

PARTNER SPOTLIGHT: DR. TAPAN PATHAK

Climate Change and the Future of California Agriculture

The future of crop management decision making

Together with the Climate Hub and other Collaborators at UC Davis, USDA ARS, Lawrence Berkeley National Laboratory, and NOAA, Dr. Pathak is developing an online hub and suite of web-based tools to aid crop managers in making climate-informed decisions.

Through integrating observed climate data, modeled future climate projections, and climate- and weather-focused crop management resources, Dr. Pathak's team will create web resources that will improve management decisions and reduce climate-related production risks. Interactive and innovative tools such as crop heat risk advisories, freeze risk forecasts, and real-time heat and chill accumulation tools are in development.

Still in its prototype phase, these web tools will be announced through the Hub when they are made public, so stay tuned!

UCANR Specialist Dr. Tapan Pathak works at the intersection of climate change and agriculture

DR. TAPAN PATHAK is a UC Agriculture and Natural Resources Specialist in climate change and agriculture. With a background in agricultural and irrigation engineering, and expertise on topics ranging from analyzing freeze risk to modeling crop yields, Dr. Pathak is well-suited to lead California in preparing its agricultural sector for the future.



Newsworthy Research

In 2018, Dr. Pathak and co-authors published a paper in the journal *Agronomy* highlighting the state of scientific knowledge on the effects of climate change on California's agricultural sector. The paper, which garnered widespread media attention, provided a detailed review of the state of the science, describing climate change trends and projections for the state, and what those changes may mean for crops, forests, and rangelands.

Based on the review, Californians can expect warmer temperatures and more frequent and hotter heatwaves. In response to warmer temperatures, some of our staple crops like rice, wheat, and corn will see lower yields. Speciality crops will also be impacted. A warming of less than 4-degrees Fahrenheit in

THE RESEARCH

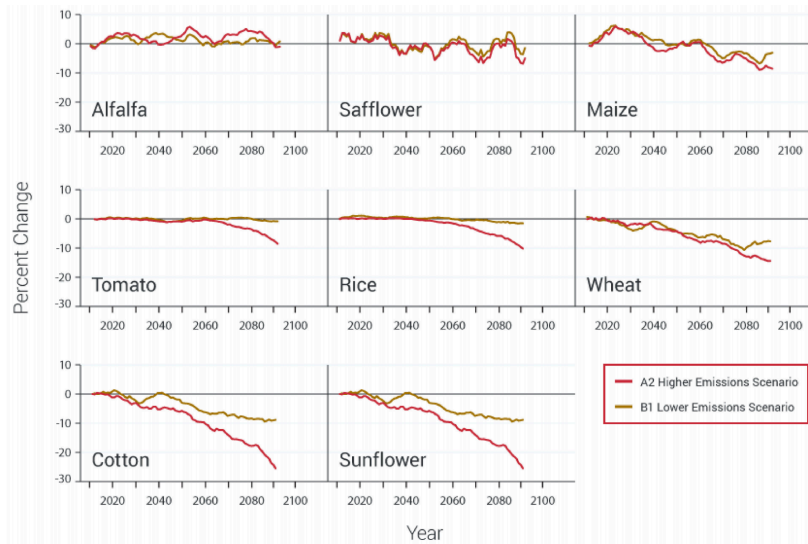
Climate Change Trends and Impacts on California Agriculture: A Detailed Review

Pathak T, Maskey M, Dahlberg J, Kearns F, Bali K, Zaccaria D (2018). Climate change trends and impacts on California agriculture: a detailed review. *Agronomy* 8(3):25.

<https://doi.org/10.3390/>

Key Strategies for Adapting Agriculture to Climate Change

- Prioritize breeding and planting of low-chill fruit and nut cultivars.
- Consider altering planting, harvest, and crop rotation schedules where possible to minimize extreme heat exposure.
- Diversify crops to incorporate heat- and drought-tolerant cultivars.
- Improve irrigation efficiencies and on-farm water capture and storage.
- Incorporate conservation practices such as mulching and cover crops.
- Increase use of efficient irrigation systems (e.g. drip) and use of recycled water.



Yields for many crops decline in response to warming temperatures. As in Pathak et al. 2018.

average annual temperatures may reduce yields in almonds, grapes, strawberries, walnuts, peaches, and cherries. In addition, reductions in winter chill (hours below 45F) will be especially damaging to crops with high chill requirements such as cherries and walnuts. In fact, for crops requiring more than 700 hours of chill, only 10% of the Central Valley will have cool enough winters by the end of the 21st century.

The wide-ranging impacts of climate change on agriculture in California will require effective adaptation strategies and actions. And although some regions, such as the Salinas and San Joaquin valleys, are more vulnerable to climate change than other regions, climate change will ultimately exacerbate challenges to agricultural production across the state. Fortunately, Dr. Pathak and his colleagues across the UC system, state, and federal agencies are working closely with climate scientists, agricultural producers, resource managers, and other key stakeholders to help California prepare its agricultural sector for an uncertain future.

The California Climate Hub will occasionally spotlight our collaborators or impactful research projects relevant to California agriculture, forestry, and rangelands. If you know of a researcher, resource manager, producer, or project that should be highlighted, please let us know. For recommendations or more information, contact Lauren Parker at leparker@ucdavis.edu