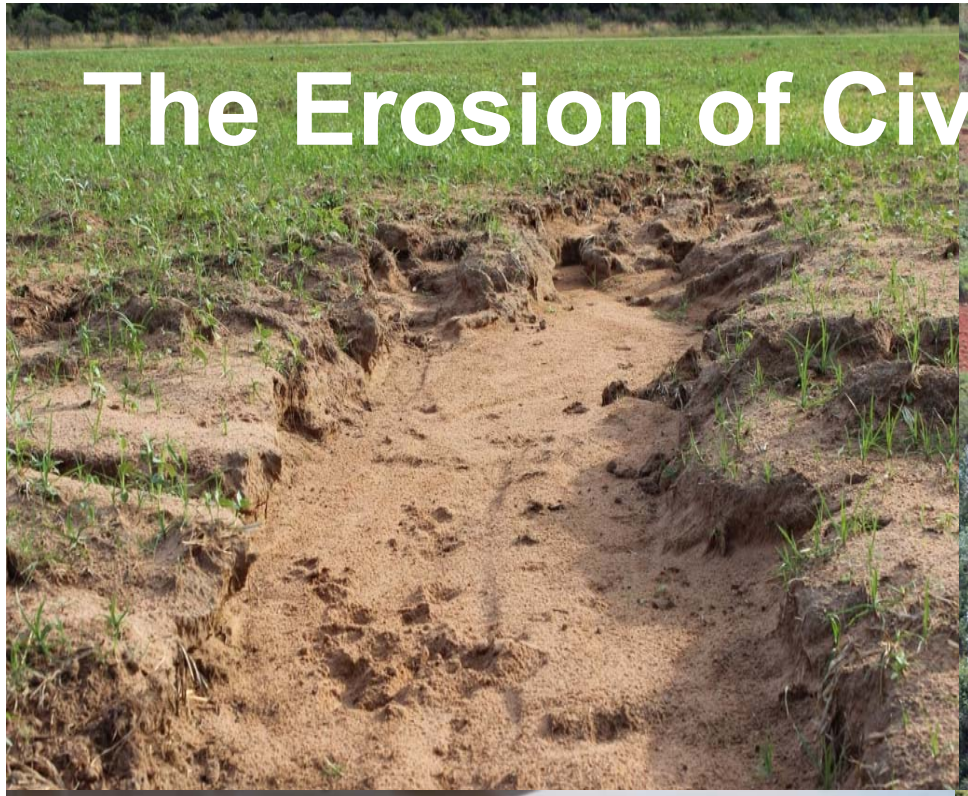
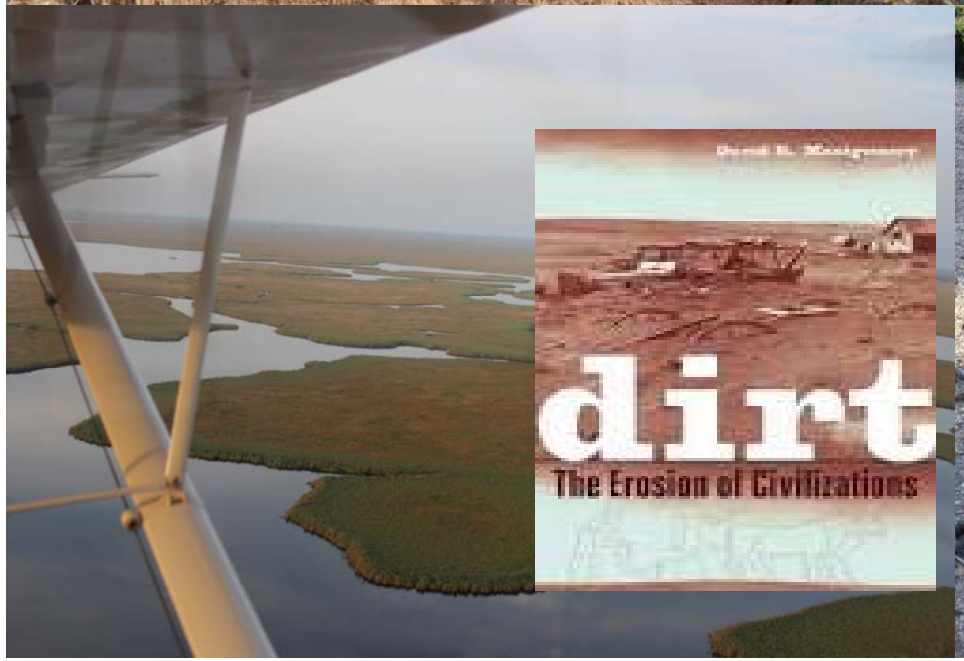
The Erosion of Civilization





Changing Paradigms

Geochemical ~ Living Biology

Fungal:Bacterial 1:1 or greater
Quorum sensing
Self fertilization

Soil Carbon Sequestration

0.5t/ha ~ 10-19t/ha

Crop Productivity

Improved photosynthesis efficiency, reduced C respiration
Increased yield ~ 660g/m ~ 3200g/m

David Johnson, PhD
Micro Molecular Biologist
NMSU
Adjunct Prof. CSU Chico

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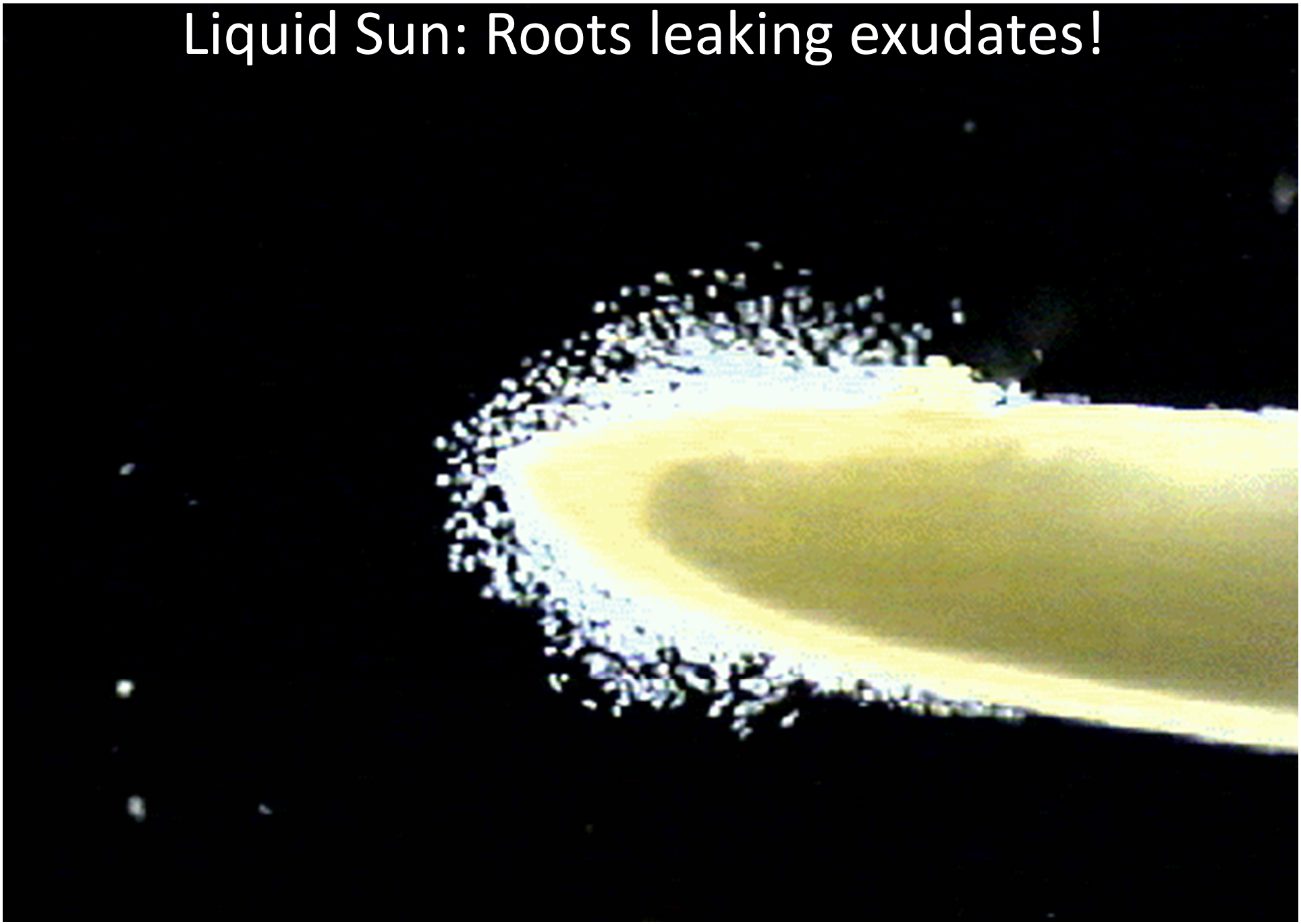
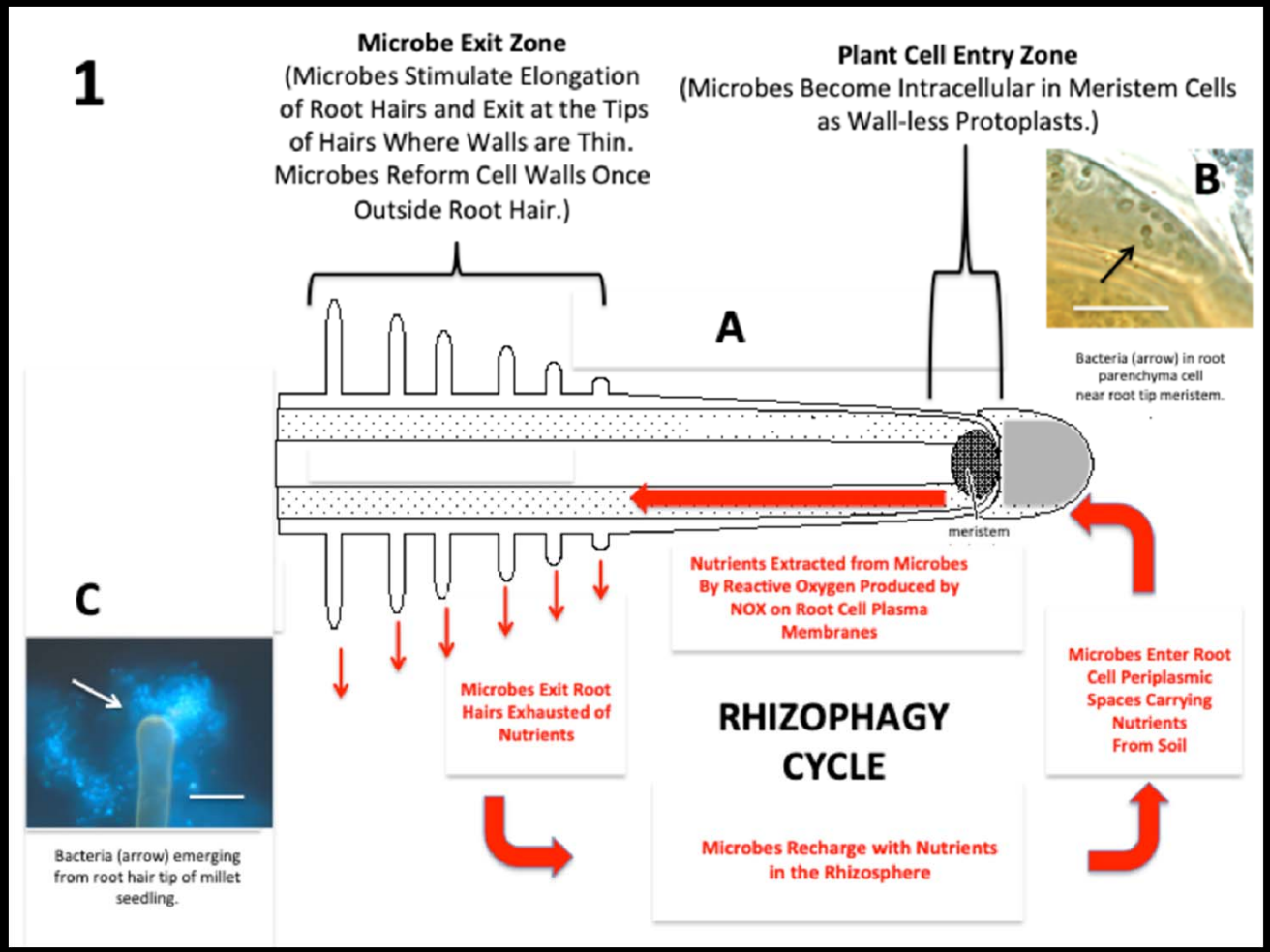
Fungal Network

50xs root surface increase

Liquid Sun: Roots leaking exudates!



Plant Nutrition through Rhizophagy



James F. White, PhD, Rutgers

regen.ag Academy

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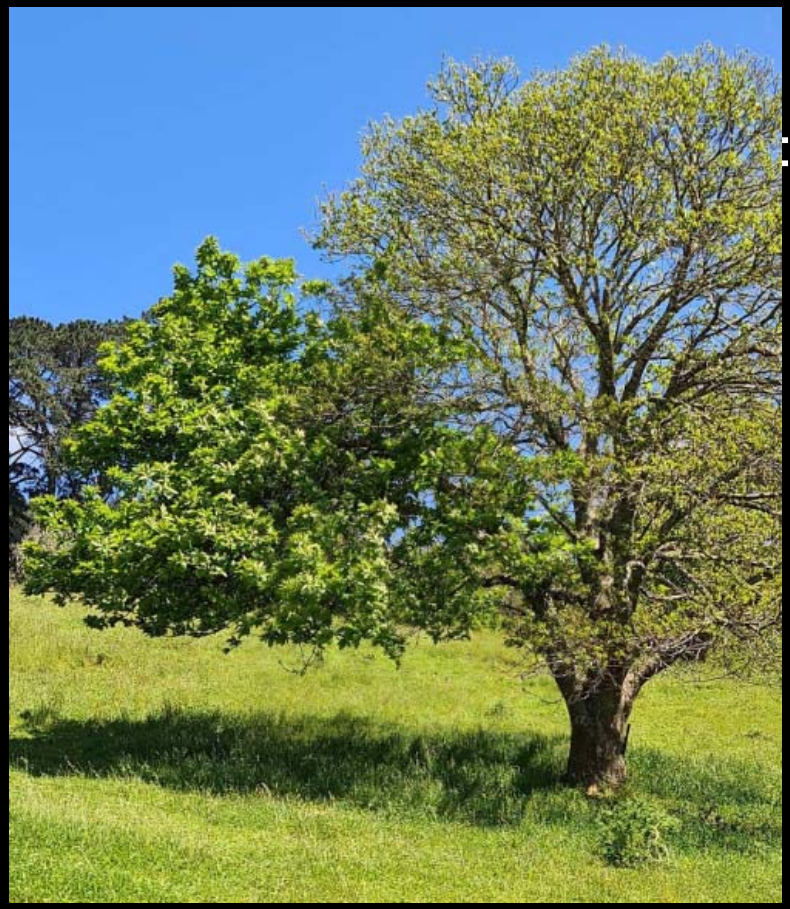
Australian Tree



Alisha Taff's Quince

New Mexico Trials

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Sorghum

Cotton

Johnson-Su

Compost

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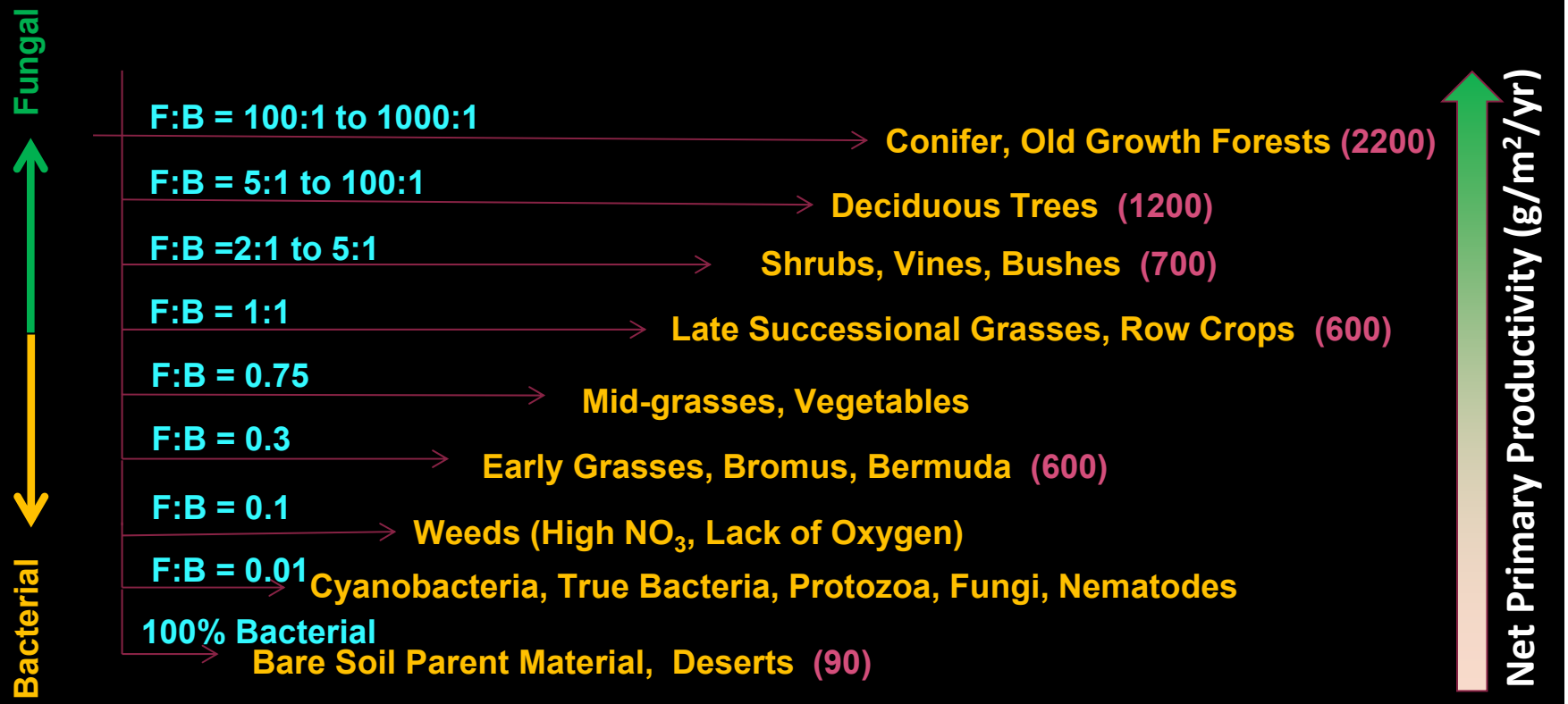
Johnson-Su

Compost

Plant Succession Ladder as a Function of Fungal:Bacterial Ratio (F:B)



Elaine Ingham- www. soilfoodweb.com

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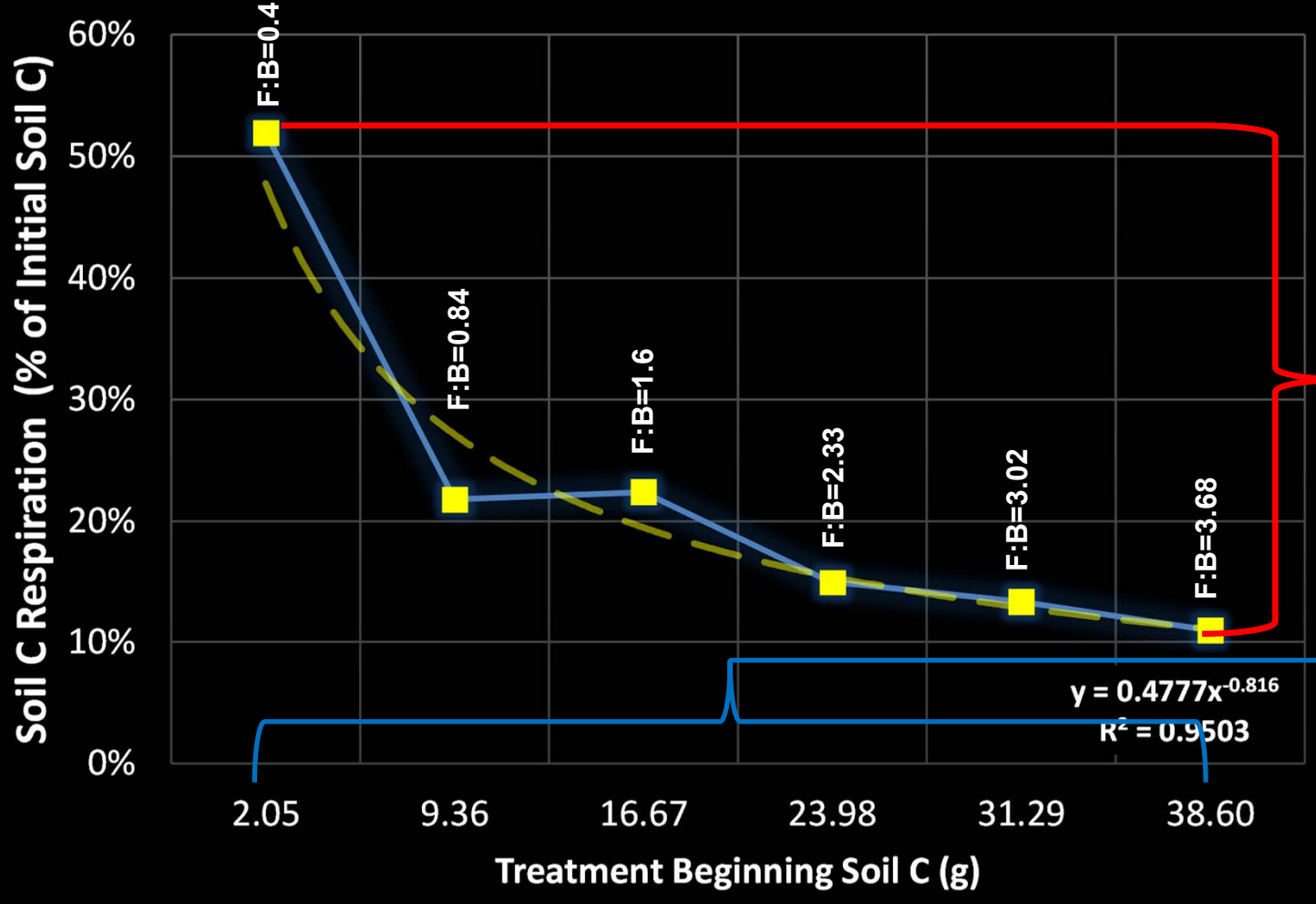
Percent of Initial Soil Carbon Respired



4 times Decrease in Relative Soil Carbon Respiration

10 Times Increase in Beginning Soil Carbon Mass

Greenhouse Trial

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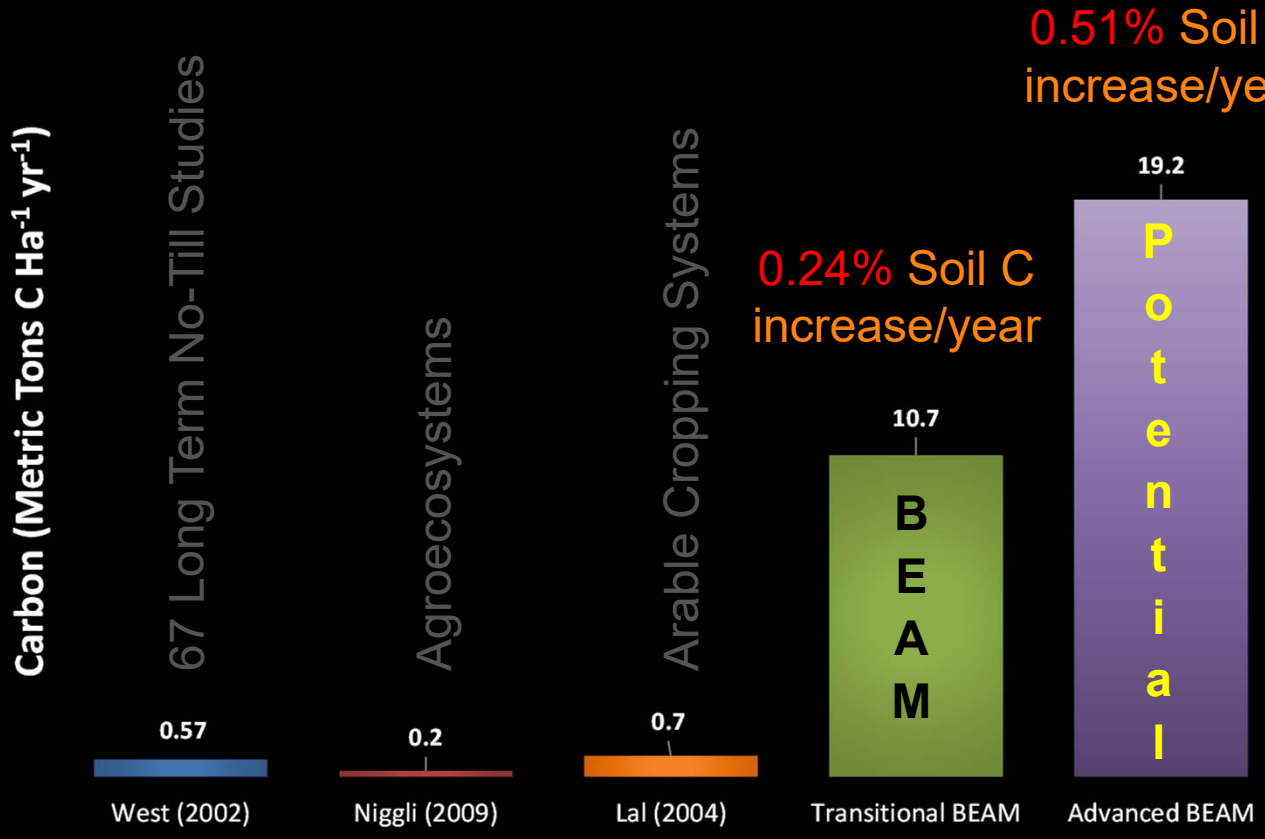
Comparing the BEAM Approach to Other Long Term Agroecosystem Studies



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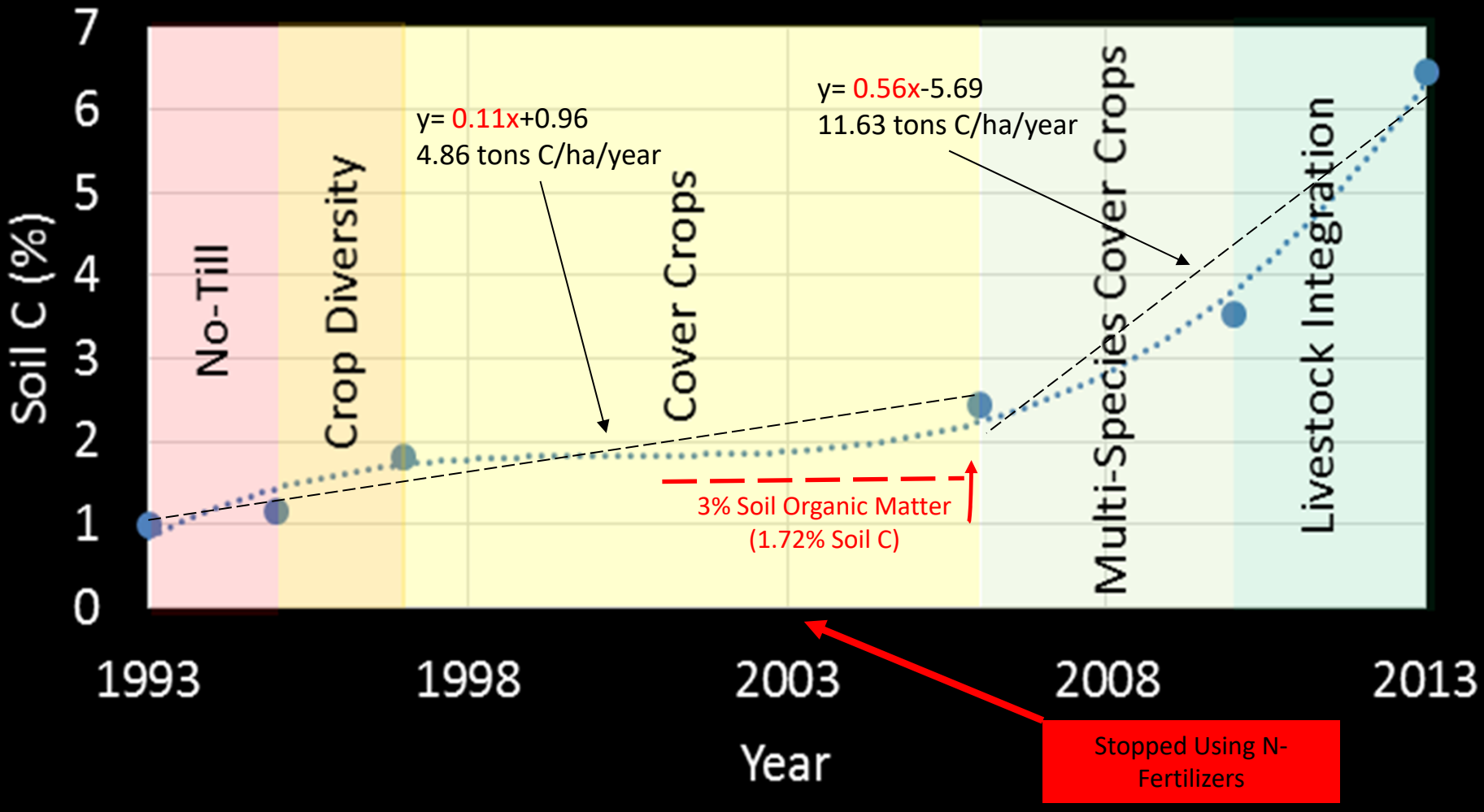
Gabe Brown's Soil Carbon Data



New Mexico State University

David C. Johnson- NMSU Institute for Sustainable Agricultural Research (ISAR)
davidcjohnson@nmsu.edu

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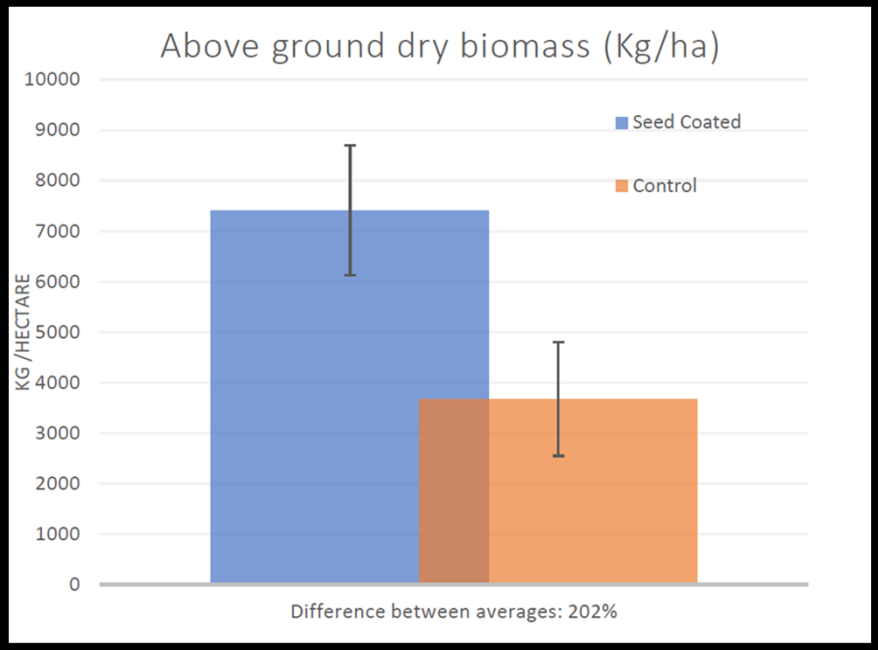
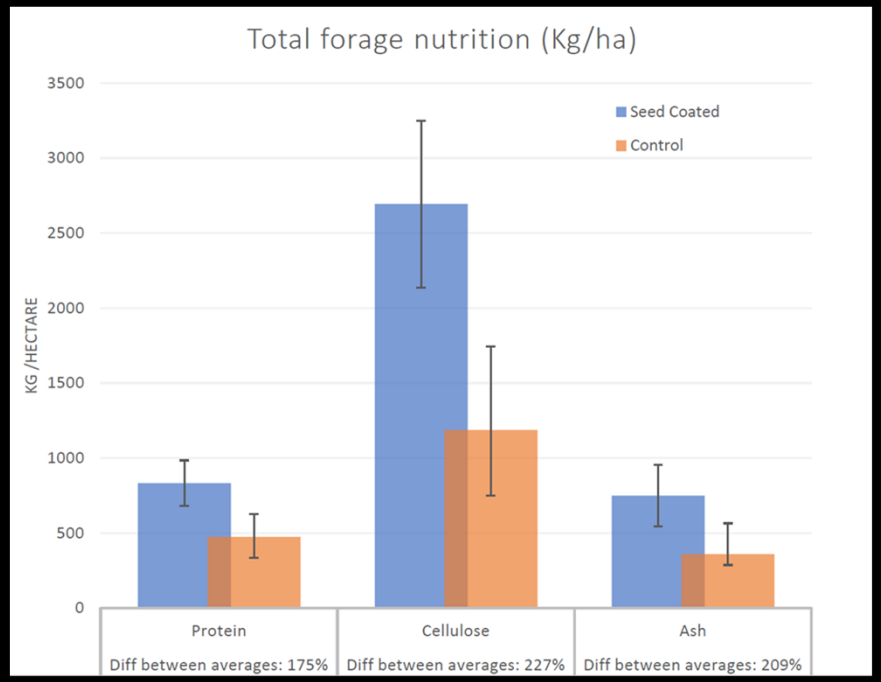


Information

- Farmer: Géraud Dumont de Chassart
- Location: Ferme de la Sarte, Longueville, Belgium
- Seed coating: Juan de la Serna
- Data collection : David Verstraete
- Data Treatment : Juan de la Serna



Seeding

- Crops: Radish, field peas, moha, sorghum, alfalfa.
- Experimental area: 1ha with coated seeds, 1ha as control.
- Seeding rate : 90kg/ha.
- Seeding date : 9/05/2020.
- Clay-loam soil.
- No fertilizer or amendments.
- Seed coating: Dr. David Johnson recipe + AACT .

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Ian & Di Haggerty's Field

http://www.futuredirections.org.au/wp-content/uploads/2017/08/FDI-Feature-Interview-Ian-and-Di-Haggerty.pdf

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Root Rhizosphere

Highest concentration of microorganisms

Dreadlocks

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Olp srsr#Vrxwk#Diulfd

Uhvhdufk#dqg#ghp rqvwudwlrq#
- Qr0wloo
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Tim LaSalle 2010-14

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We have degraded Mother Earth through tillage, chemicals, monocultures – but we can robustly regenerate life if we work with Her.

Sonora Desert

Sonora Grasslands

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Cindy Daley, PhD

Director, Co-founder Center for Regenerative Agriculture

CDaley@csuchico.edu

David Johnson, PhD

Adjunct Professor, Center for Regenerative Agriculture

Barriers to adoption

- Adoption theory – human adoption of new technologies
  - Peer pressure – don't want to be ostracized
  - Govt. incentives – subsidies, crop insurance, etc.
  - Science/University training – including govt. agencies
  - Input infrastructure – crop advisors, chemical sales
  - Unknown financial risks

Soil Aggregation

(No-till) Conservation Ag + Biological (Soil Biome)

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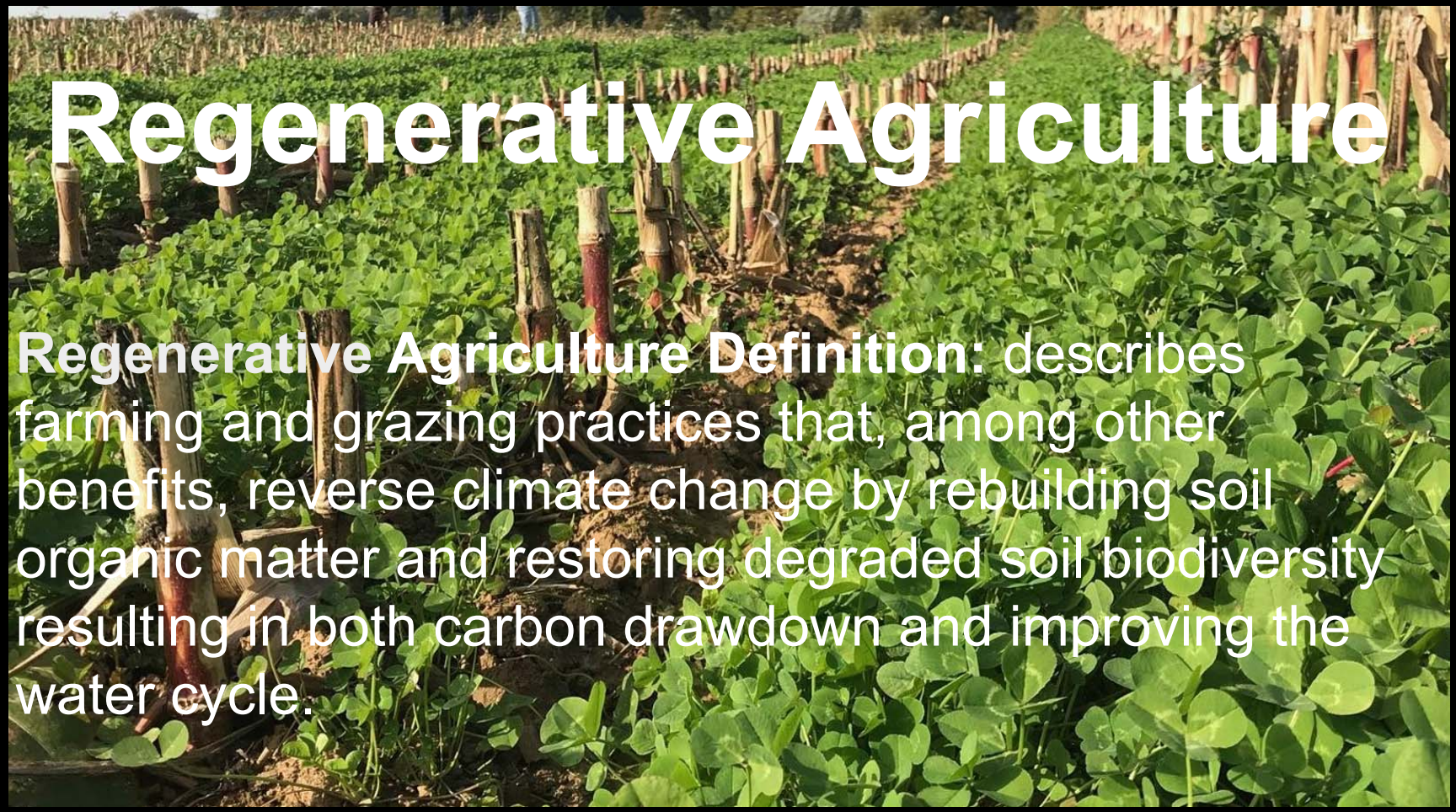

Regenerative Agriculture

Regenerative Agriculture Definition: describes farming and grazing practices that, among other benefits, reverse climate change by rebuilding soil organic matter and restoring degraded soil biodiversity resulting in both carbon drawdown and improving the water cycle.

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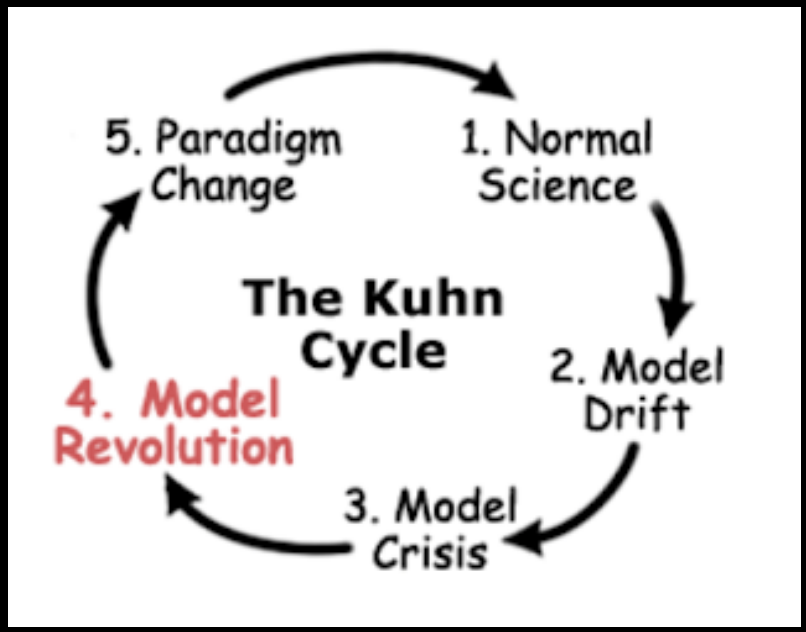
Paradigm paralysis: is a distinct set of concepts or thought patterns, including theories, research methods, postulates, and standards for what constitutes legitimate contributions to a field. (Kuhn)



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Regenerative Ag Practices on the Home Scale

Teresa Tree Lees – Our Global Family Farm

REGENERATIVE AGRICULTURE

Focuses on

Increasing biodiversity

Enriching the soil

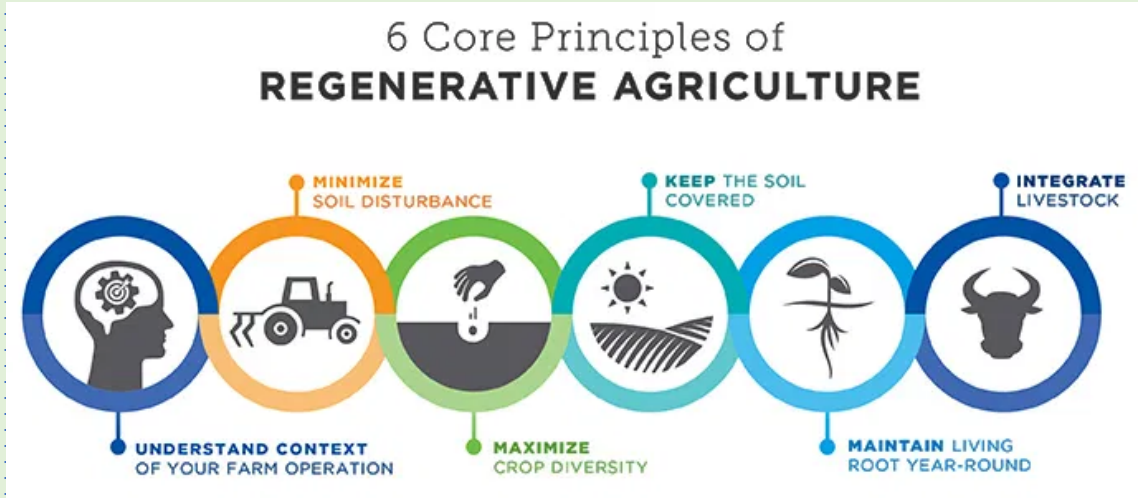
Improving water quality

Enhancing ecosystem services

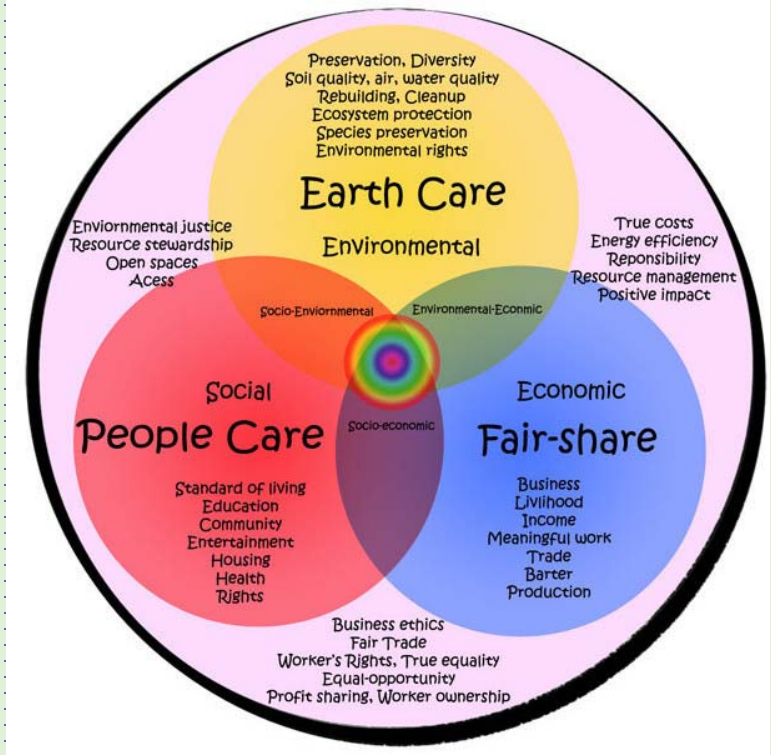
Reversing climate change

Dr. Axe
FOOD IS MEDICINE

6 Core Principles of Regenerative Agriculture



Permaculture Principles are Regenerative Ag



Practicing these principles on a small scale

Our Global Family Farm at City Farm SLO

- Maximizing Carbon in the Soil through Permaculture Practices
  - Agroforestry
  - Food Forest
  - Forest Gardening

- https://www.ourglobalfamilyfarm.com/

Three main methods of Carbon Capture

1. Maximize Rate and Amount of Carbon Sequestration in the Biomass (Sink It)
2. Maximize Rate of Transfer of Carbon into Soil Biology where it is most stable (Spread It)
3. Minimize Carbon Losses from the Soil (Slow It)

It's kind of like the slogan "Sink it, Spread it, Slow it"

#1 – Carbon Sequestration in Biomass of Trees & Shrubs ("Sink It")

- High Density Planting of Trees and Shrubs
- Use of Nitrogen Fixing Trees and Shrubs
- Maximize Use of Large, Fast Growing Trees
- Inclusion of Especially Deep-Rooted Trees and Shrubs

1 – Carbon Sequestration through Diversity of Biomass ("Sink It")

- Maximize Use of Perennials
- Maximize Species Diversity of Crops
- Maximize Use of Cover Crops
- Maximize Use of Intercropping & Polyculture

#2 –Transfer Carbon to Soil Biology ("Spread It")

- Return Biomass from Tree and Shrub Plantings back to the Forest Floor and Soil Surface
- Maximize Use of Wood Chips and High Carbon Mulches
- Leave Stumps & Branches & Leaves to Decompose
- Maximize use of Chop & Drop

#2 – Transfer of Carbon through Compost and Cardboard ("Spread It")

- Spread thick layers of compost to increase life in soil
- Spread thick layers of carboard to keep weeds down
- Create compost piles and spread that compost
- Create Hügelkultur Piles

#3 – Minimize Losses of Carbon ("Slow It")

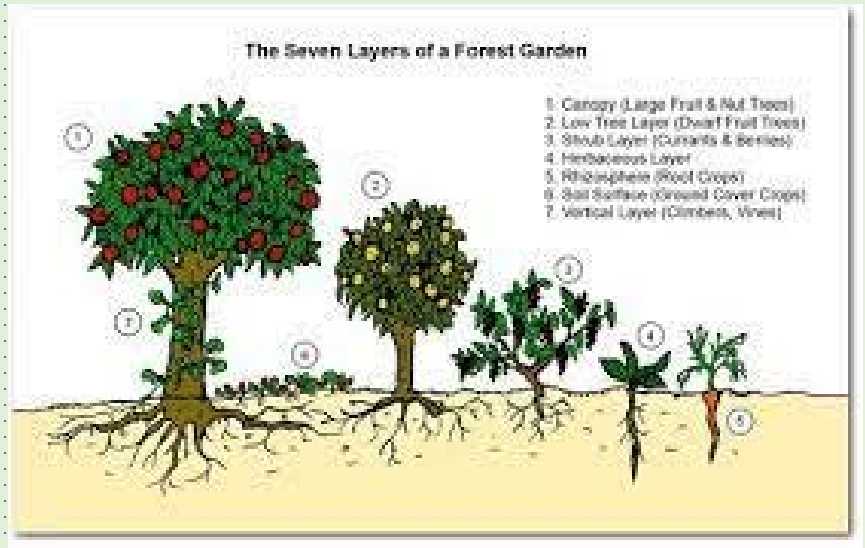
- Reduce Use of Soil Cultivation (Low or No Till)
- Avoid Bare Soil – Keep Soil Covered
- Keep Roots in the Ground as Much as Possible
- Slow Down Soil Erosion by Minimizing Soil Disturbance when Planting

#3 – Minimize Water & Wind Erosion ("Slow It")

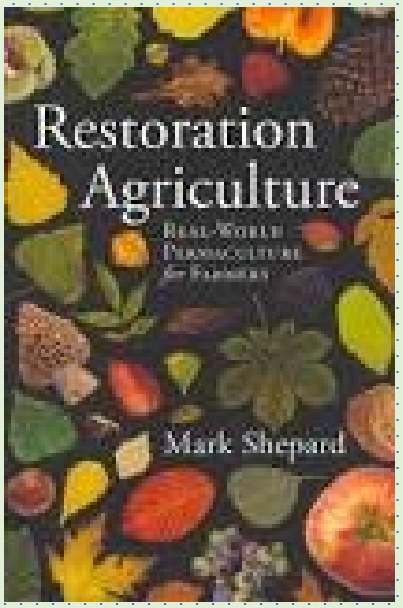
- Maximize use of Bioswales and Terraces to Catch & Store Water
- Slow Down Water Flow in Garden Beds and Neighboring Streams & Rivers
- Slow Down Wind Erosion with Windbreaks

Food Forests Sequester Carbon

- With these good techniques a Food Forest can sequester 4 to 5 tons/ha/year of carbon in the biomass and in the soil for decades to come.



Creating a Forest Garden by Martin Crawford
Restoration Agriculture by Mark Shepard



Welcome to my garden

Virtual visit

https://photos.google.com/share/AF1QipOfd-0YoGg_4FSBtmCOEkqtJk4jkstGIZJU1YvS5FM1hY5N1CyWq8w69NBNGUd46w/photo/AF1QipN4yKoaZe3YGxYBJPYBqtB0ozXS3n8WkxG16wUS?key=ZHoyOGhxbGI5U0pmQ0FZRzRoWjVtb2V3bmsyZkN3

So what can you do?

Disturb the soil as little as possible. Till or plow only if you must to break new ground. In established beds, gently remove weeds without tilling.

Never allow soil to remain bare. During the growing season, cover soil with an organic mulch, such as straw, bark mulch, or leaves.

During the off-season, plant a cover crop to nurture the soil ecosystem, deter weeds, prevent soil compaction from heavy rains, and add nutrients.

Include some perennial plants in your annual flower and vegetable beds. These plants' roots — and the carbon they contain — remain intact year-round.

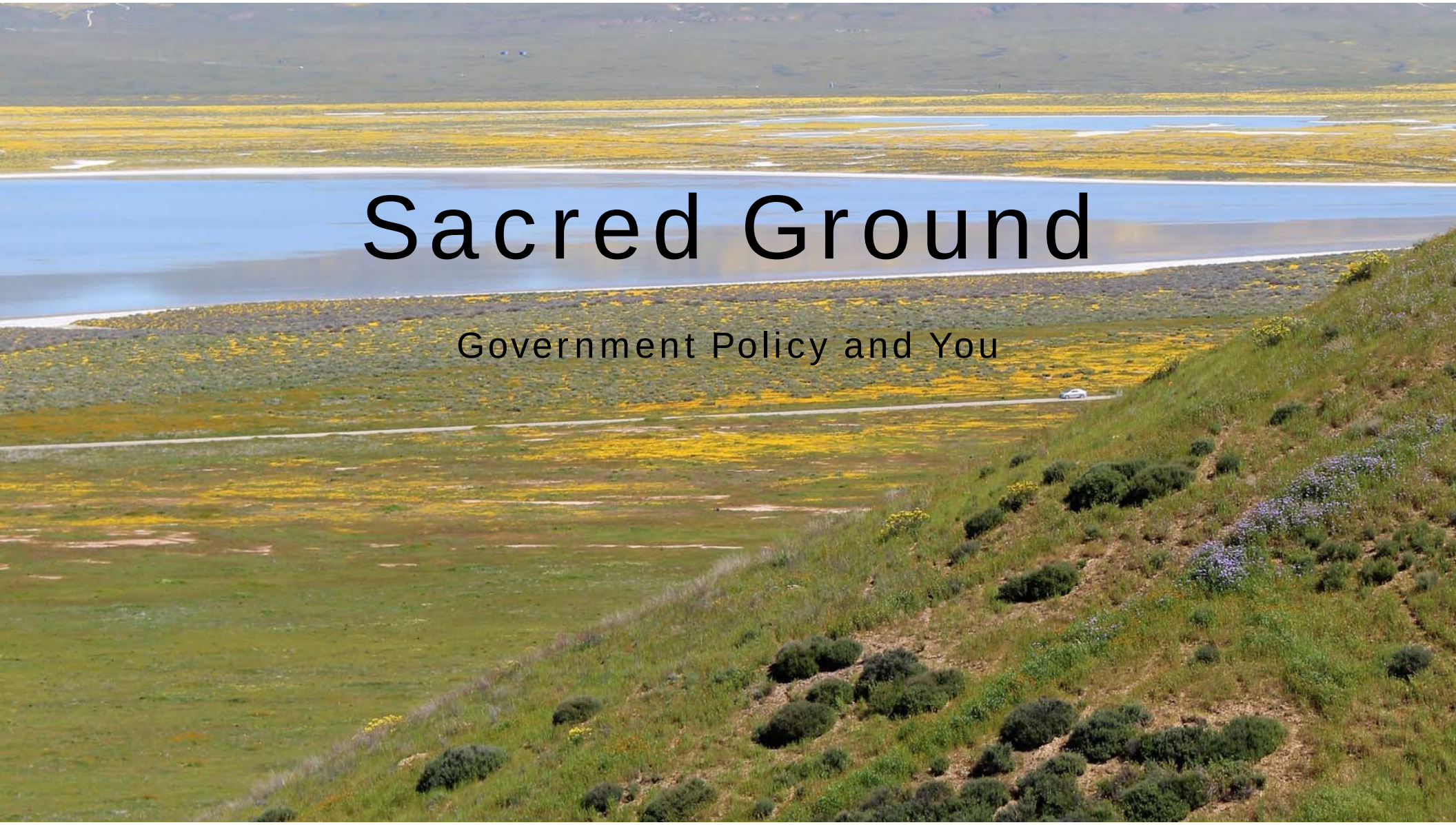
Add compost — homemade or purchased — to soil every year. Soil microbes consume organic matter, such as compost, and need to have a continual supply

Sharing, teaching, living a better future

Getting in Touch

- Teresa Tree Lees – treelees@charter.net
- Our Global Family Farm: https://www.ourglobalfamilyfarm.com/
- Volunteer: Sunday mornings 9am to 12noon
- Donate through PayPal: treelees@charter.net

- Remember, we are all part of one global family on this planet.



Sacred Ground

Government Policy and You

Sacred Soil

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Senior District Representative
Congressman Salud Carbajal (CA-24)
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San Luis Obispo, CA 93401
(805) 546-8348w
(805) 699-1442c
(805) 439-3574fx
Greg.Haas@mail.house.gov
https://carbajal.house.gov/

INVENTORY

U.S. GHG Emissions by Economic Sector

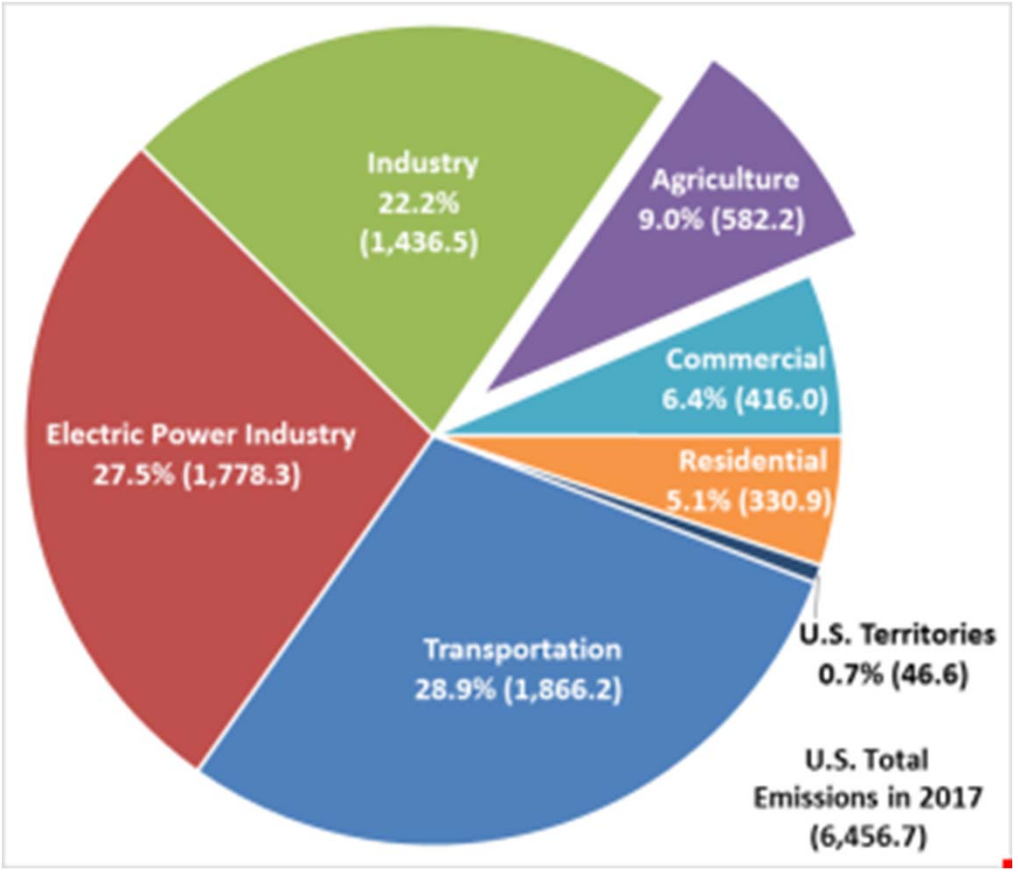
In 2017, three activity types accounted for 90% of U.S. agriculture (economic sector) emissions:

1. **Soil management (46%, 266.4 $MMTCO_2$-Eq.)**. N_2O emissions from soils, associated with agricultural practices that disturb soils and increase oxidation, releasing emissions into the atmosphere. Associated with fertilization, irrigation, drainage, cultivation and tillage, shifts in land use, and application and/or deposition of livestock manure and other organic materials on cropland and other farmland soils.

2. **Enteric fermentation (30%, 175.4 $MMTCO_2$-Eq.)**. CH_4 emissions from livestock occurring as part of normal digestive process in ruminant animals during metabolism and digestion. Associated with feed nutrient content and efficiency of feed use by the animal.

3. **Manure management (14%, 80.4 $MMTCO_2$-Eq.)**. CH_4 and N_2O emissions associated with livestock and poultry manure occurring from manure/waste that is stored and treated in systems that promote anaerobic decomposition (e.g., lagoons, ponds, tanks, or pits).

Source: CRS from *EPA Inventory*, 2017 data.
Notes: Emissions, in $MMTCO_2$-Eq., are presented in parentheses. The *Inventory* expresses GHG estimates in terms of CO_2-equivalents, aggregated to millions of metric tons ($MMTCO_2$-Eq.). CO_2-equivalents convert an amount of a GHG, such as N_2O, to the amount of CO_2 that could have a similar impact on global temperature over a specific duration (100 years in the *Inventory*).



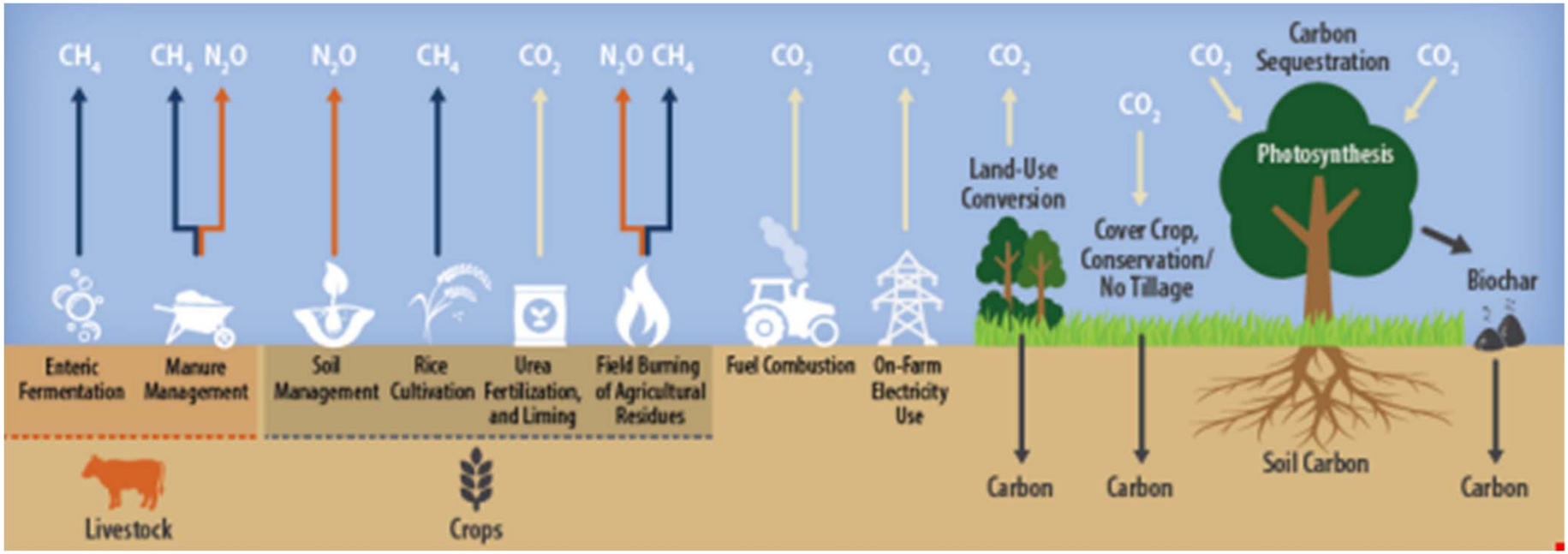
U.S. Agriculture and Related Source Emissions, 1990-2017

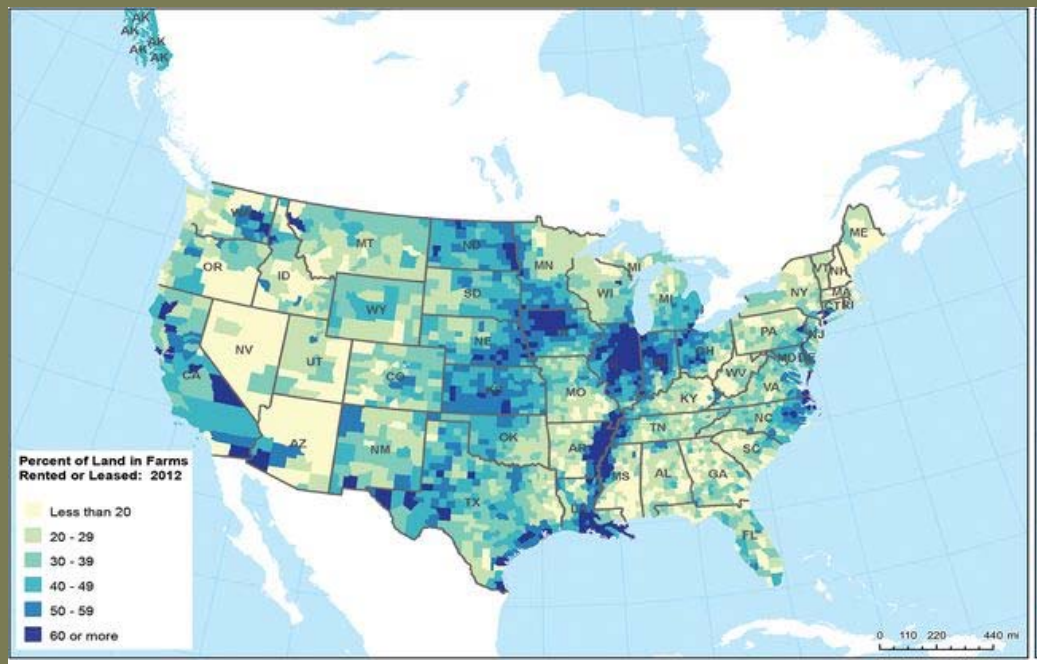
Source: CRS from *EPA Inventory* (emissions in $MMTCO_2$-Eq.).

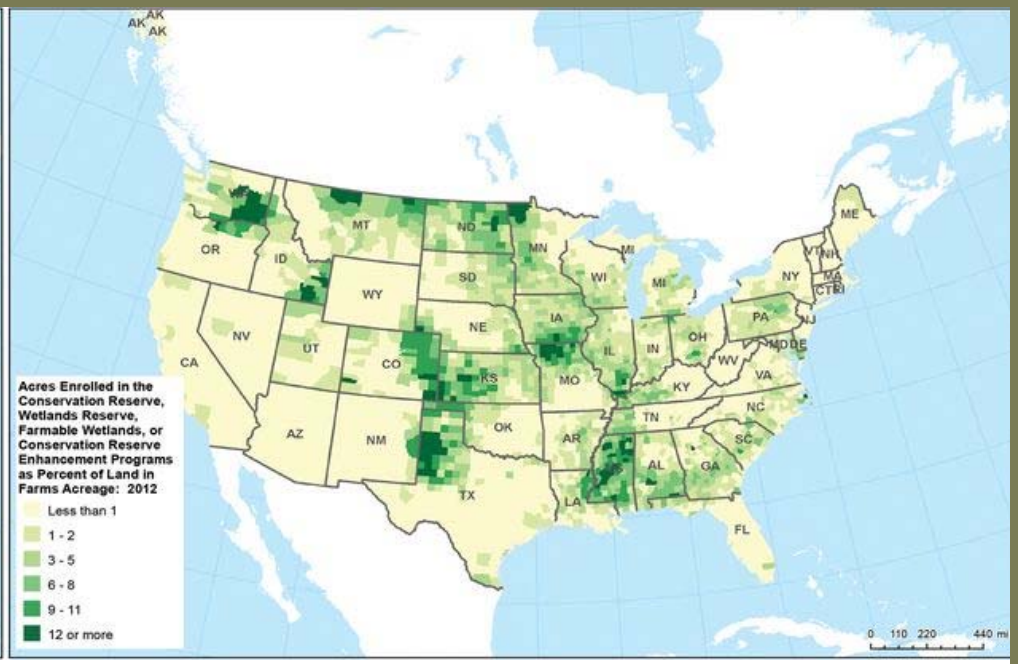
Emissions by Gas (Activity)	1990	2000	2010	2017
Total, Ag. Econ. Sector	**534.9**	**550.4**	**593.7**	**582.2**
N_2O (soil and manure mgmt.)	265.7	264.5	292.4	285.2
CH_4 (enteric ferment., manure mgmt., rice cultivation)	217.4	237.8	245.7	248.7
CO_2 (urea fertilization, liming)	7.1	7.5	8.6	8.2
CO_2, CH_4, and N_2O (fuel use)	44.6	40.4	47.1	40.0
Total Ag. w/Electricity-Related	**569.9**	**592.3**	**634.3**	**620.9**
CO_2, N_2O, SF_6 (electric.-rel.)	35.1	41.9	40.6	38.7
Tot. Emissions, All Sectors	**6,371.0**	**7,232.0**	**6,938.6**	**6,456.7**

GHG Emissions and Sinks from Agricultural Activities

Source: CRS.
Note: *Enteric fermentation* refers to digestive processes in ruminant animals, which result in GHG emissions.







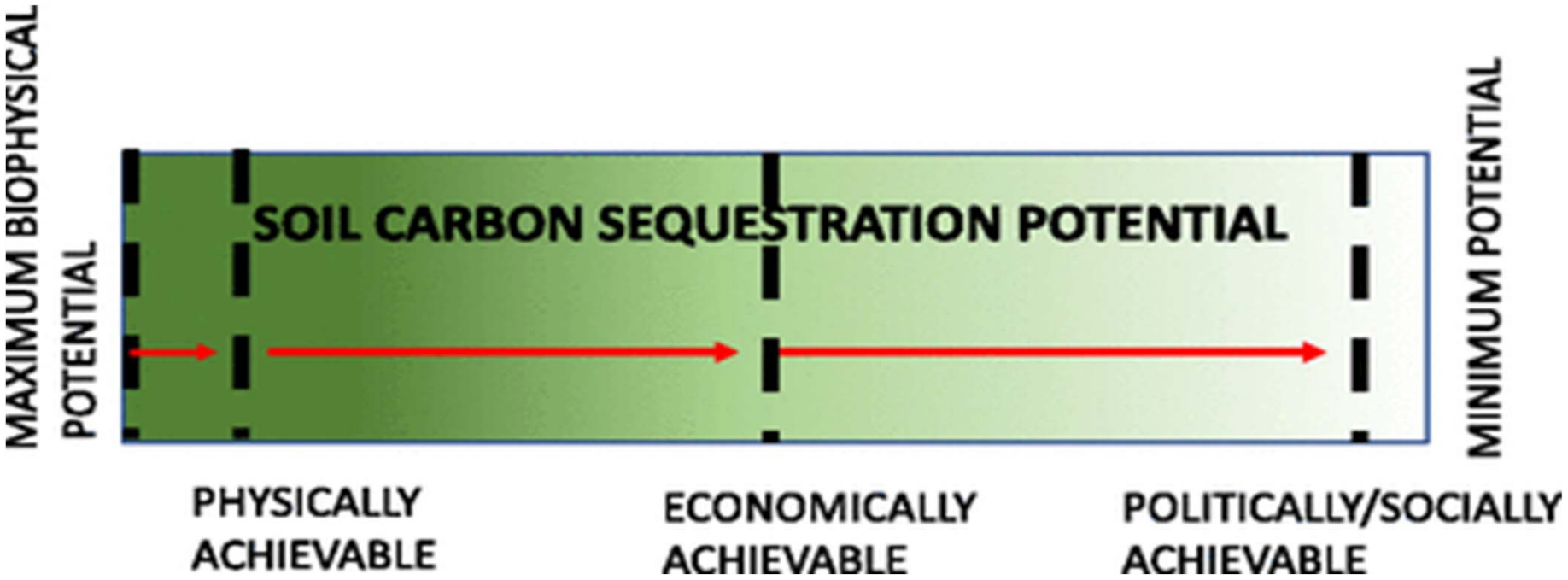
A map of the percentage of farms operated by renters in the United States (*Left*) and one depicting the percentage of land enrolled in government conservation programs. Data from 2012.

Image courtesy of USDA/NASS.

CHALLENGE

Technical vs Political

An illustration of the various impediments to maximum versus achievable soil carbon sequestration due to physical and socioeconomic controls. Modified from ref. 29, © 2004 Scientific Committee on Problems of the Environment (SCOPE)



WHAT IS BEING DONE

Devin Best, Executive Director of Upper Salinas-Las Tablas Resource Conservation District, with landowner working together to stop erosion after a 200-year flood event.

SCIENCE!

Compost Application and Reduced Tillage on Hay Field:

Coastal San Luis RCD has recently kicked off a project with Cal Poly that is taking a deep dive into the effects of reduced tillage and compost application on Hay production. This project has two experimental factors (compost, no compost, conventional tillage, reduced tillage) and looks at their individual and combined effects on soil and plant health as well as agronomic factors such as biomass. Cal Poly soil science professors and student researchers are helping with data collection and analysis and will be presenting the finding during outreach events and conferences.

Carbon Farming Practices

A partial list of USDA Natural Resources Conservation Service practices that are currently being prescribed as carbon and climate beneficial.

- **Conservation Cover #327 -** Establishing and maintaining permanent vegetative cover. This practice applies on all lands needing permanent vegetative cover. This practice does not apply to plantings for forage production or to critical area plantings.

- **No-Till #329 -** Limiting soil disturbance to manage the amount, orientation and distribution of crop and plant residue on the soil surface year around. This practice applies to all cropland and only involves an in-row soil tillage operation during the planting operation and a seed row/furrow closing device. There is no full-width tillage performed from the time of harvest or termination of one cash crop to the time of harvest or termination of the next cash crop in the rotation regardless of the depth of tillage.

- **Reduced Till #345 -** Managing the amount, orientation and distribution of crop and other plant residue on the soil surface year round while limiting the soil-disturbing activities used to grow and harvest crops in systems where the field surface is tilled prior to planting. This practice applies to all cropland and includes tillage methods commonly referred to as mulch tillage or conservation tillage where the entire soil surface is disturbed by tillage operations such as chisel plowing, field cultivating, tandem disking, or vertical tillage.

- **Critical Area Planting #342 -** Establishing permanent vegetation on sites that have, or are expected to have, high erosion rates, and on sites that have physical, chemical or biological conditions that prevent the establishment of vegetation with normal practices. This practice applies to highly disturbed areas such as: mined lands; road construction areas; conservation practice construction sites; areas needing stabilization before or after natural disasters; eroded banks of natural channels, banks of newly constructed channels, and lake shorelines; other areas degraded by human activities or natural events.

- **Hedgerow Planting #424 –** Establishment of dense vegetation in a linear design to achieve a natural resource conservation purpose. This practice applies wherever it will accomplish at least one of the purposes stated above.

- **Compost Application #XXX –** Application of compost on grazed rangelands. This practice is currently under development by the USDA NRCS

- **Prescribed Grazing #528 -** Managing the harvest of vegetation with grazing and/or browsing animals. This practice applies to all lands where grazing and/or browsing animals are managed.

SLO County RCDs

- Coastal San Luis Resource Conservation District (805) 772-4391

- Uppers Salinas-Las Tablas Resource Conservation District (805) 460-7272

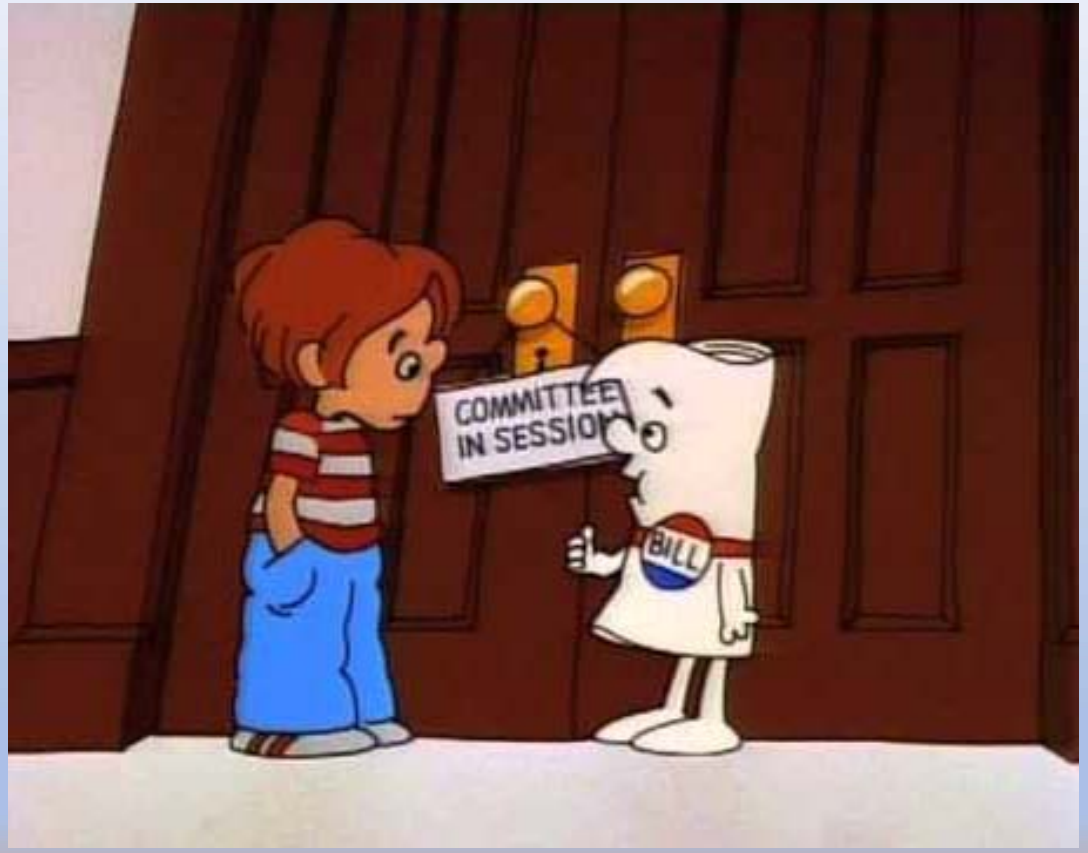
WHAT CAN BE DONE?

From your backyard to…

the Capitol.

Advocacy

- Form advocacy groups,
  - ❑ Develop a Strategy
- Work with organizations and agencies who are making an effort
  - ❑ Collaborate
- Educate the public and elected officials
- Lobby your elected officials on what needs to be done
  - ❑ from local to Federal




Thank You

Opportunities for you to take action

- Join the Earthcare Team open to community participation -- send an email to office@stbenslososos.org to indicate your interest.

- Express your interest and support for regenerative agriculture – ask farmers about it, buy from farmers who follow regenerative agriculture.

- Join the Kiss the Ground community – www.kisstheground.com/memberships

- Advocate with state and federal elected officials and agencies to support policies that promote healthy soils for a healthy planet.