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Warming Climate Threatens California Fruit and Nut Production

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Winter chill, a vital climatic trigger for many tree crops, is likely to decrease by more than 50 percent during this century as global climate warms, making California no longer suitable for growing many fruit and nut crops, according to a team of researchers from the University of California, Davis, and the University of Washington.

In some parts of California's agriculturally rich Central Valley, winter chill has already declined by nearly 30 percent, the researchers found.

"Depending on the pace of winter chill decline, the consequences for California's fruit and nut industries could be devastating," said Minghua Zhang, a professor of environmental and resource science at UC Davis.

Also collaborating on the study were Eike Luedeling, a postdoctoral fellow in UC Davis' Department of Plant Sciences and UC Davis graduate Evan H. Girvetz, who is now a postdoctoral research associate at the University of Washington, Seattle. Their s appears July 22 in the online journal PLoS ONE.

The study is the first to map winter chill projections for all of California, which is nearly 3 million acres of fruit and nut trees that require chilling. The combined p value of these crops was $7.8 billion in 2007, according to the California Departr Food and Agriculture.

"Our findings suggest that California's fruit and nut industry will need to develop cultivars with reduced chilling requirements and new management strategies for dormancy in years of insufficient winter chill," Luedeling said.

About winter chill

Most fruit and nut trees from nontropical locations avoid cold injury in the winter their leaves in the fall and entering a dormant state that lasts through late fall a

In order to break dormancy and resume growth, the trees must receive a certain winter chill, traditionally expressed as the number of winter chilling hours betwe 45 degrees Fahrenheit. Each species or cultivar is assumed to have a specific chi requirement, which needs to be fulfilled every winter.

Insufficient winter chill plays havoc with flowering time, which is particularly criti trees such as walnuts and pistachios that depend on male and female flowering at the same time to ensure pollination and a normal yield.

Planning for a warmer future

Fruit and nut growers commonly use established mathematical models to select varieties whose winter chill requirements match conditions of their local area. Ho those mathematical models were calibrated based on past temperature conditior