



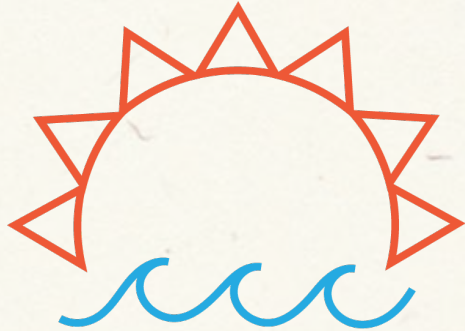
CLIMATE SCIENCE ALLIANCE

Building Climate Resilience *with* **Southern California Agriculture**

MARCH 12, 2020

THE CLIMATE SCIENCE ALLIANCE

Our Vision



CLIMATE SCIENCE ALLIANCE

The mission of the Climate Science Alliance is to safeguard natural and human communities in the face of a changing climate. We do this through leading activities and creating partnerships which increase awareness of climate change impacts, promote solutions, and facilitate action.



www.climatesciencealliance.org

Responses to Climate Change

Mitigation:

- Addresses causes
- Focus on reducing greenhouse gas emissions



Adaptation:

- Addresses impacts on people and ecosystems
- Focus on preparing for and managing impacts
- Resistance/Resilience –
Accommodation - Transformation



Climate Change Consortium for Specialty Crops

Vision:

Convene growers, technical advisors, stakeholders, researchers and representatives of California's specialty crop industry to make recommendations on strategies for climate change adaptation

2012 Consortium Recommendations:



1. Research
Needs



2. Planning &
Resource
Optimization



3. Outreach
& Education



4. Technology &
Innovation



CALIFORNIA DEPARTMENT OF
FOOD AND AGRICULTURE

Learn more about 2012 Consortium Final Report that summarizes these recommendations:

www.cdfa.ca.gov/oefi/climate/climate_change_consor_tium_info.html



Climate Change Consortium for Specialty Crops

Outcomes of 2012 Consortium:

**Online Platform for
Educational Resources**

**Office of Environmental
Farming & Innovation (EOFI)**

**Advancements in
Research & Technical Tools**

**Informed State & Federal
Programs**

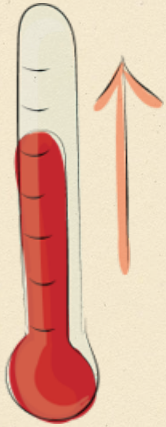
Creation of Climate Resilience Incentives:



Targeted assistance
for farmers and ranchers

New in 2019!

Regional Climate Projections



Temperature

Increases in overall average temperatures, with higher daily maximum temperatures and more frequent/intense heat events



Precipitation

Precipitation will become more variable and extreme events will continue to intensify



Wildfire

Increased risk of high intensity wildfires



Drought

More dry days, dry years, and more frequent/intense droughts. Projections indicate a drier Southern California

STATE OF THE CLIMATE

Climate Impacts to Agriculture



Soils & Water Resources



Crop Production & Yields



Pests, Pollinators, & Weeds



Economic Losses & Costs

Draft Summary Guide

Climate Change Impacts for Specialty Crops

DRAFT SUMMARY GUIDE

Southern California is already experiencing the impacts of a changing climate, with shifts in temperature, precipitation variability, extreme weather events, prolonged drought, and intense wildfires. These changes could have implications for the region's agriculture with corresponding impacts to the region's economy, environment, and people. Despite these challenges, agricultural producers play a critical role in building on-the-ground resilience and are an important part of the region's climate change solution.

This document leverages climate projections for California and southern regions of the state to better understand potential impacts for the region's diverse crops and highly valuable agricultural landscapes, providing an initial framework for informing future actions.



- Regional climate projections
- Overview of climate impacts for agriculture
- Potential impacts for California's top crops



CLIMATE IMPACTS KEY	TOP PERENNIAL SPECIALTY CROPS (FRUIT & NUTS)						OTHER FRUIT & NUT CROPS		
	Almonds	Avocados	Oranges	Table Grapes	Walnuts	Wine Grapes	Cherries	Strawberries	Melons
High Precipitation: Increased precipitation and/or heavy rain events.	• Almost yields could potentially benefit from warmer springs and summers (Lobell and Field, 2015)	• Sensitive to warmer August temperatures in the year prior to harvest, with negative impacts for avocado production following year (Lobell et al., 2007; Katan et al., 2016)	• High temperatures could cause "scurrying" of the blossoms (Pessarakis, 2003)	• Moderate to substantial yield reductions by the end of the century under future climate scenarios (Lobell and Field, 2015)	• Potential for improved yields due to warmer summer temperatures (Lobell and Field, 2015)	• Overall median yield reductions of 10% for the state by the end of the century (Lobell et al., 2007)	• Overall, cherries will likely be the most negatively impacted of the state's top 20 perennial crops due to warming conditions in the upcoming decades (Lobell and Field, 2015)	• High temperatures and heat waves could shorten growing cycles (Lobell and Field, 2015)	• Warming temperatures could allow for very heat-tolerant crops, such as melons, to expand production to new areas (Jackson et al., 2017)
Low Precipitation: Decreased precipitation and/or drought events.	• Warmer January/February temperatures could shorten the duration of blooming, impacting pollination and resulting in light yield declines of 10% by 2050 (Lobell and Field, 2015)	• Projections show a substantial reduction in areas that exhibit high yields of avocados under 2°C warming, with potential for only a 50% reduction in avocado yields statewide by 2050 (Lobell et al., 2006; USDA, 2016)	• Warmer winter minimum temperatures could reduce the risk of frost damage (Kerr et al., 2017)	• Potential negative impacts from projected reduction in precipitation during fall months, as table grape yields have been shown to increase with October rains the year prior to harvest (Lobell et al., 2006; Nicholas et al., 2007)	• Potential for reduced yields due to warmer winter and minimum temperatures (Nicholas et al., 2007) and soil water stress in northwards, while having different grape varieties compared to historical conditions (Lobell et al., 2015)	• Regions with currently optimal wine growing conditions will likely shift to climate conditions difficult for growing and producing high-quality wine (Nicholas et al., 2007) and soil water stress in northwards, while having different grape varieties compared to historical conditions (Lobell et al., 2015)	• Projections for warmer winter and fall temperatures and reduced number of chill hours could result in harmful impacts for cherries that require a certain number of accumulated chill hours during February–November (Lobell and Field, 2015)	• Potential increases in fungal pathogens, pests, and diseases due to higher temperatures that promote spreading of these organisms (Lobell and Field, 2015)	• Potential increases in fungal pathogens, pests, and diseases due to higher temperatures that promote spreading of these organisms (Lobell and Field, 2015)
Heat Events: Increased frequency and intensity of heat waves.	• Severe storms could damage crops and reduce yields, especially during flowering stages, in addition to causing high winds that lead to widespread lodging (Carpenter, 2006; USDA, 2016)	• Extreme heat frost waves could suppress sensitive wine populations that are key producers of California grape varieties (Merrill et al., 2016)	• Subsonic cold snaps can cause frost damage to citrus (Gessel and Orshui, 2003; Kerr et al., 2017)	COMBINED IMPACTS: Projections show a substantial reduction in areas that exhibit high yields of table grapes (Lobell et al., 2006)	COMBINED IMPACTS: Projections show a substantial reduction in areas that exhibit high yields of walnuts (Lobell et al., 2006)	COMBINED IMPACTS: Moderate to substantial yield declines by the end of the century under future climate scenarios (Lobell et al., 2007)	• Impacts to sugar-free wine production and grape composition (due to extreme heat) with implications for wine and grape quality (Lobell and Field, 2015; Nicholas et al., 2011; De Dreuze, 2016)	• Warmer winters could likely reduce strawberry yields, but the impact may be buffered with warmer summers that could improve yields (Lobell and Field, 2015)	• Extreme precipitation and flooding, which are projected to become more frequent and intense, could cause less harvesting of strawberries along the Central and Southern California coasts (Pattel et al., 2018)
Warmer Winter: Increased frequency and intensity of winter storms.	• Warm extreme precipitation storms could increase occurrence of fungal disease in almonds (Carpenter, 2006; USDA, 2016)	• Warmer winter minimum temperatures predicted under climate change could reduce the risk of frost damage (Lobell et al., 2006; Kerr et al., 2017)	• Extreme precipitation and flooding events, projected to increase in frequency and intensity, can delay harvesting particularly along Central/Southern CA coasts (Pattel et al., 2018; Katan et al., 2016)	• Areas suitable for future production have minimal overlap with current production (Lobell et al., 2006)	• Areas suitable for future production have minimal overlap with current production, and the majority of these areas have challenging circumstances that limit agricultural opportunities (Lobell et al., 2006)	• Areas suitable for future production have minimal overlap with current production, and the majority of these areas have challenging circumstances that limit agricultural opportunities (Lobell et al., 2006)			
Warmer Spring: Increased frequency and intensity of spring storms.	• Potential for reduced yields when using deficit irrigation during drought periods (Furber et al., 2014; USDA, 2016)	• Challenges associated with limited water availability and drought, with specific production to increase safety and to use precipitation forecasts in October during the year of harvest that are projected under climate change (USA, 2016; Katan et al., 2016)	• Moderate to substantial yield declines by the end of the century (Lobell et al., 2006)	• Projections show a substantial reduction in areas that exhibit high yields of oranges (Lobell et al., 2016)	• Areas suitable for future production have minimal overlap with current production, and the majority of these areas have challenging circumstances that limit agricultural opportunities (Lobell et al., 2006)				

California Crops & Climate Change



Avocados

- Declines in yields
- Decreases/shifts in areas suitable for production
- Reduced risk of frost damage
- Sensitivity to rainfall and water availability



Citrus

- Delayed harvesting due to extreme precipitation/flooding
- Impacts to fruit quality and yields
- Decreases/shifts in areas suitable for production

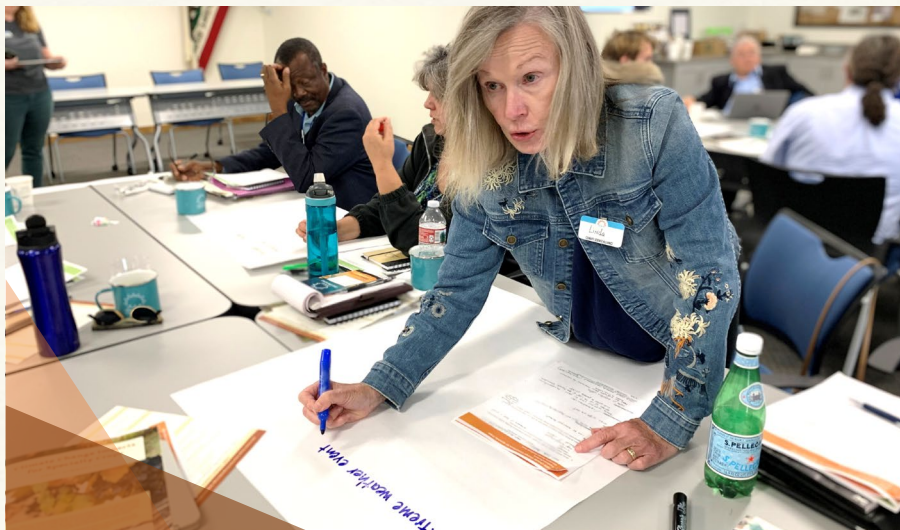


Grapes

- Shifts in areas suitable for production
- Different varieties
- Impacts to quality
- Changes in timing of ripening/harvest

2020 Climate Change Consortium for Specialty Crops

**Over 40 producers, researchers,
technical advisors, and
representatives**



**Challenges and opportunities
moving forward**

2020 CLIMATE CHANGE CONSORTIUM FOR SPECIALTY CROPS

Case Studies of Resilience

Learning from our region's producers
and the strategies they are testing to
build on-the-ground resilience



Input & Recommendations

Challenges & Concerns:

- Greater seasonal unpredictability
- Shifts in growing season and harvest
- Difficulty in crop planning
- Crop losses



Recommendations & Opportunities:

- Diversified & new crop varieties
- Local research, data and monitoring
- Cover cropping, composting, mulching, agroforestry
- Funding and subsidies

We Need Your Input!

Climate Change Consortium for Specialty Crops

Share your input & recommendations through our surveys:

[Producer/Farmer Survey](#) & [TA/Researcher Survey](#)

- San Diego Region: Follow-Up Feedback Session
- South San Joaquin region: Consortium event

www.climatesciencealliance.org/farmer-feedback



Thank you!

For questions and to get involved, please contact Lindsey at:
ljasperse@climatesciencealliance.org

2020 Consortium resources, events, surveys, and case studies:
www.climatesciencealliance.org/farmer-feedback

2012 Climate Change Consortium for Specialty Crops final report:
www.cdfa.ca.gov/oefi/climate/climate_change_consortium_info.html

