

Agriculture, Resources, and the Environment

II. Responding to Climate Change

Summary

This initiative focuses on identifying adaptations and mitigations needed in agriculture to respond to climate change. Over a longer time frame, adaptation to higher temperatures, intermittent drought, and climate variation will be necessary, and these adaptations will be facilitated by programs that consider individual farms within a larger landscape (e.g., greater diversity at the landscape level may serve as a source of resilience). This initiative will complement other ASI initiatives that measure greenhouse gas emissions in the food system, test the efficacy of different technologies to reduce emissions on the farm scale, and investigate how landscape-scale nutrient cycles affect greenhouse gas emissions. Methods adopted in agriculture to mitigate climate change are likely to directly complement methods needed for adaptation (e.g. conservation tillage methods might facilitate more carbon sequestration, thus reducing emissions, while also conserving soil moisture in a drier climate). This initiative will utilize results from the other initiatives and will take a larger level, landscape-scale approach to understanding cross-scale relationships and formulating strategies for integration of mitigation and adaptation.

Problem statement/ Baseline

How climate change will impact specific regions is still widely debated by scientists. In California, some scientists predict that changes in temperature regimes will likely affect important crop-specific variables like chilling hours and evapotranspiration rates, requiring geographic shifts northward in Central Valley cropping systems.¹ In addition, water availability throughout the West is predicted to decline due to decreases in the mountain snowpack and earlier spring runoff, with important implications for irrigation capacity.

Structural issues/ Broad drivers shaping change

- Historical neglect of climate change issues by the federal government has hindered progress in the climate change science and has slowed the development of policies needed to make societal-scale adaptations.
- Specialization in commodity production increases the difficulty for growers to shift to new crops.

Strategic opportunity

- California's 'Global Warming Solutions Act' (AB32) is creating new opportunities to sequester carbon on farms, and, at the same time, is requiring new technologies to reduce greenhouse gas emissions.
- Recent changes in the federal government are focusing more political attention on climate change and its impacts on the national economy and opening up new funding sources to examine these issues.
- Agriculture is already subject to environmental regulations regarding water use and air pollution, some of which may offer synergies with future climate change regulations.

Desired outcomes

- A list of agronomically and economically feasible practices that can be implemented to reduce greenhouse gas emissions in agriculture.
- Policy makers increase their understanding of regional and landscape-scale changes needed for agriculture to remain sustainable under changing climate regimes.
- Producers, processors, and other elements of the food industry can anticipate changes needed in their operations in order to facilitate the continued viability of their businesses in a world of greater climate uncertainty.

Key Partners

- Farmers
- Regional and state level planning agencies
- UCCE

Activities

- Multidisciplinary research on the landscape-scale biophysical effects of changing climate regimes and the economic and social impacts of these changes in agriculture.
- Modeling a variety of adaptation scenarios to test their economic, social, and agronomic feasibility

Resources needed for 5 years

Total need: \$200-500K?

- Research grants (intra- or extramural funds) = \$200-500K?
- *Additional SAREP/ASI staffing (using extramural funds) dedicated to ARE @ \$60K for 5 years = \$300K [part of all initiatives]*

Current extramural grants: \$0 (1 funded project on adaptation in the Central Valley already completed by Jackson et al.)

Additional need: \$200-500K?

ⁱ Jackson, L.E., F. Santos-Martin, A.D. Hollander, W.R. Horwath, R.E. Howitt, J.B. Kramer, A.T. O'Geen, B.S. Orlove, J.W. Six, S.K. Sokolow, D.A. Sumner, T.P. Tomich, and S.M. Wheeler. Potential for adaptation to climate change in an agricultural landscape in the Central Valley of California. Report from the California Climate Change Center. CEC-500-2008-xxx. 170 pp. In press.