



CALSMART.ORG
CDFA'S CLIMATE-SMART AG REPOSITORY

March 2024

Presented to

CDFA UCCE USDA Workshop
Adapting Production Practices to Changing and Variable Climate

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OUTLINE

- Background
- Project Purpose and Goals
- Agronomy of Climate Change
- Content
- Content Demonstration

LAND IQ

Land-Based Sciences: Land and Water Resources

- Agronomic assessments/soil science
- Water quality and supply evaluations
- Salinity and nutrient management
- Agricultural reuse
- Land stabilization and erosion control
- Soil reclamation and irrigation/drainage
- Land repurposing and restoration

Spatial Sciences: Remote Sensing and GIS

- Consumptive use estimation and crop identification
- Large landscape evaluations
- Irrigation and drainage
- Production agriculture

Development

- Data management tools
- Web interface applications

CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE

- Science Advisor to Secretary Ross
- Working with Daniele Zaccaria at UC Davis
- Office of Environmental Farming and Innovation
 - Funding and initiatives
 - Information and resources
 - Events – conferences, stakeholder meetings, informational workshops

PROJECT BACKGROUND

- California Climate Change Consortium Reports (2013, 2020)
 - Recommendations
- Webinars
 - International partners
 - California practitioners
- Climate-smart ag practices
 - Overlap with other CDFA incentive programs
 - New practical information
 - Research and technology transfer

PROJECT PURPOSE

- Goals
 - **Consolidate:** All existing resources, practices, webinar summaries
 - **Find new information:** Literature review
 - **Create something farmer-friendly:** Present in user-friendly way for farmers – not researchers
 - **Provide a way to submit new practices:** California and international community



PROJECT ELEMENTS

- Task 1 – Literature Review and Webinar Summary (Content)
 - Summarize literature
 - Summarize webinars
- Task 2 – Website Development (Presentation)
 - Develop intuitive framework
 - Ensure ADA access

<https://calsmartag.org/>

CLIMATE-SMART AG CONTENT



CLIMATE CHANGE

- Long-term or permanent shift of average climatic conditions; changes of weather patterns
 - Higher temperatures and stronger solar radiation and increase in mean temperature
 - Changes in timing, duration, amounts and intensity of rainfall
 - Higher frequency of droughts and floods
 - Changing strength and direction of winds
 - More and new pests and diseases



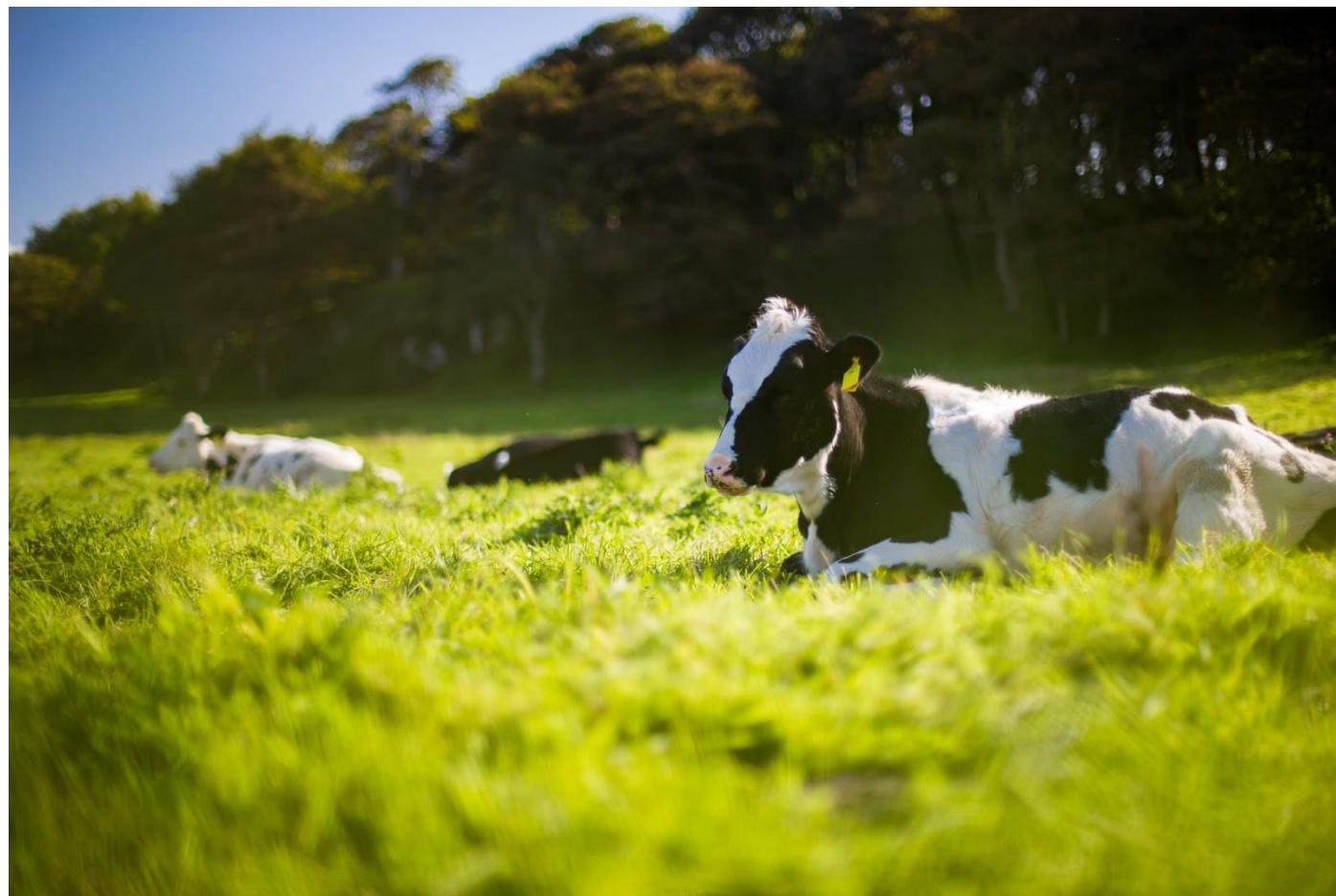
CLIMATE-SMART AGRICULTURE



- Different than
 - Sustainable
 - Regenerative
 - Organic
- Focuses on reducing adverse environmental impacts of agriculture while improving efficiency and increasing production

SOLUTION-ORIENTED MANAGEMENT PRACTICES

- Soils
- Water
- Pest and Disease
- Pollinators and Beneficial Species
- Crops and Livestock



SOILS

- Building soil health - primary way to adapt to climate change, mitigate the challenges imposed by climate change, and maximize productivity and profitability.
 - Foundation of a sustainable and resilient farm
 - Place for the diversity of microorganisms that create high functioning soil to live and eat
- Climate-smart practices
 - Build soil organic matter
 - Prevent erosion
 - Maintain high nutrient supply capacity for crops and livestock



SOILS - PRACTICES

- Soil organic matter and carbon
 - Cover crops
 - Reduced disturbance
 - Compost and other amendments
 - Mulching
- Erosion minimization
 - Windbreaks and shade covers
- Nutrient management
 - Nitrogen, other macro- and micro-nutrients
- Salinity management



WATER

- **The major impacts of climate change on agriculture are expected to result from its effect on the water cycle.** – *Food and Agriculture Organization of the United Nations Climate Smart Agriculture Sourcebook*
 - Less precipitation
 - Different timing of precipitation
 - More extreme weather events
 - Irrigation water quality



WATER - PRACTICES

- Drought
- Water use efficiency and productivity
- Flooding and wetlands
- Water quality and salinity



PESTS AND DISEASE

- Elevated carbon dioxide
 - Increase sugars and decrease nitrogen in plant leaves
 - Increases damage done by insects who must consume more leaf matter to get the nitrogen they need
- More pests surviving winter because of higher fall and winter temps
- Pest populations will generally move poleward (north, in the Northern Hemisphere)
- Effectiveness of some pesticides may be decreased

PESTS AND DISEASE

- Insect pests
 - Warmer temps favor insect carriers of disease
 - May also favor natural enemies of certain insects.
 - Current agrometeorological models for predicting pest outbreaks become ineffective
- Invasive plants and other weeds - increase in population and distribution.
- Disease
 - Poultry - increased prevalence of respiratory infections
 - Dairy - higher incidences of mastitis

PESTS - PRACTICES

- Farmscaping
 - Increase and manage biodiversity
 - Goal of increasing beneficial organisms
 - e.g. insectary plants
 - Enhance biological control
- Integrated pest management
- Invasive plant species
 - Prevention of spread
 - Management

POLLINATORS AND BENEFICIAL SPECIES



- Thirty-five percent of global food production (representing 87 crops) depends on pollinators.
- Pollination - increasingly disrupted by
 - Temperature changes that force pollinators out of their habitat,
 - Mismatch between pollinators and bloom cycles of crops and wild plants.
 - Nutritional deficiencies in pollinators and colony collapse disorder in bees.
- Beneficial insects other than pollinators control insect pests.

POLLINATORS AND BENEFICIAL SPECIES - PRACTICES

- Insectary and banker plants
- Cover crops and pollinators
- Hedgerows
- Wildflower plantings



CROPS AND LIVESTOCK

- Crop impacts
 - Yields
 - Suitability for different climates
 - Crop and food quality
- Livestock impacts
 - Health and performance,
 - Meat and milk quality, and
 - Rangelands because of higher temperatures, increased duration and frequency of drought, higher pest and disease pressure, and changes in nutrient concentrations in food and forage crops.

CROPS AND LIVESTOCK - PRACTICES

- Herd management
- Drought management
- Grazing management and feeding practices
- Dairy
- Agroforestry
 - Alley cropping/tree intercropping
 - Riparian Buffers
 - Silvopasture
 - Agro woodlots

INTERNATIONAL WEBINARS

- <https://www.cdfa.ca.gov/climatesmartag/>
- Examples
 - *California & The Netherlands: The Challenges of Opportunities of Saline Agriculture – focus on specialty crops*
 - *California & Israel: The Extent, Development and Potential of Recycled Water Use for Specialty Crop Production*
 - *California & Australia: irrigation Water Management and Technologies*
 - *California & Chile: Opportunities for Precision Agriculture in Climate change Adaptation and Mitigation*
 - *California & The Western Cape: Agricultural Water-use Efficiency*
 - *India, Portugal, Denmark*

WEBSITE DEVELOPMENT & CONTENT

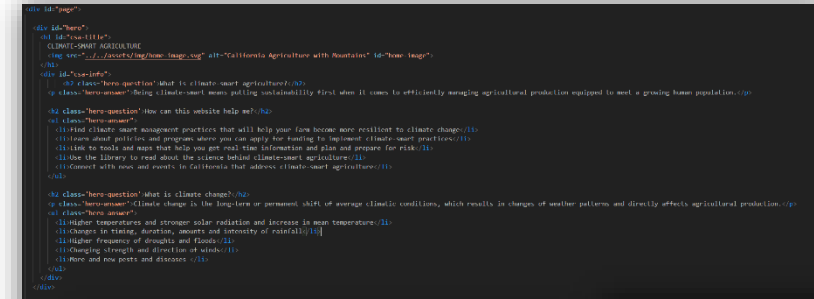


DEVELOPMENT

- Refined content internally and with CDFA
- Most pages static
- Links to tools are live/dynamic
- Submit / Admin Portal
- Optimized all pages for mobile displays
- ADA compliant

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div id="hero">

# CLIMATE-SMART AGRICULTURE





## What is climate-smart agriculture?



Being climate-smart means putting sustainability first when it comes to efficiently managing agricultural production equipped to meet a growing human population.



## How can this website help me?



- 1. Find climate-smart management practices that will help your farm become more resilient to climate change.
- 2. Learn about policies and programs where you can apply for funding to implement climate-smart practices.
- 3. Link to tools and maps that help you get real-time information and plan and prepare for risk.
- 4. Use the library to read about the science behind climate-smart agriculture.
- 5. Connect with new and existing California farmers that address climate-smart agriculture.



## What is climate change?

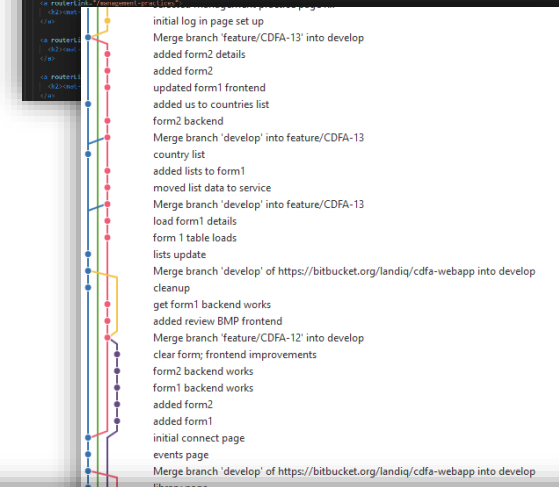


Climate change is the long-term or permanent shift of average climate conditions, which results in changes of weather patterns and directly affects agricultural production.



- 1. Higher temperatures and stronger solar radiation and increase in mean temperature.
- 2. Changes in timing, duration, amount and intensity of rainfall.
- 3. Higher frequency of droughts and floods.
- 4. Changing strength and direction of winds.
- 5. More and new pests and diseases.


```



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Application name: CDFA Climate Smart

Health
Ok
Causes

Running version
1.2.1-1
Upload and deploy

Platform
node.js
Node.js 14 running on 64bit Amazon Linux 2/5.4.10
Different version recommended
Change

CALSMARTAG.ORG HOMEPAGE

California Climate-Smart Agriculture

HOME MANAGEMENT PRACTICES SUBMIT PROGRAMS & FUNDING TOOLS & MAPS LIBRARY EVENTS & CO...

CLIMATE-SMART AGRICULTURE

CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

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- Learn about policies and programs where you can apply for funding to implement climate-smart practices
- Link to tools and maps that help you get real-time information and plan and prepare for risk
- Use the library to read about the science behind climate-smart agriculture
- Connect with news and events in California that address climate-smart agriculture

What is climate change?

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Management Practices

Submit BMP

Policies & Programs

Tools & Maps

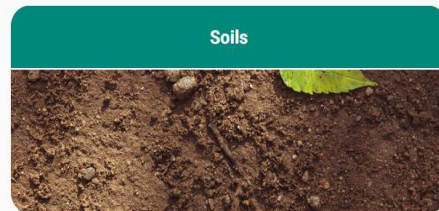
Library

Connect

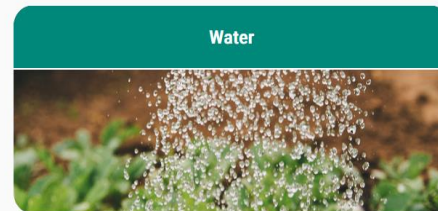
MANAGEMENT PRACTICES

Management Practices

Climate-smart agriculture practices are used to manage cropland, livestock, forests and fisheries to increase productivity, enhance resilience and reduce greenhouse gas emissions. The purpose of using these practices is threefold: to produce more and better food while reducing agriculture's vulnerability to drought, pests, and disease, and absorbing more carbon out of the atmosphere. Though similar to the principles of sustainable agriculture, climate-smart ag practices focus on productivity, adaptation and climate-change mitigation.



Soils



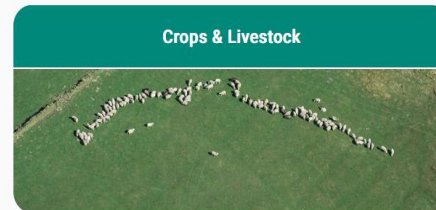
Water



Pest & Diseases



Pollinators & Beneficial Species



Crops & Livestock

MANAGEMENT PRACTICES – SOIL – COVER CROPS

- Search Practices
- Management Practices Home
- Soils
 - Soil Organic Matter and Carbon
 - Cover Crops**
 - Reduced Disturbance
 - Compost and other Amendments
 - Mulching
- Erosion Minimization
 - Wind Breaks and Shade Covers
- Nutrient Management
 - Nitrogen
 - Macro- and Micro-Nutrients
- Salinity Management
- Water
- Pests and Disease
- Pollinators and Beneficial Species
- Crops and Livestock

Cover Crops



Cover cropping improves climate change resilience:

- Decomposing cover crops help feed soil life and contribute to stable soil organic matter, improving nutrient cycling and soil structure.
- Cover crop organic matter helps join soil particles into stable aggregates. Aggregates and cover crop root channels help soils absorb intense rain, resist erosion, and improve water holding capacity in drier conditions.
- Plant cover helps intercept and lessen the force of raindrops, reducing soil erosion, compaction, and nutrient runoff from intense rainstorms.
- Cover crops reduce water pollution risks and remove CO₂ from the atmosphere, helping the environment and reducing a farm's carbon footprint.
- Cover crops can provide economic benefits by increasing crop yields, reducing machinery costs, out-competing weeds, breaking disease and insect cycles, hosting beneficial organisms, attracting pollinators, scavenging nutrients, and supplying forage.
- Cover crops take up excess water, helping to dry out wet fields before planting.

MANAGEMENT PRACTICES

* indicates that practice is eligible for funding through the [CDFA Healthy Soils Program](#)

- NRCS COVER CROP PLANT GUIDES**
- CONSERVATION PLANTS AND USES**
- NRCS COVER CROP PRACTICE STANDARD***
- CARBON TO NITROGEN RATIOS OF COVER CROPS**
- COVER CROPS IN ALMONDS**

RESOURCES

- COVER CROP DATABASE**

SUBMIT A MANAGEMENT PRACTICE

Submit Management Practices / Policies and Programs

If you have a climate-smart agriculture management practice or policy/program not already featured on this website, you may submit your own for consideration using the forms below. All submitted forms will be reviewed for approval by CDFA before being published on this website.

- Under the "Management Practice" form, "Cost per Unit Area" and "Website" are optional inputs.
- Under the "Policy & Program" form, "Website" is an optional input.
- Each form is allowed a single file attachment - a JPEG, PNG, or PDF with a maximum file size of 5MB.
- By submitting a form with an attached file, you are agreeing to let CDFA redistribute the attached file on this website.

Management Practice | Policies and Programs

Country*	Organization*	Full Name*
Email*	Practice Name*	Website
Adaptation Driver*	Practice Group*	Status*
Objective*	Cost per unit area (if known):	
Description* <small>Description & co-benefits, if any (GHG reduction, energy reduction, water savings, ect.)</small>		
Attach File		SUBMIT

PROGRAMS AND FUNDING

Programs & Funding



CDFA currently incentivizes and supports several types of programs which promote climate-smart agricultural practices. These programs have periodic solicitations for grants.

HEALTHY SOILS PROGRAM (HSP)

HSP stems from the California Healthy Soils Initiative, a collaboration of state agencies and departments that promotes the development of healthy soils on California's farmlands and ranchlands. The HSP has two components: the HSP Incentives Program provides financial assistance for conservation management practices that improve soil health, sequester carbon and reduce greenhouse gas (GHG) emissions. The HSP Demonstration Projects showcase California farmers and ranchers' implementation of HSP practices.

STATE WATER EFFICIENCY AND ENHANCEMENT PROGRAM (SWEET)

SWEET provides financial assistance in the form of grants to implement irrigation systems that reduce greenhouse gases and save water on California agricultural operations.

DAIRY DIGESTER RESEARCH & DEVELOPMENT PROGRAM (DDRDP)

DDRDP provides financial assistance for the installation of dairy digesters in California, which will result in reduced greenhouse gas emissions.

ALTERNATIVE MANURE MANAGEMENT PROGRAM (AMMP)

AMMP provides financial assistance for the implementation of non-digester manure management practices in California, which will result in reduced greenhouse gas emissions.

TECHNICAL ASSISTANCE PROGRAM

TAP provides funding to technical assistance providers in the form of hands-on application assistance to farmers and ranchers.

TOOLS & MAPS



- Climate Risk and Resiliency
- Pest and Weeds
- Weather, Water, and Irrigation
- Soil Carbon and Nutrients
- Maps

Climate Risk and Resiliency



COMET-FARM
Whole farm and ranch carbon and greenhouse gas accounting system.

COMET-PLANNER
Tool designed to provide generalized estimates of the greenhouse gas impacts of conservation practices. Intended for initial planning purposes. Site-specific conditions (not evaluated in this tool) are required for more detailed assessments of greenhouse gas dynamics on your farm. Use COMET-Farm if you would like to conduct a more detailed analysis.

SOIL AGRICULTURAL GROUNDWATER BANKING INDEX (SAGBI)
Suitability index for groundwater recharge on agricultural land in California.

GHG AND CARBON SEQUESTRATION RANKING TOOL
List of USDA NRCS practice standards and rankings of how beneficial they are in reducing GHGs.

FUTURE CROP SUITABILITY TOOL
Maps and information on the suitability of growing conditions for perennial crops under current and projected future climate conditions across the Pacific States of the US.

AGRISK VIEWER
Tool for exploring, visualizing, and analyzing publicly-available crop insurance data from the USDA Risk Management Agency.

CALIFORNIA CLIMATE CONSOLE
Web mapping application designed for exploring climate change projections, simulated impacts, and fuzzy logic (EEMS) model results for a specified area of interest.

LIBRARY

Websites

Articles

Videos and Webinars

Websites



[CALIFORNIA CROPS UNDER CLIMATE CHANGE STORYMAP](#)

[NATIONAL NRCS SOIL HEALTH WEBSITE](#)

[NATIONAL STUDIES ON THE EFFECTS OF COVER CROP SEEDING RATES AND DIVERSITY ON SOIL HEALTH – CALIFORNIA](#)

[CLIMATE SMART AGRICULTURE VIDEOS](#)

[SMALL DAIRY CLIMATE CHANGE RESEARCH SUMMARY REPORT](#)

[PROACTIVE INTEGRATED PEST MANAGEMENT SOLUTIONS](#)

[BIOLOGICALLY INTEGRATED FARMING SYSTEMS](#)

[CLIMATE CHANGE CONSORTIUM FOR SPECIALTY CROPS – STATEWIDE](#)

[CLIMATE CHANGE CONSORTIUM – SOUTHERN CALIFORNIA REGION](#)

EVENTS & CONTACT



Events & Contact

Contact

If you have any suggestions to improve the content or experience of the CDFA California Smart Agriculture website, please contact us using the information below.

Contact Email: cdfa.oefi@cdfa.ca.gov

Contact Phone: (916)-654-0433

Submit Management Practice or Program/Funding

CDFA Technical Assistance Providers

UC ANR Technical Assistance Providers



Events



Engagement Opportunities



California adaptation Forum



University of California Institute for Water