The Changing Nature of Water Allocation

Richard Howitt

- Past water was supplied by publically funded infrastructure development
- Sources of additional water supply and funding are both drying up
- Demand increases will be satisfied by reallocation based on economic considerations
- Combining behavioral and technological aspects leads to more predictable policy decisions

Climate Change, Markets, and Technology

Richard Howitt, Josué Medellín-Azuara, and Duncan MacEwan

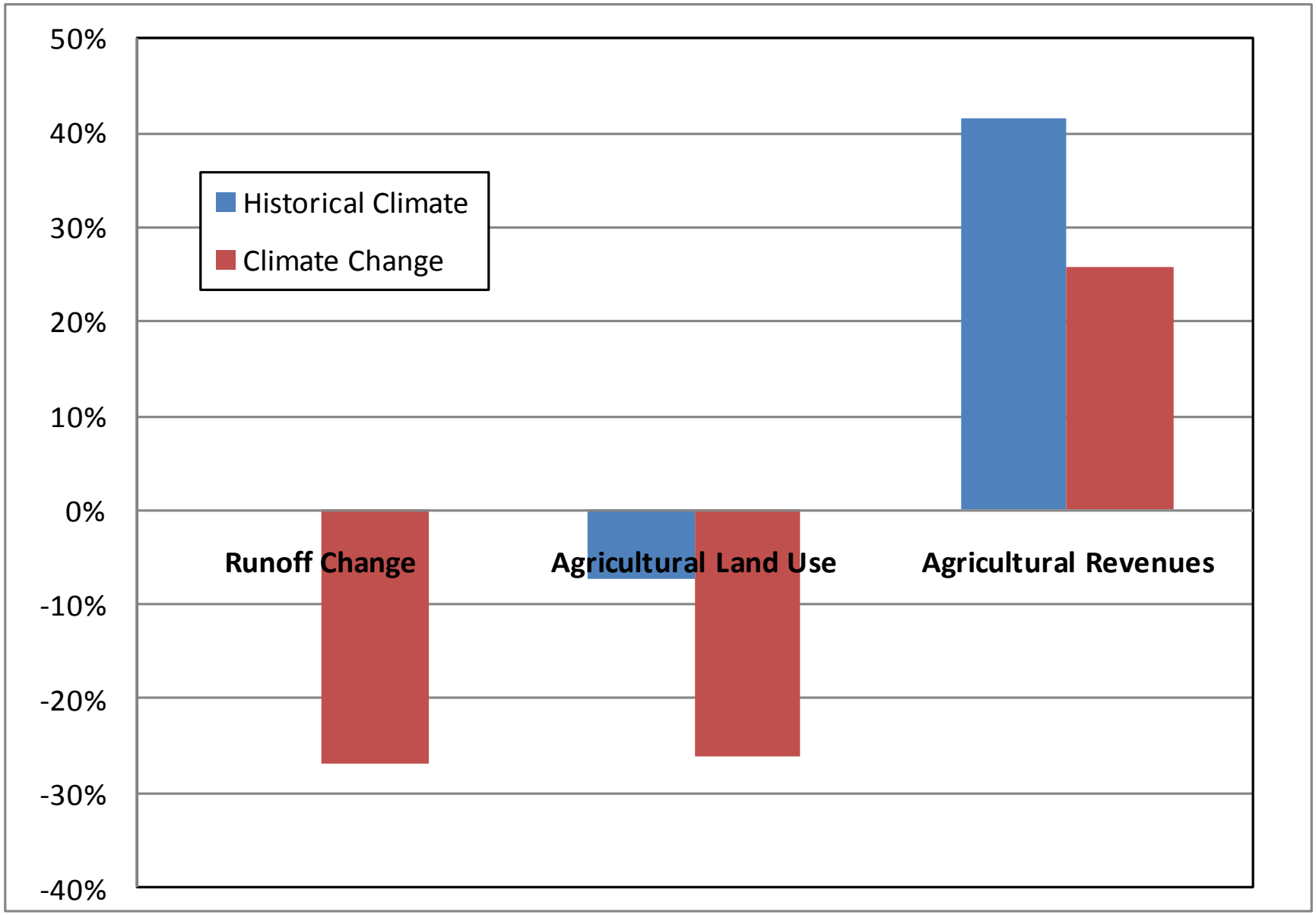
- Water supplies are the dominant way in which climate change will affect agriculture in the western US
- Temperature changes are as important as precipitation for western water supplies
- Changes in evapotranspiration and growing season degree days will have different effects on different crops
- CO2 increases will tend to increase yields
- Past trends in market growth and technological yield increases dwarf projected climate change effects
- For irrigated Californian crops, growth in market share and yields will likely more than offset the economic impacts of climate change.
- Irrigated agriculture in California will downsize land and water use under climate change, but increase in economic terms.

Table 1. Expected climate-related yield changes for a warm-dry climate scenario (adapted from Howitt *et al.*, 2009c).

Crop Groups	Sacramento	San Joaquin
Alfalfa	4.9	7.5
Citrus	1.77	-18.4
Corn	-2.7	-2.5
Cotton	0.0	-5.5
Field	-1.9	-3.7
Grain	-4.8	-1.4
Orchards	-9.0	-9.0
Pasture	5.0	5.0
Grape	-6.0	-6.0
Rice	0.8	-2.8

Table 2. Expected percent reduction in water availability under the warm-dry climate scenario versus the historical climate scenario under using CALVIN hydro-economic optimization (adapted from Medellin-Azuara *et al.*, 2008a)

Region	Agriculture	Urban	Total
Total	21.0	0.7	14.0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-40%
Historical Climate
Climate Change
Runoff Change
Agricultural Land Use
Agricultural Revenues