

# Resilient farming systems in the face of climate change-Practical Farmers of Iowa Conference 2020



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# Photosynthesis and Respiration tell us much about climate change

- **Photosynthesis:**  $\text{CO}_2 + \text{H}_2\text{O} \xrightarrow{\text{sunlight}} \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$  ( in the presence sunlight)
- **Respiration:** Carbon dioxide plus water yields sugars plus oxygen
- $\text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2 \rightarrow \text{CO}_2$  plus  $\text{H}_2\text{O}$  —( $\text{CO}_2$  is a by-product of cellular respiration and the burning of fossilized plants for our energy use) Heat and gases are released that trap heat in the earth's atmosphere



# Where are the CO2 emissions coming from?

- About 28% from burning of fossil fuels in transportation vehicles and 28% as well from electrical generation
- Industrial use-22%
- Agriculture-9%-estimates vary
- Commercial and Residential-11%
- Where are greenhouse gases coming from?
- Carbon Dioxide-76%
- Methane-16%
- Nitrous Oxide-6%
- Took billions of years to create all of this stored carbon-used much if not most of it in just less than 400

# It's a delicate balance of infrared light absorption that keeps us from plunging into an icy state

- CO<sup>2</sup> amounts to about 20% of the greenhouse effect
- Water Vapor and clouds- 75%
- Minor gases and aerosols- 5% (NO<sup>2</sup>, methane, Ozone, fluorocarbons)
- Water vapor quickly precipitates out and would turn us to ice (feedback mechanism)
- CO<sup>2</sup>- ice ages-180ppm
- Warmer periods-280 ppm
- Today-415 ppm
- Future-600 ppm and beyond



# HOW IS WEATHER CHANGING IN WESTERN IOWA?

- Extreme weather and precipitation events
- Warmer and wetter overall
- Cold wet springs
- Warmer nights and winters
- Increased summer precipitation
- Longer growing seasons
- Less 100 degree days



# Principles of Regenerative Agriculture and Resiliency

- **Providing eco-system services**  
(let nature do the heavy lifting)
- **Sequestering carbon**
- **Community based**
- Economic Stability through adding value
- Innovation and on-farm research
- **Being content with what you have**
- **Diversity**
- **Soil Quality**
- Water Retention
- Perennials
- Microbes, Insects, wildlife
- Composting
- Livestock
- Recycling of Nutrients
- Conservation
- Agroforestry



What we do on our farm  
= Diversity, over 50  
fields, plant more than 20  
species every year





Early spring  
annuals-oats,  
barley, wheat,  
field peas,  
cool season  
grasses







# Late Spring Annuals Corn - Soy

Ridge Till Cultivation



# Controlling weeds without pesticides & reducing tillage

Taking the longer view-  
crop rotations and  
curbing spread of weed  
seeds- don't assume new  
herbicides-Frisvold and  
Adams





Practical Farmers of  
Iowa and on-farm  
research-over 40 trials on  
our farm since 1987



Winter annuals, rye, triticale, hybrid rye-no-till drilling  
soybeans in rye stubble

**Cutting rye for hay on  
June, 9, 2014**



**What about complete no-till in  
organics? Planted on June 13,  
2014**





Late Summer annuals-turnips, millet,  
Sorghum-Sudan, vetch, radish, buckwheat, etc.



**Composting:** role of microbes to feed soil & improve soil health, produce stable carbon, no purchased N for 37 years









Trees and shrubs  
provide so many  
services besides storing  
CO<sup>2</sup>-wind protection,  
wildlife habitat,  
pollinators, etc.

































# Adaptation versus Mitigation

- Agriculture could lower CO<sub>2</sub> emissions by as much as 150 ppm
- Melting of the perma-frost could raise it by 150 ppm
- **Challenges:**
- Fear
- Can we and will we be able to change?
- Demand policy changes
- Tell the truth about agriculture and food production
- How much suffering before we say enough is enough
- Will we rapidly develop a new ice age?

