

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

Source: <https://www.fao.org/3/i1881e/i1881e001.htm>

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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

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

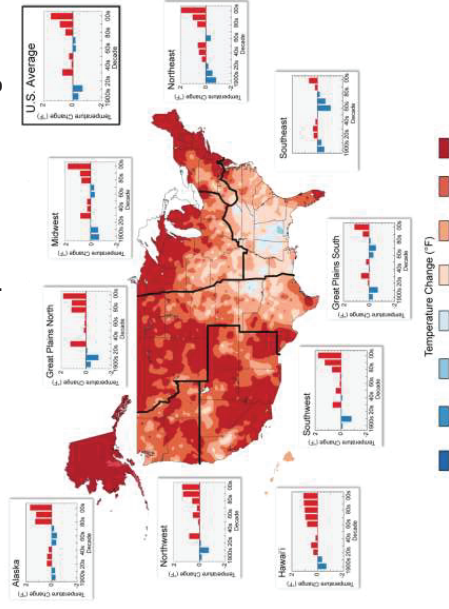
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Agriculture and a Changing Climate

- 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

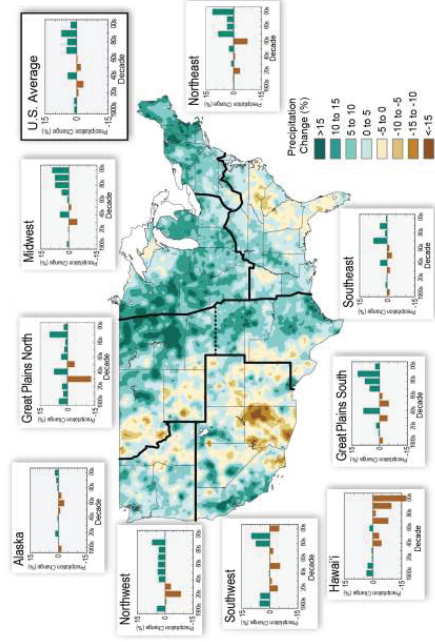
Source: <https://www.worldbank.org/en/topic/climate-smart-agriculture>

Observed U.S. Temperature Changes



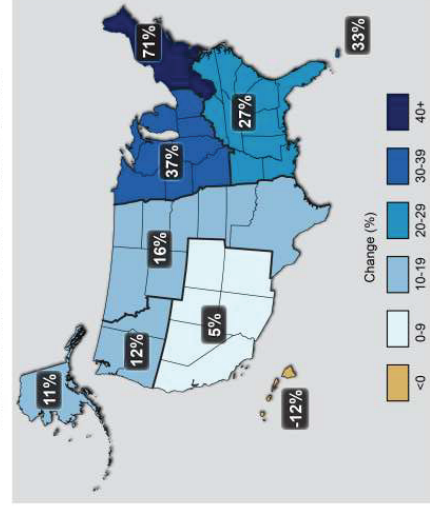
Source: Walsh et al. 2014, National Climate Assessment: SARE – Climate Change in Agriculture, 2015

Observed U.S. Precipitation Changes



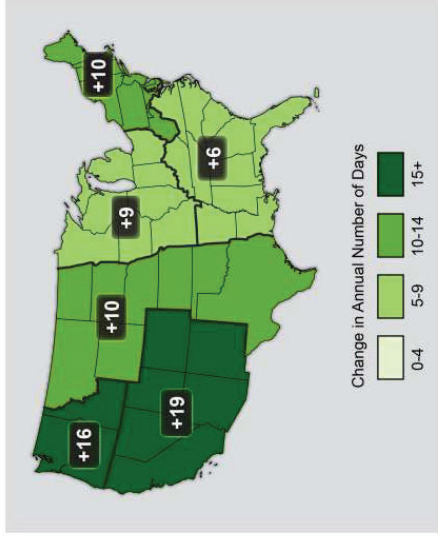
Source: Walsh et al. 2014, National Climate Assessment: SARE – Climate Change in Agriculture, 2015

Observed U.S. Heavy Precipitation Changes



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

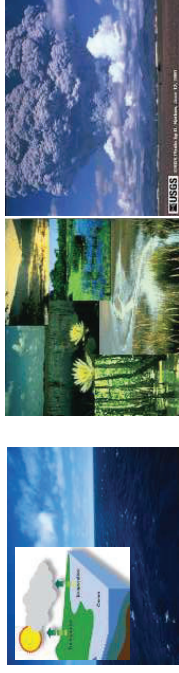
Observed Increase in Frost-Free Season Length



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

Causes of Climate Change

Natural causes



Human (anthropogenic) causes



Source: SARE - Climate Change and Sustainable Agriculture

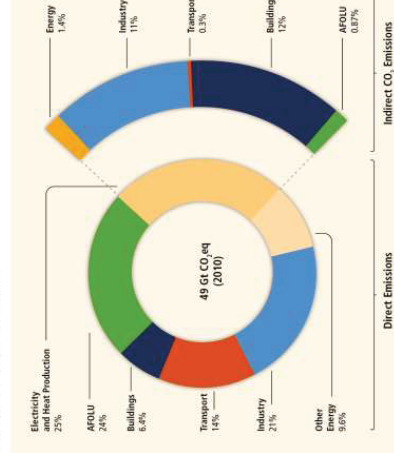
Climate Change and Agriculture

- 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>

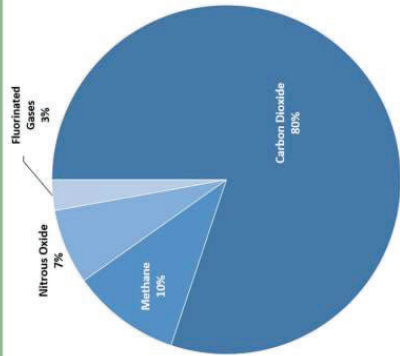
Many sources of GHGs

Greenhouse Gas Emissions by Economic Sectors



Agriculture,
Forestry and Other
Land Use (AFOLU)

Overview of U.S. Greenhouse Gas Emissions in 2019



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

GHG emissions Decreasing

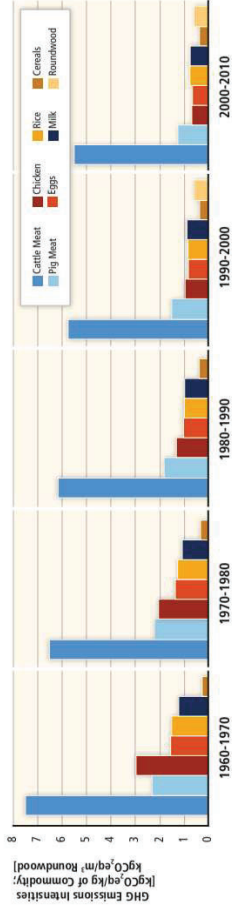
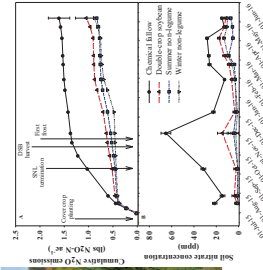


Figure TS.30 | GHG emissions intensities of selected major AFOLU commodities for decades 1960s–2000s. (1) Cattle meat, defined as GHG (enteric fermentation + manure management of cattle, dairy and non-dairy)/meat produced; (2) pig meat, defined as GHG (enteric fermentation + manure management of swine, 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)

Resilient Soils Through Conservation Practices



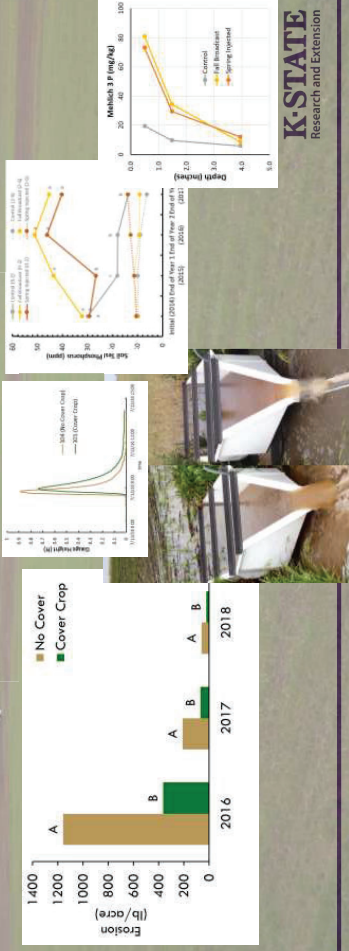
Long-term Cropping System and Cover Crop Study - Cover Crops Between Wheat & Sorghum/Corn On going since 2007



Cover crop treatment	Mean grain yield at 0 N (bu/ac)	Fertilizer N 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 no-tillage	100 a	30 a	9.90
Winter no-tillage	64 c	-45 c	-14.85
Winter no-tillage	87 b	-1 b	-0.33
Winter no-tillage	87 b	-3 b	-0.99

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

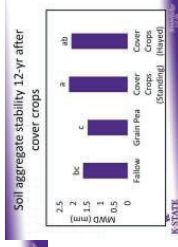
Objectives:

- Determine cover crop management 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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Flex-cover cropping concept for drylands

- Flex-fallow is a cover crop strategy that allows farmers to maintain cover crop benefits while also providing a fallow period for soil moisture recharge and pest management.
- Soil moisture is a key factor in determining the success of cover crops in drylands.
- Flex-fallow allows farmers to maintain cover crop benefits while also providing a fallow period for soil moisture recharge and pest management.
- Flex-fallow allows farmers to maintain cover crop benefits while also providing a fallow period for soil moisture recharge and pest management.



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)

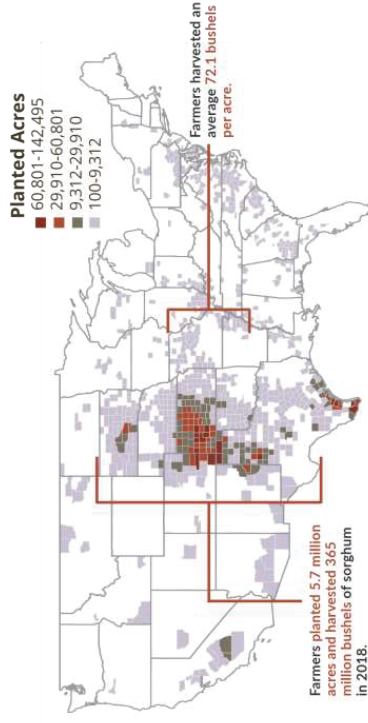
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Sorghum + Sensors + Sustainability = SMARTFARM

SMARTFARM for Sorghum

Sorghum



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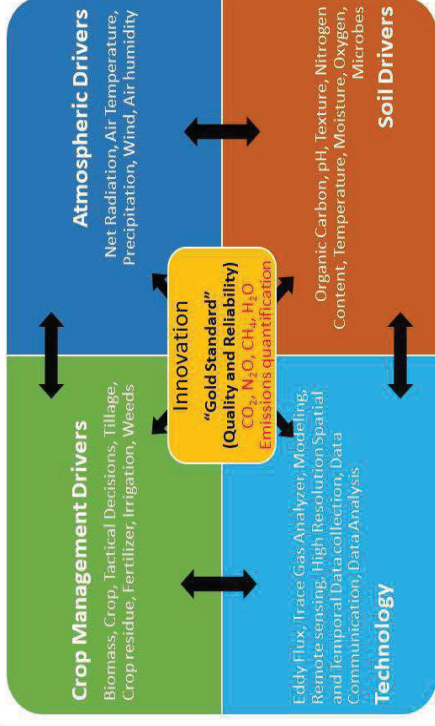


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Sorghum + Sensors + Sustainability = SMARTFARM

Our Pitch



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Partnership for Climate-Smart Commodities

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

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

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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