



Russell Ranch Sustainable Ag. Facility
Research Briefs
University of California Davis

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Topics:

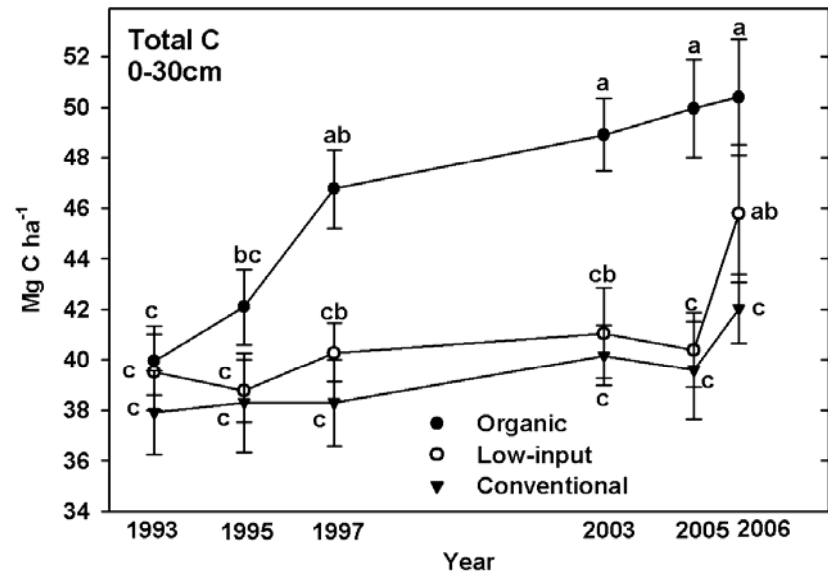
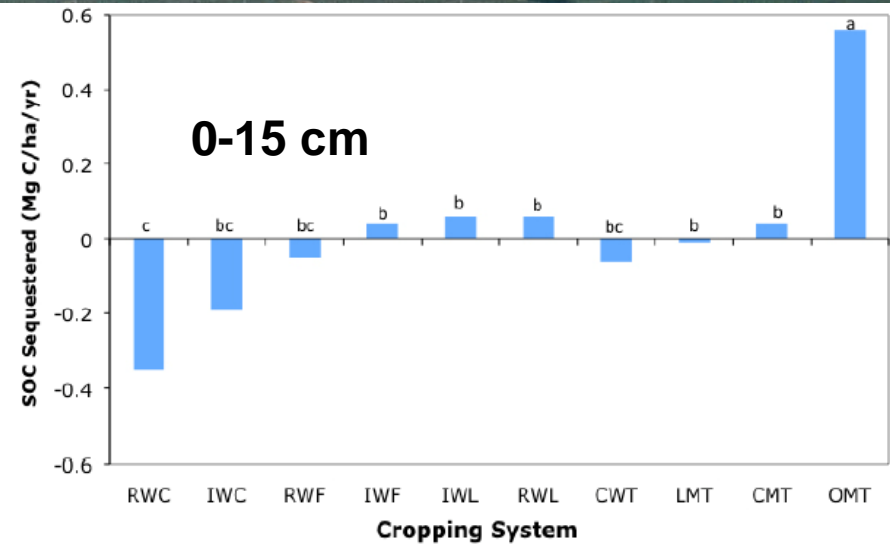
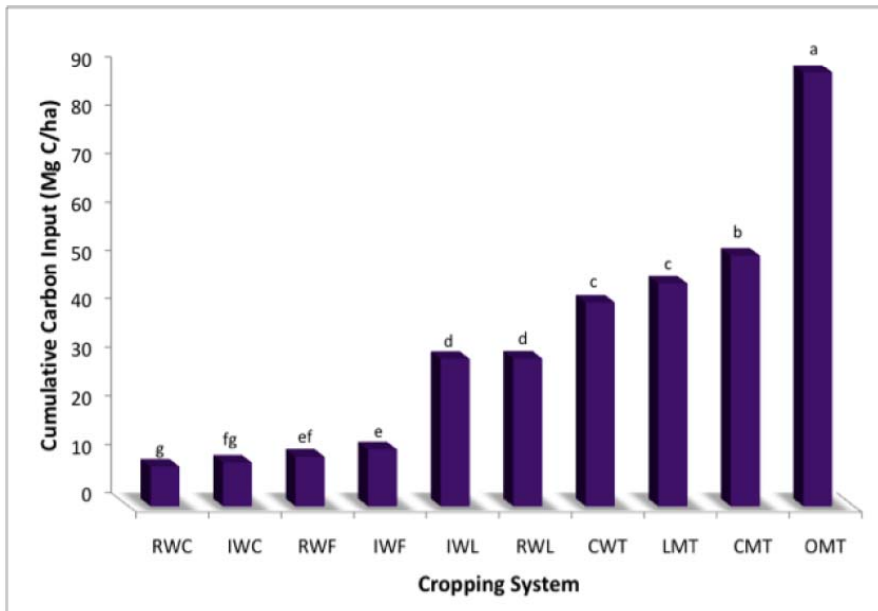
1. **Carbon sequestration**
2. **Nitrous oxide emissions**
3. **Cover crop effects on soil hydraulic properties and yields**



Russell Ranch (LTRAS, SAFS) History

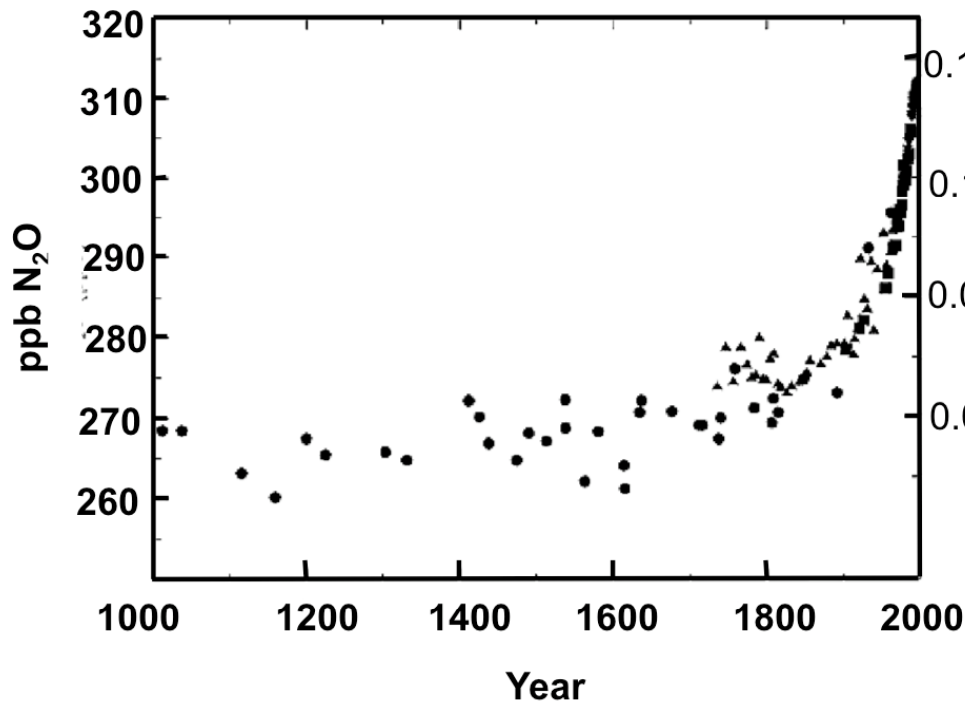
Years	Events
1992	Russell Ranch purchased by UC Davis
1994 - 2007	Two-year rotations of processing tomato and corn , tomato/wheat & several wheat systems (10 total) Organic : Winter cover crops & compost Low input: Cover crops & synthetic fertilizer Conventional: Synthetic fertilizer Each system/crop combination each year
2003	SAFS relocates to Russell Ranch from Vegetable Crops facility
2008 - present	Two-year rotations of processing tomato and wheat Organic, low input, and conventional

Carbon Inputs & Carbon Sequestration



Kong et al., 2005

Greenhouse Gas Emissions: Nitrous Oxide (N₂O)



Source: IPCC, 2001

7% of total GHG

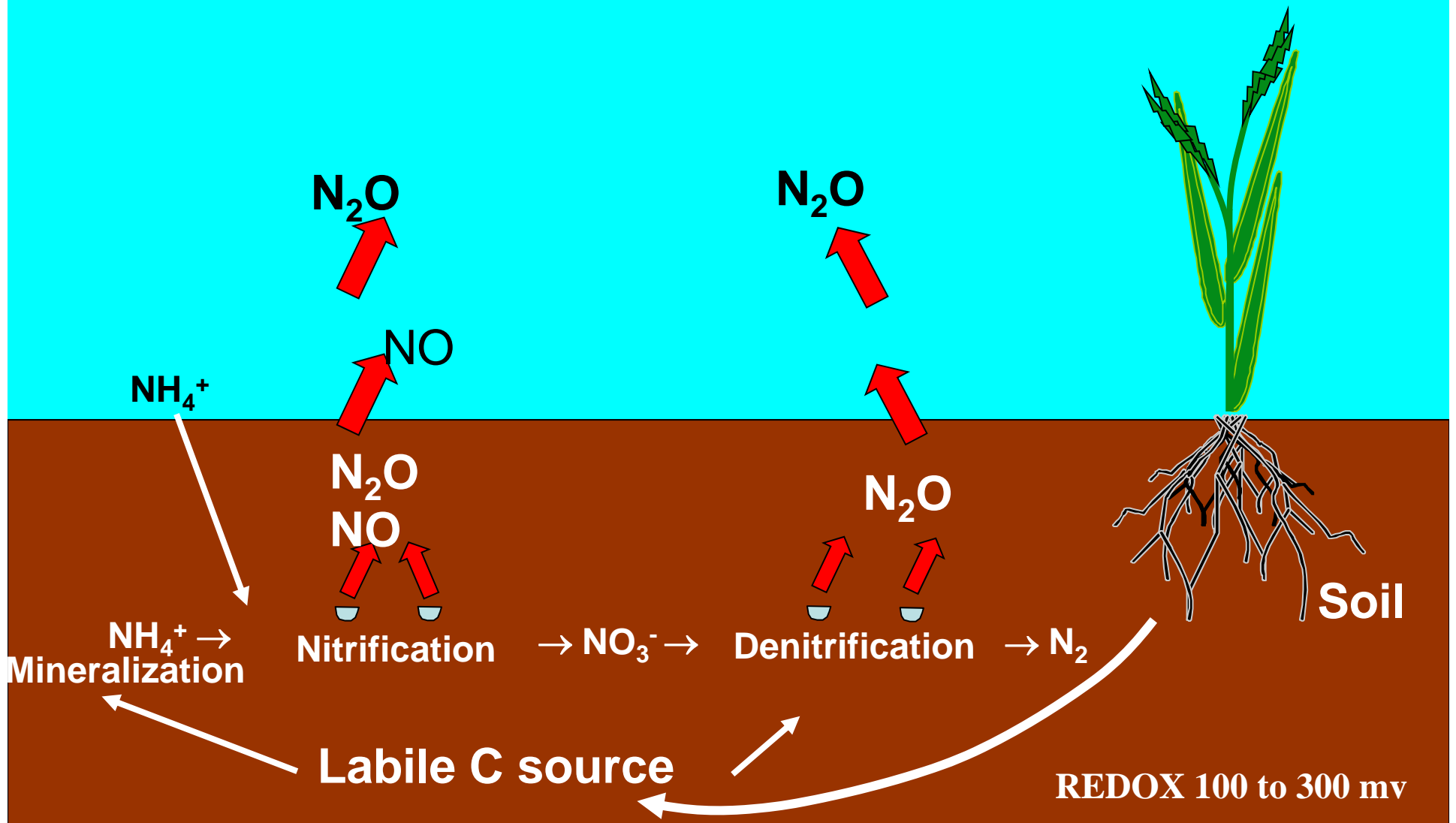
Greatest source of ozone depletion in stratosphere

**CA agricultural land emits:
52% of total N₂O
or**

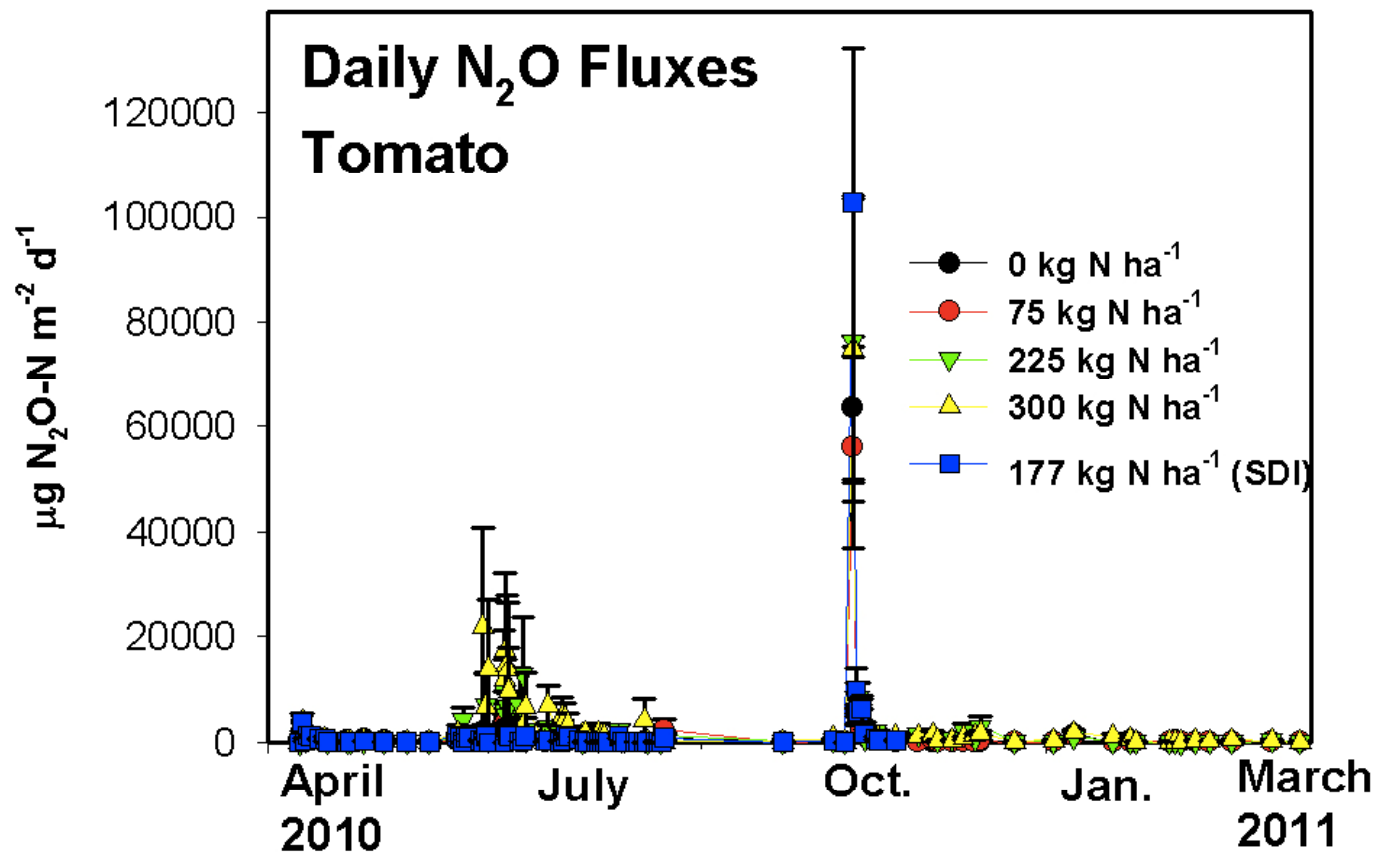
4% of CA total GHG emissions

Source: CEC, 2005

Soil Factors affecting N₂O production and emission

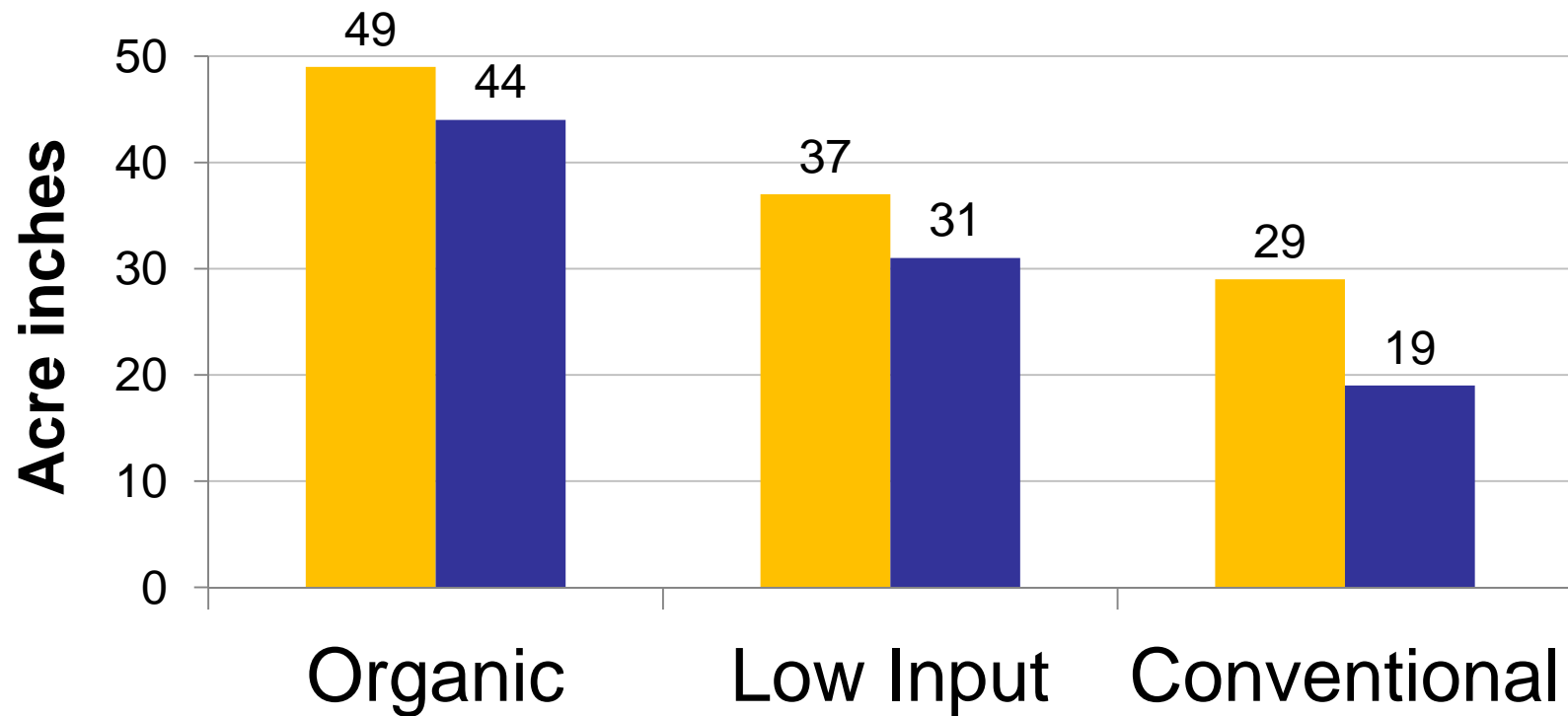


First Rain in Fall: Potential for N₂O Emissions



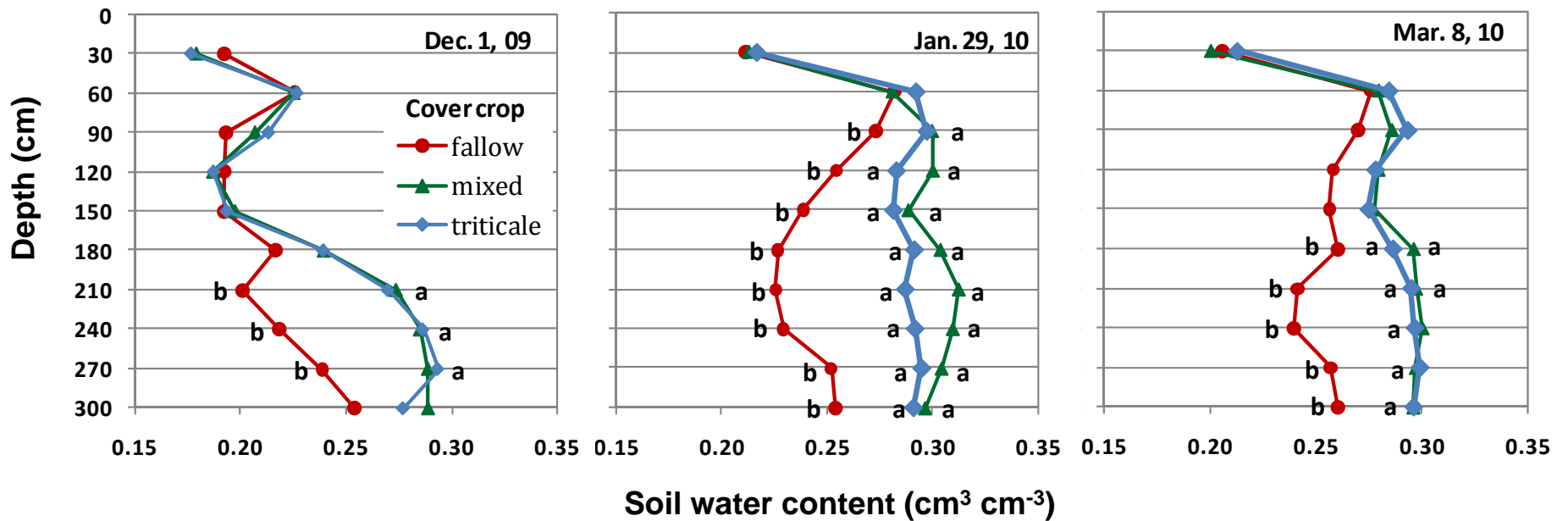


■ Corn ■ Tomato



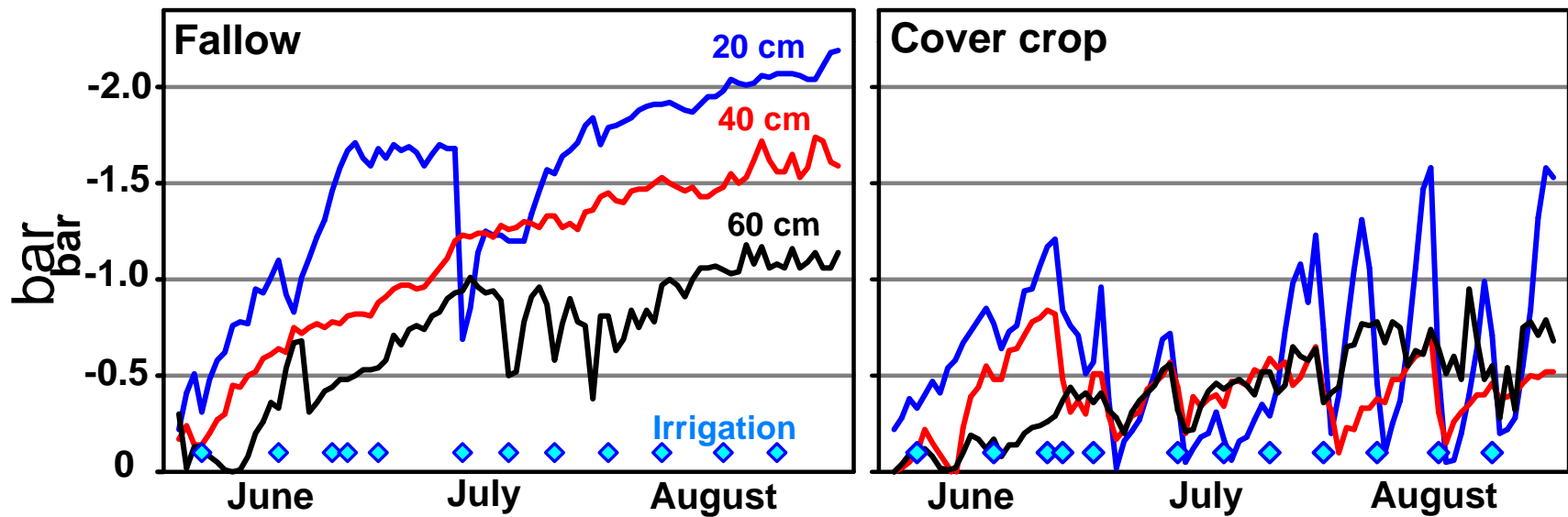
Soil Infiltration & Percolation Properties

Soil water content during Dec. 2009 – Mar. 2010



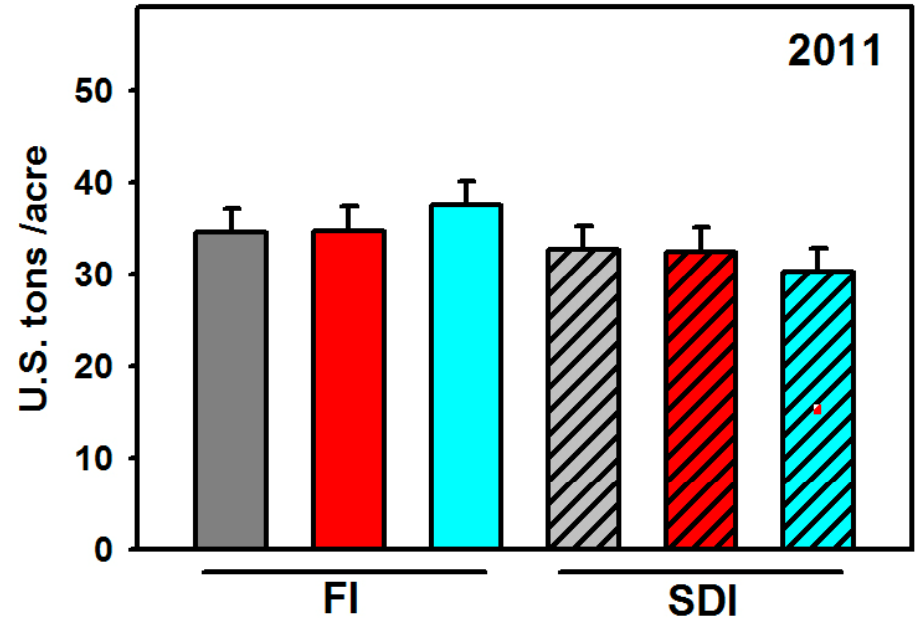
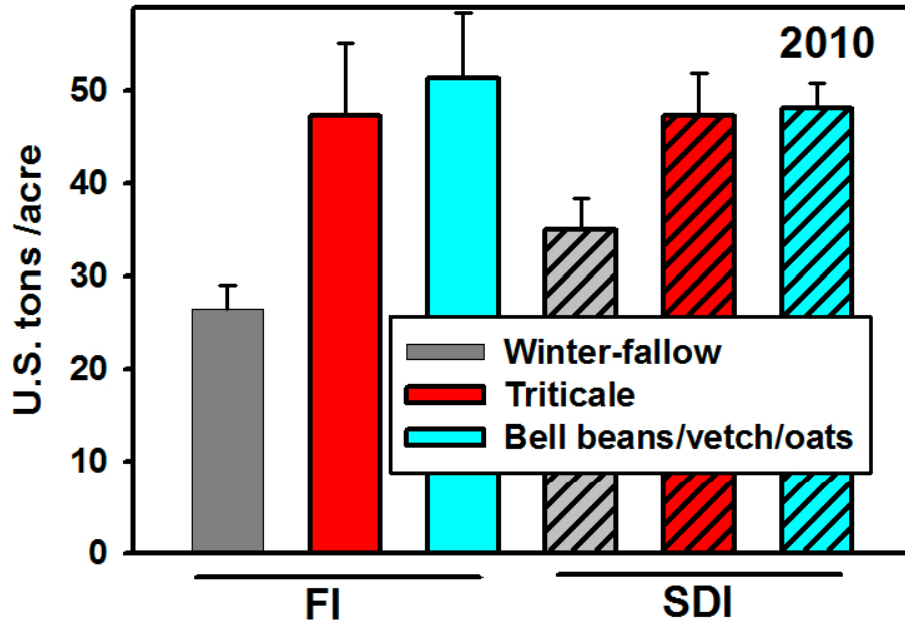
Long-term Change of Soil Infiltration Properties due to Cover Crops?

Soil water potential 6 inches from plant line at 3 depths with furrow irrigation (2010)



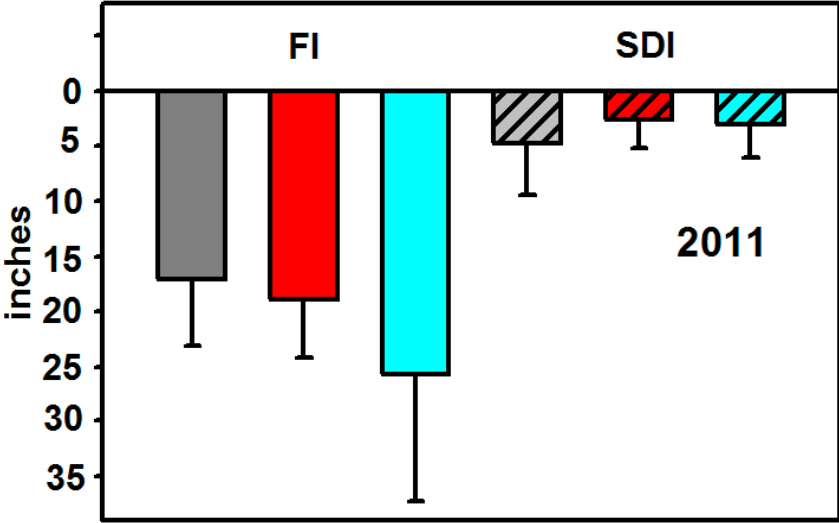
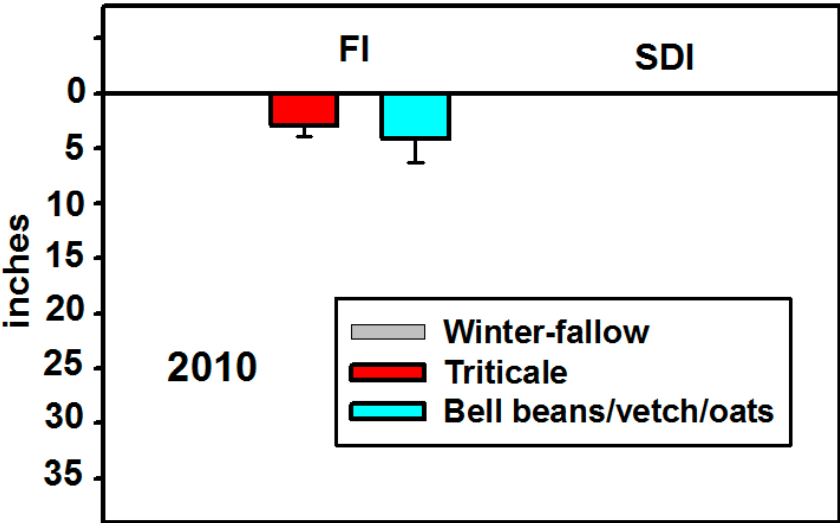


Yields





Calculated percolation below root zone





Summary & Conclusions

- **Carbon sequestration is proportional to the size of the organic matter inputs.**
- **After increased organic matter inputs, soils reach a new equilibrium carbon content that is maintained as long as the organic matter inputs continue.**
- **Sub-surface drip irrigation significantly decreased N₂O emissions compared to furrow irrigation.**
- **N₂O emissions increase with increasing fertilizer N additions.**
- **N₂O emissions were similar with non-legume and leguminous cover crops in plots with a long-term history of legume cover crop inputs at the Russell Ranch.**
- **Cover cropped soils have higher infiltration rates and the use of cover crops may also increase percolation.**

THANKS!

Acknowledgments

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