Climate Smart Agriculture: What's all the Buzz

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Climate-smart Agriculture

- Integrated approach to managing landscapes
  - Cropland, livestock, forests, fisheries
- Addresses interlinked challenge of food security and climate change
- First defined in a 2010 by the Food and Agriculture Organization of the United Nations

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Source: https://www.fao.org/3/i1881e/i1881e00.htm

Climate-smart Agriculture

- 3 main goals
  - Increase productivity
  - Enhance resilience
  - Reduce emissions
- Does not define any new farming practices
- Does include many of the things already being done
  - Nutrient management, conservation tillage, cover cropping, etc.

Source: https://www.climatehubs.usda.gov/hubs/northeast/topic/role-climate-smart-agriculture-climate-adaptation-and-mitigation-northeast

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Why now?

- Growing global population
  - Changing diets
  - Increased demand for food
- Food production struggling to keep up
  - Crop yield leveling off globally
  - Stressing natural resources (soil, water, biodiversity)
- In 2020, 690 million people (8.9%) hungry

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Source: https://www.worldbank.org/en/topic/climate-smart-agriculture

Agriculture and a Changing Climate

- Agriculture vulnerable to:
  - Increasing temperatures
  - Weather variability
  - Shifting agroecosystem boundaries
  - Invasive plants and insects
  - Increased frequency of extreme events
- Substantial investment in adaptation is needed to maintain and increase yields

Source: https://www.worldbank.org/en/topic/climate-smart-agriculture

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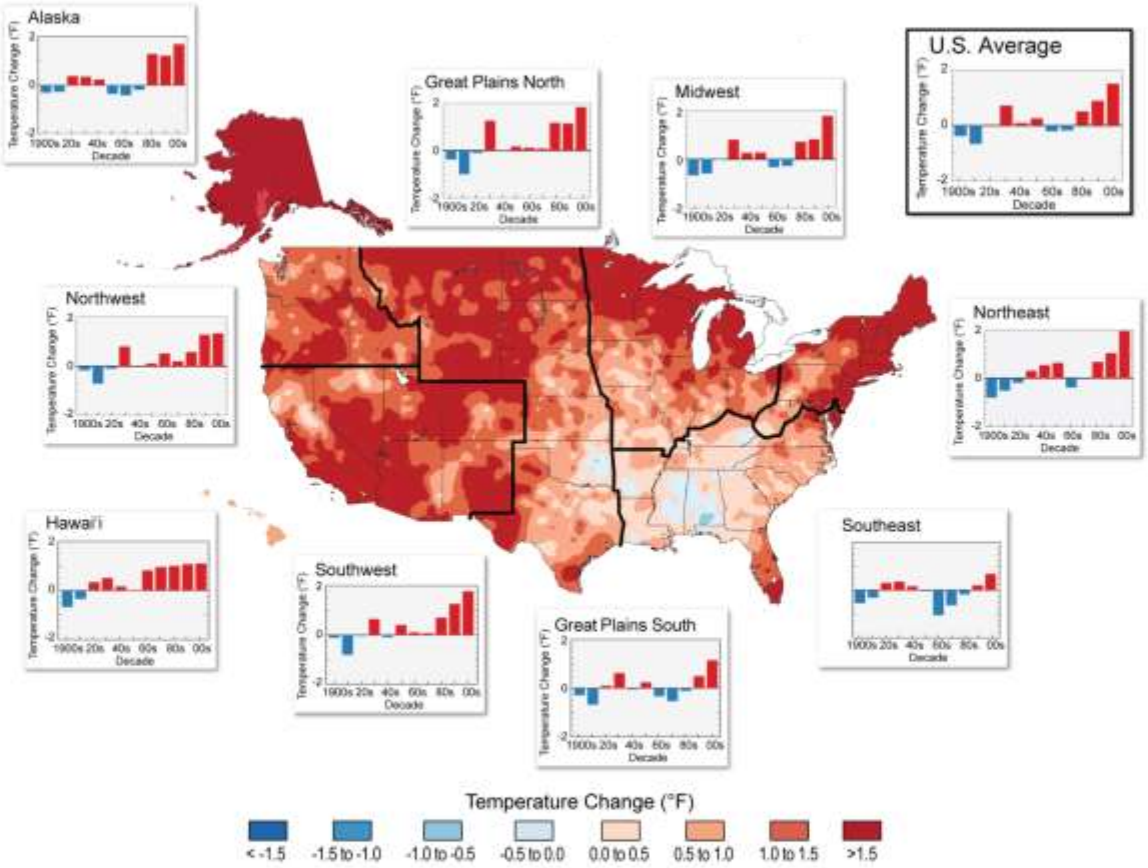
Observed U.S. Temperature Changes



Source: Walsh et al. 2014, National Climate Assessment; SARE – Climate Change in Agriculture, 2015

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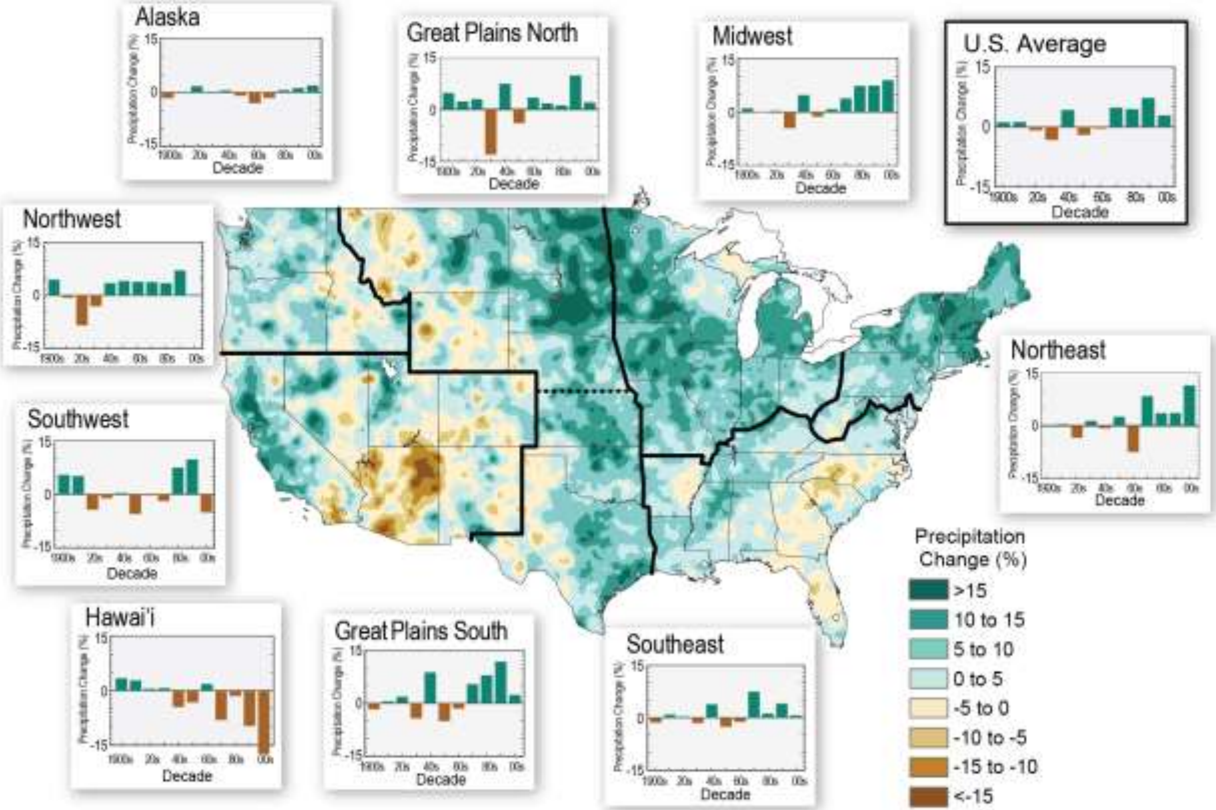
Observed U.S. Precipitation Changes



Source: Walsh et al. 2014, National Climate Assessment; SARE – Climate Change in Agriculture, 2015

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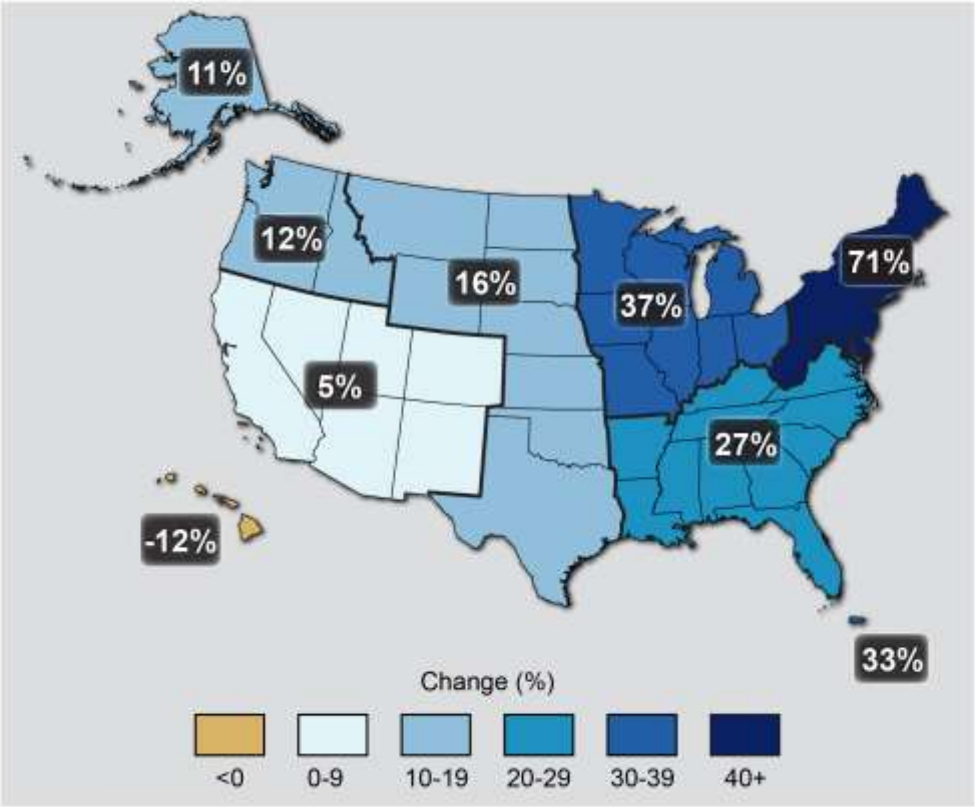
Observed U.S. Heavy Precipitation Changes



Source: Walsh et al. 2014, National Climate Assessment; SARE – Climate Change in Agriculture, 2015

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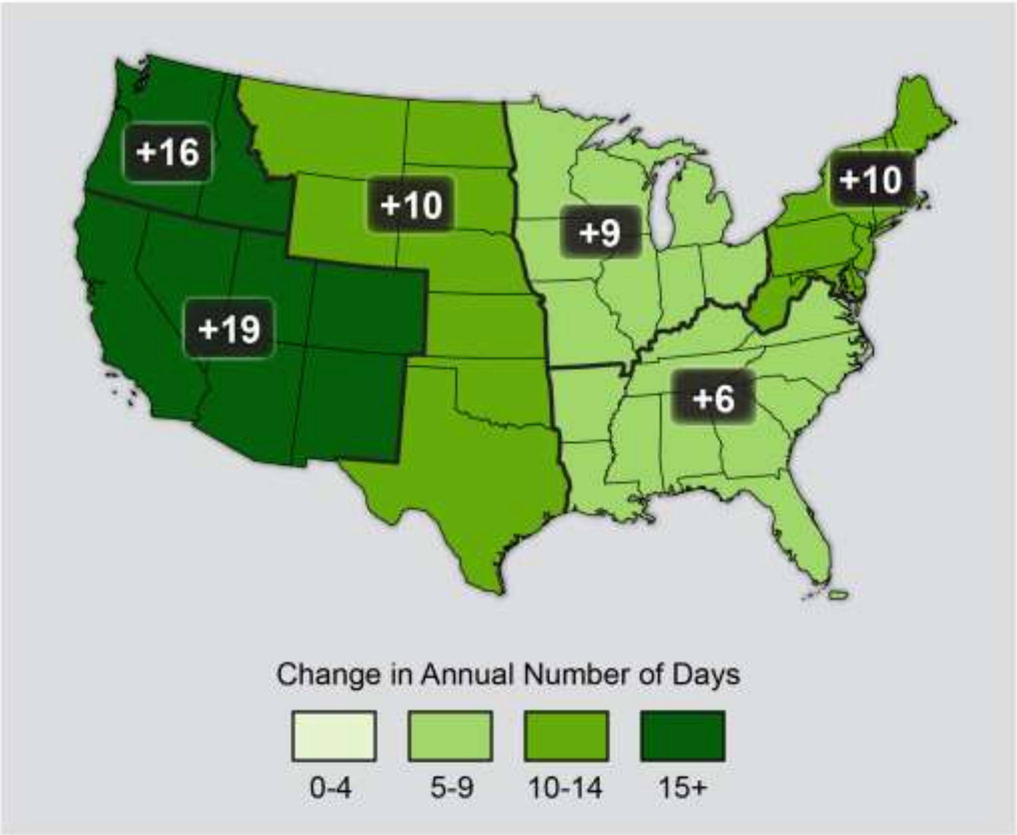
Observed Increase in Frost-Free Season Length



Source: Walsh et al. 2014, National Climate Assessment; SARE – Climate Change in Agriculture, 2015

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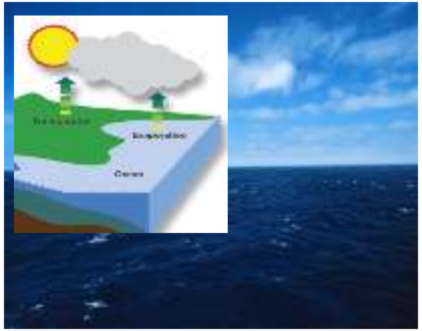
Causes of Climate Change

Natural causes



Human (anthropogenic) causes



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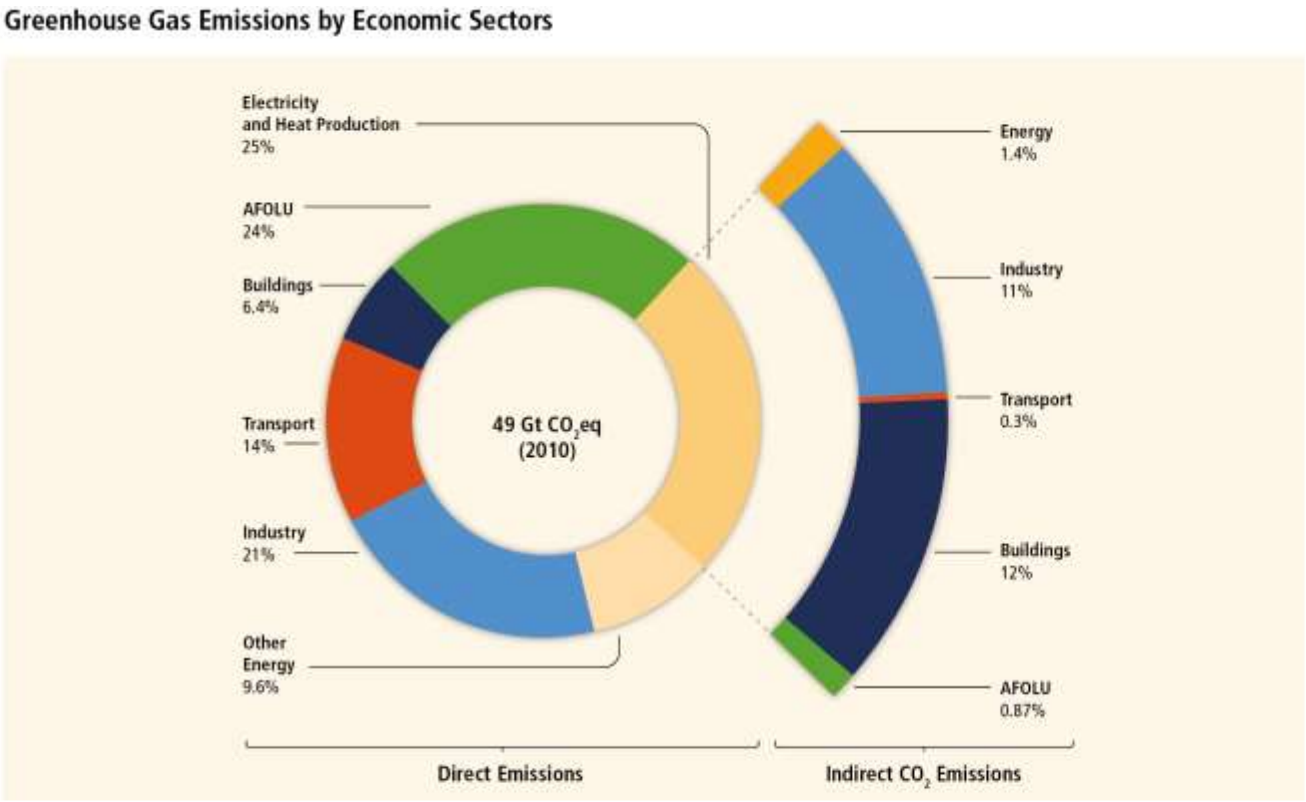
Source: SARE – Climate Change and Sustainable Agriculture

Climate Change and Agriculture

- Agricultural generates 19 to 29% of total greenhouse gas emissions
- Food loss or wasted accounts for 1/3 of global production
- Opportunities
  - Lower emissions per unit produced
  - Sequester carbon

Source: https://www.worldbank.org/en/topic/climate-smart-agriculture

Many sources of GHGs



Agriculture, Forestry and Other Land Use (AFOLU)

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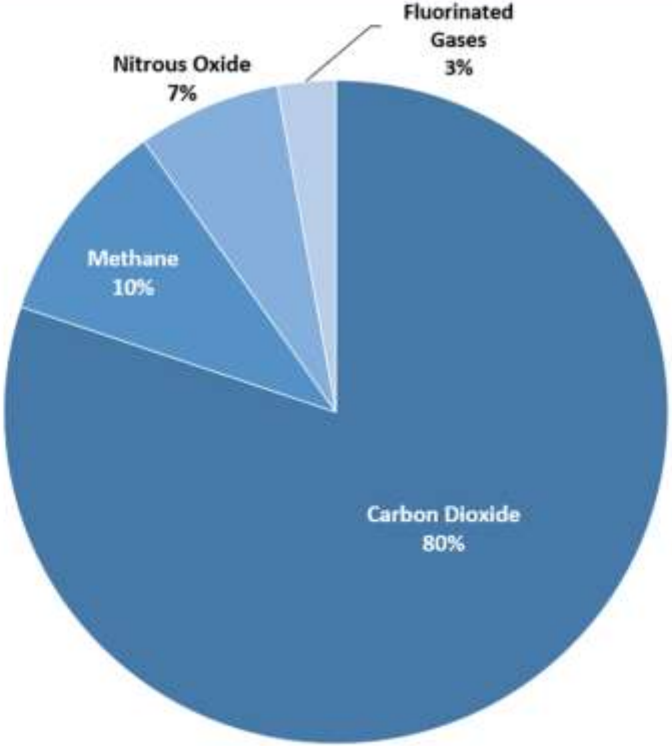
Overview of U.S. Greenhouse Gas Emissions in 2019



U.S. Environmental Protection Agency (2021). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019

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GHG emissions Decreasing

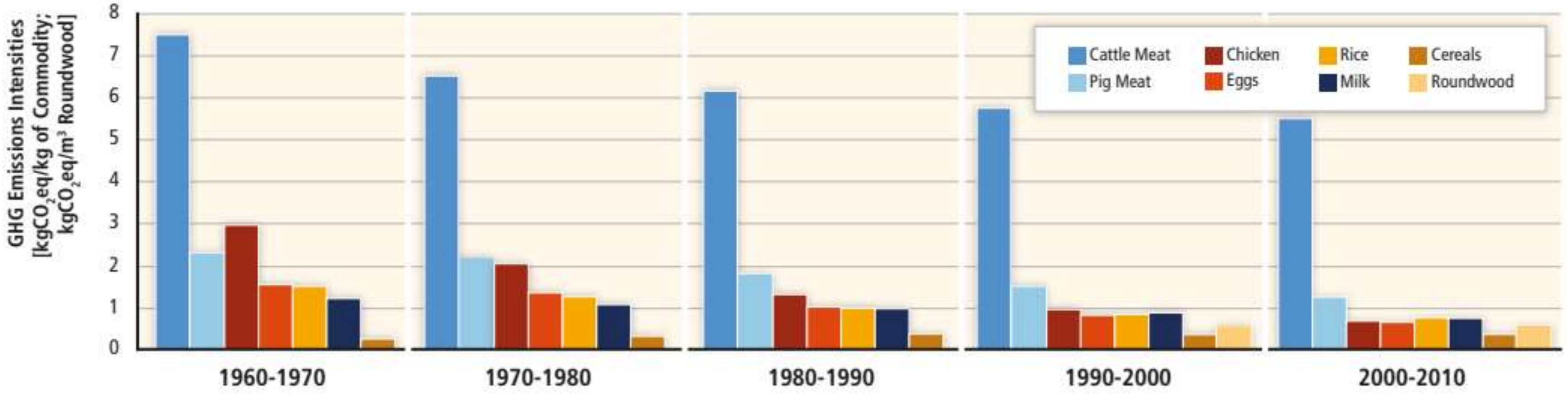

Figure TS.30 | GHG emissions intensities of selected major AFOLU commodities for decades 1960s–2000s. (1) Cattle meat, defined as GHG (enteric fermentation + manure management of cattle, dairy and non-dairy)/meat produced; (2) pig meat, defined as GHG (enteric fermentation + manure management of swine, market and breeding)/meat produced; (3) chicken meat, defined as GHG (manure management of chickens)/meat produced; (4) milk, defined as GHG (enteric fermentation + manure management of cattle, dairy)/milk produced; (5) eggs, defined as GHG (manure management of chickens, layers)/egg produced; (6) rice, defined as GHG (rice cultivation)/rice produced; (7) cereals, defined as GHG (synthetic fertilizers)/cereals produced; (8) wood, defined as GHG (carbon loss from harvest)/roundwood produced. [Figure 11.15]

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Resilient Soils Through Conservation Practices

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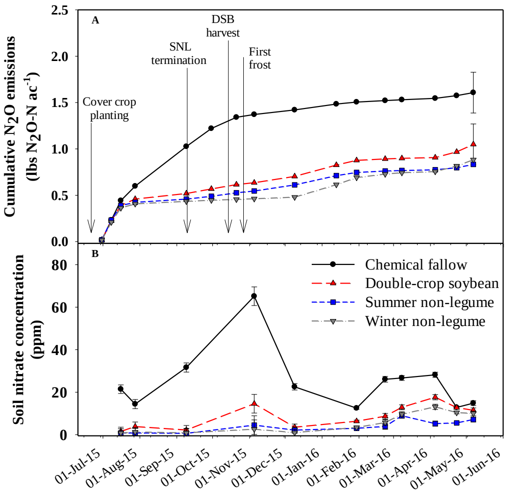
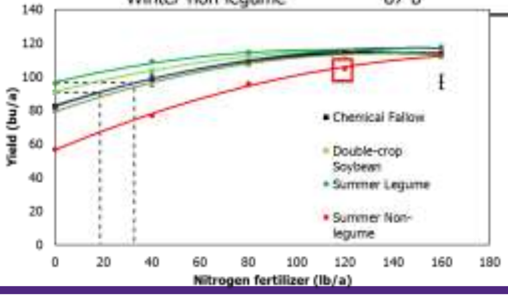
Long-term Cropping System and Cover Crop Study - Cover Crops Between Wheat & Sorghum/Corn

On going since 2007



Cover crop treatment	Mean grain yield at 0 N rate (bu/ac)	Fertilizer N equivalent credit (lb N/ac)	Fertilizer N value @ $0.33/lb N ($/ac)
Chemical fallow	88 b	-	-
Double-crop soybean	91 b	8 b	2.64
Summer legume	100 a	30 a	9.90
Summer non-legume	64 c	-45 c	-14.85
Winter legume	87 b	-1 b	-0.33
Winter non-legume	87 b	-3 b	-0.99



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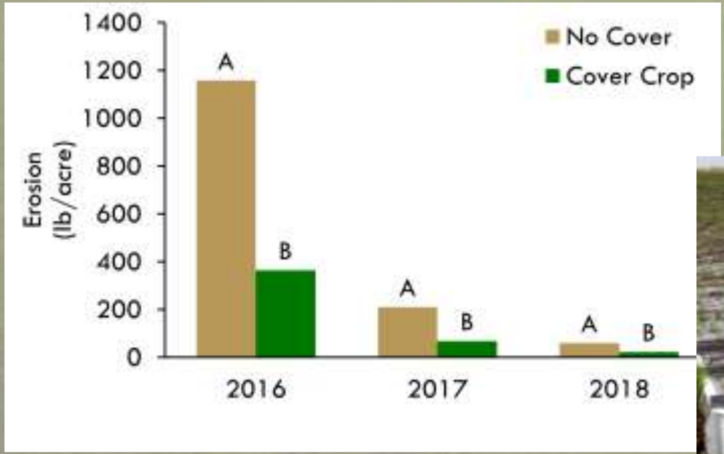
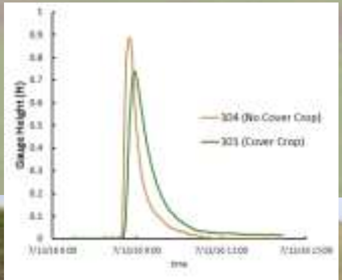
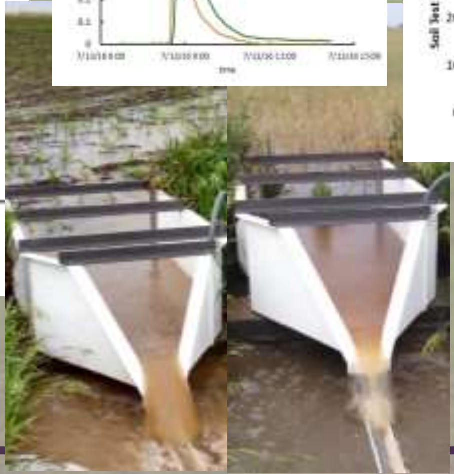
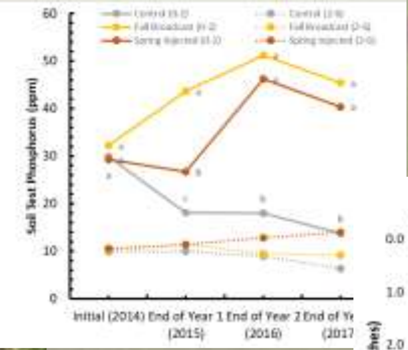
Kansas Agricultural Watershed Field Laboratory

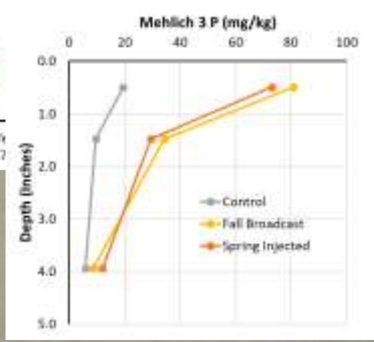
On going since 2014











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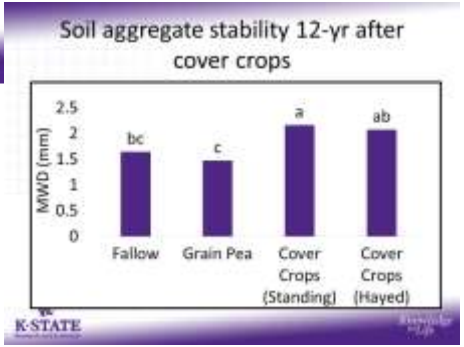
Cover Crop Research in Western Kansas

Augustine Obour and John Holman

Western Kansas Agricultural Research Centers



Objectives:

•Determine cover crop manage options for dryland systems.

•Determine impacts of removing cover crops for forage on soil health.

•Evaluate flex-fallow as a strategy for sustainable integration of cover crops in semiarid environments.

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On-going work in Kansas

- Kansas Corn Growers Association / Soil Health Partnership: 3 producer projects (Rice and others).
- USDA-AFRI Sustainable Agricultural Systems Projects
  - Increasing Water Productivity, Nutrient Efficiency and Soil Health in Rainfed Food Systems of Semi-Arid Southern Great Plains (Rice and others)
  - Enhancing the Sustainability of US Cropping Systems through Cover Crops and an Innovative Information and Technology Network (Tomlinson and Presley)

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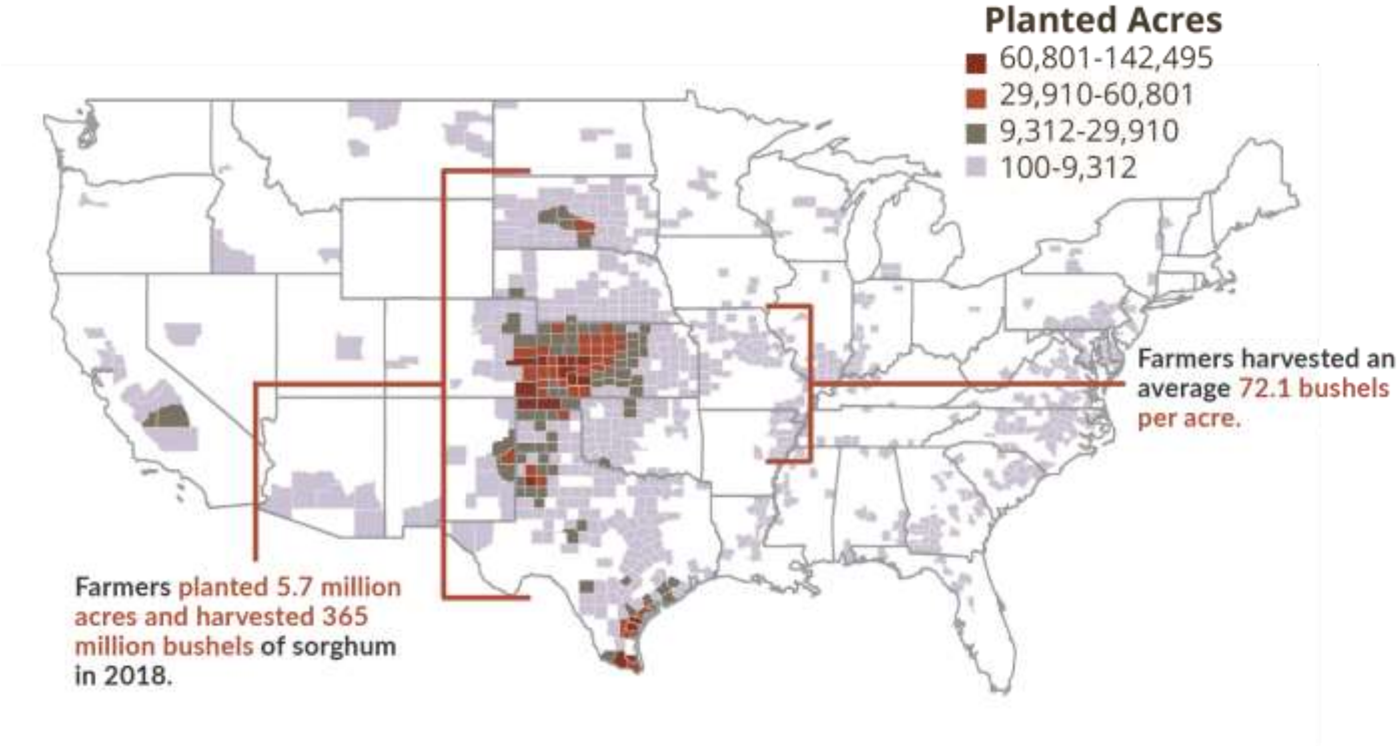
SMARTFARM for Sorghum



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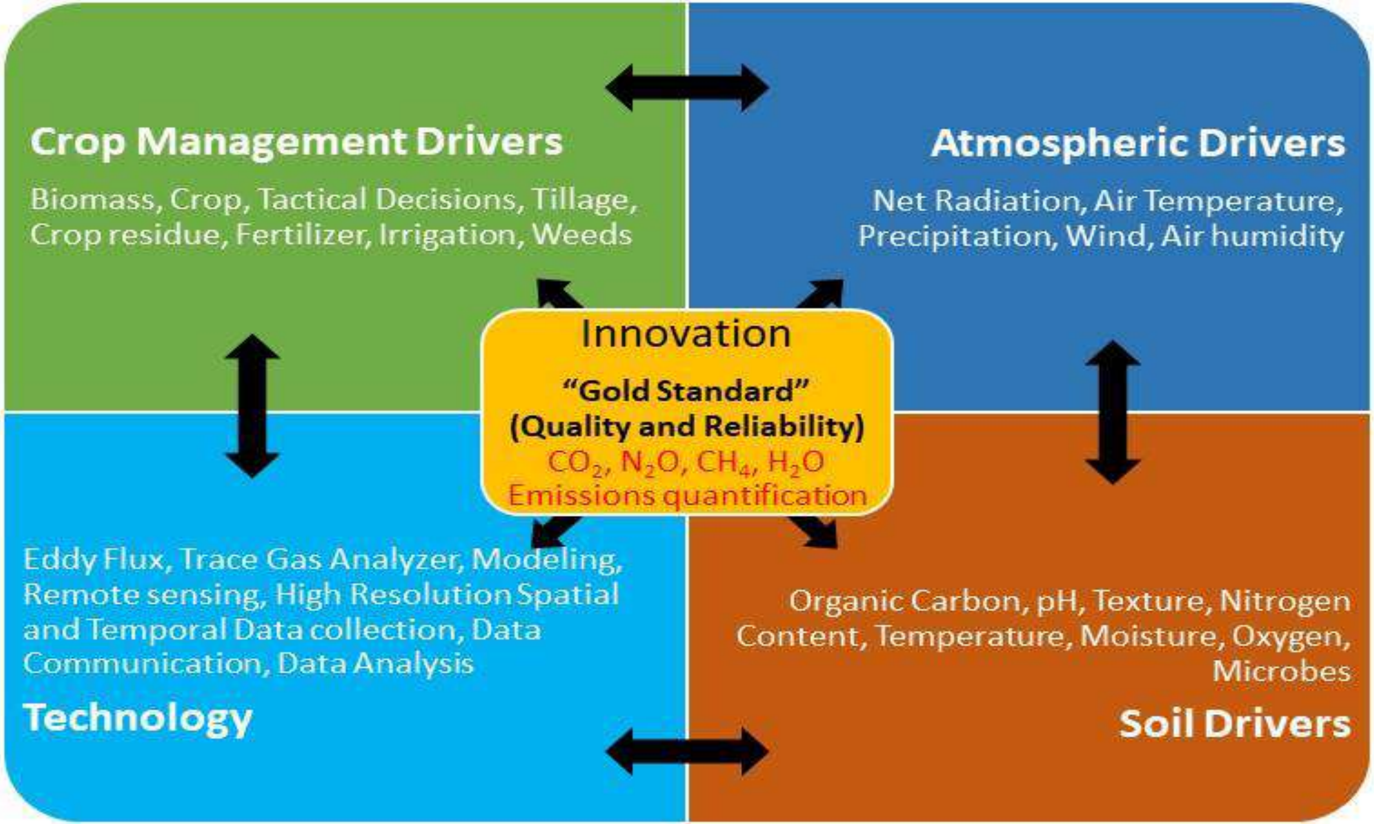
Our Pitch



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Partnership for Climate-Smart Commodities

- USDA announced details in February 2022
  - Goal to finance partnerships to support production and marketing of climate smart commodities
  - Pilot projects to have a time frame of 1 to 5 years
  - Funding through USDA's Commodity Credit Corporation
  - Two rounds of proposals
    - Round one large proposals $5 to $100 million
    - Round two small proposals $250,000 to 5 million

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Partnership for Climate-Smart Commodities

- September 2022
  - USDA announced selection of 70 projects (investment of $2.8 billion)
- December 2022
  - USDA announced selection of an additional 71 projects (investment of $325 million)
- 24 projects identifying Kansas

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Partnership for Climate-Smart Commodities - Goals

- Provide technical and financial assistance to producers to implement climate-smart production practices on a voluntary basis on working lands
- Pilot innovative and cost-effective methods for quantification, monitoring, reporting and verification of greenhouse gas benefits
- Develop markets and promote the resulting climate-smart commodities

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National Sorghum Producers Partnerships for Climate-Smart Commodities Project

- Implement climate-smart production practices across US sorghum acres
- Goal of reducing carbon emissions and developing markets for sorghum as a climate-smart commodity

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National Sorghum Producers Partnerships for Climate-Smart Commodities Project

- K-State leading Climate-smart sorghum nitrogen fertility
  - Partners Oklahoma State, Texas A&M and A&M Prairie view
- Modernize recommendations to reflect current:
  - tillage practices
  - enhanced efficiency fertilizer products
  - fertilizer application technology
- Optimizing nitrogen use has the potential to:
  - Reduce the nitrogen input requirements to produce a bushel of grain
  - Reduce fertilizer input costs
  - Reducing the risk potential for nitrogen loss through leaching, runoff, and denitrification.

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Thank you

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