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Soil aeration may prevent crop damage during flooding

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Agricultural managed aquifer recharge (Ag-MAR) flooding experiment in an almond orchard at the Kearney Agricultural Research and Extension Center (KARE). Inset: Installation of the soil sensors and the air-injection system at the research site. Photos courtesy of

Yonatan Ganot.

Agricultural managed aquifer recharge (Ag-MAR) is one approach to mitigate chronic groundwater depletion in California. In Ag-MAR, farmland is flooded with excess surface water to recharge the underlying aquifer. However, successful implementation requires careful estimation of the soil aeration status as prolonged saturated conditions in the rhizosphere can damage crops due to oxygen deficiency.

A new study published in *Vadose Zone Journal* reports on the soil aeration status under almonds and cover crops during Ag-MAR flooding at three sites differing in drainage properties. Water application included several cycles (two to seven) and flooding durations (27–63 h) that varied according to the soil infiltration capacity at each site. Oxygen and redox potential were measured to test the impact of forced aeration by air injection vs. natural soil aeration. Air injection positively impacted soil aeration at one site with mixed impact at the other two sites. For all treatments, no impact on crop yield was observed for one growing season.

Natural aeration can potentially support crop oxygen demand during Ag-MAR if flooding duration is controlled based on soil oxygen depletion rates. In large Ag-MAR projects, forced aeration might be useful to improve local zones of soil oxygen deficiency, which likely occur.

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