Carbon footprint of high-yielding irrigated alfalfa production in California

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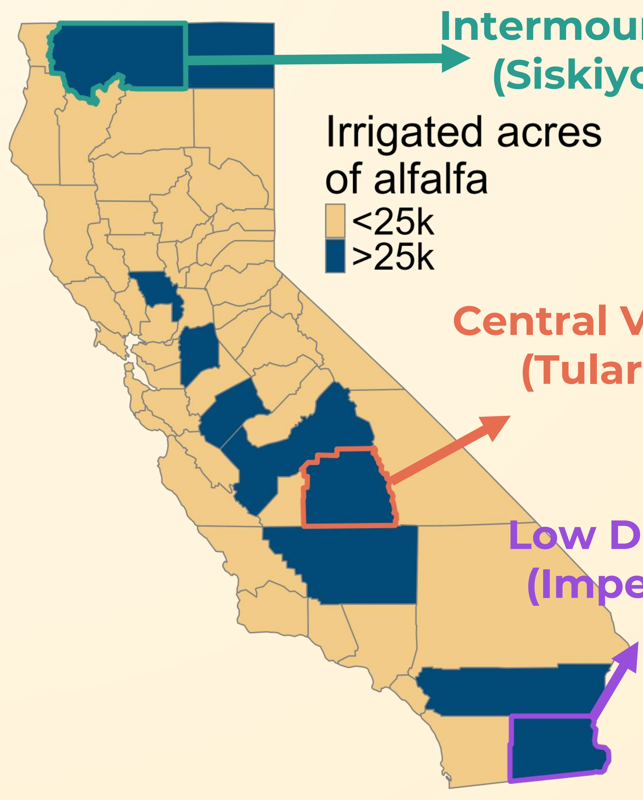
Introduction



Intermountain (Siskiyou)

- Cooler climate, short growing season.
- Mixed irrigation methods.
- Moderate inputs and yields **(14.1 Mg/ha)**
- 3-4 cuts per season.

Central Valley (Tulare)

- Warmer climate, moderate growing season.
- Mixed irrigation methods.
- Higher inputs and yields **(20.2 Mg/ha)**
- 5-9 cuts per season.

Low Desert (Imperial)

- Hot and dry, long growing season.
- Intensive irrigation, predominantly surface water.
- High inputs, moderate yields **(16.6 Mg/ha)**
- 8-12 cuts per season.

Objectives

- Quantify the carbon footprint of alfalfa production for three distinct growing regions
- Develop GHG mitigation scenarios targeting major drivers in each region
- Explore the potential role of alfalfa in emerging carbon markets, focusing on the feasibility and barriers of current programs and methodologies

Methods

System boundary: cradle to farmgate

+ manufacturing
+ field emissions
- CO_2 sequestered in soil
- N_2O emissions from avoided fertilizers in next crop

Results

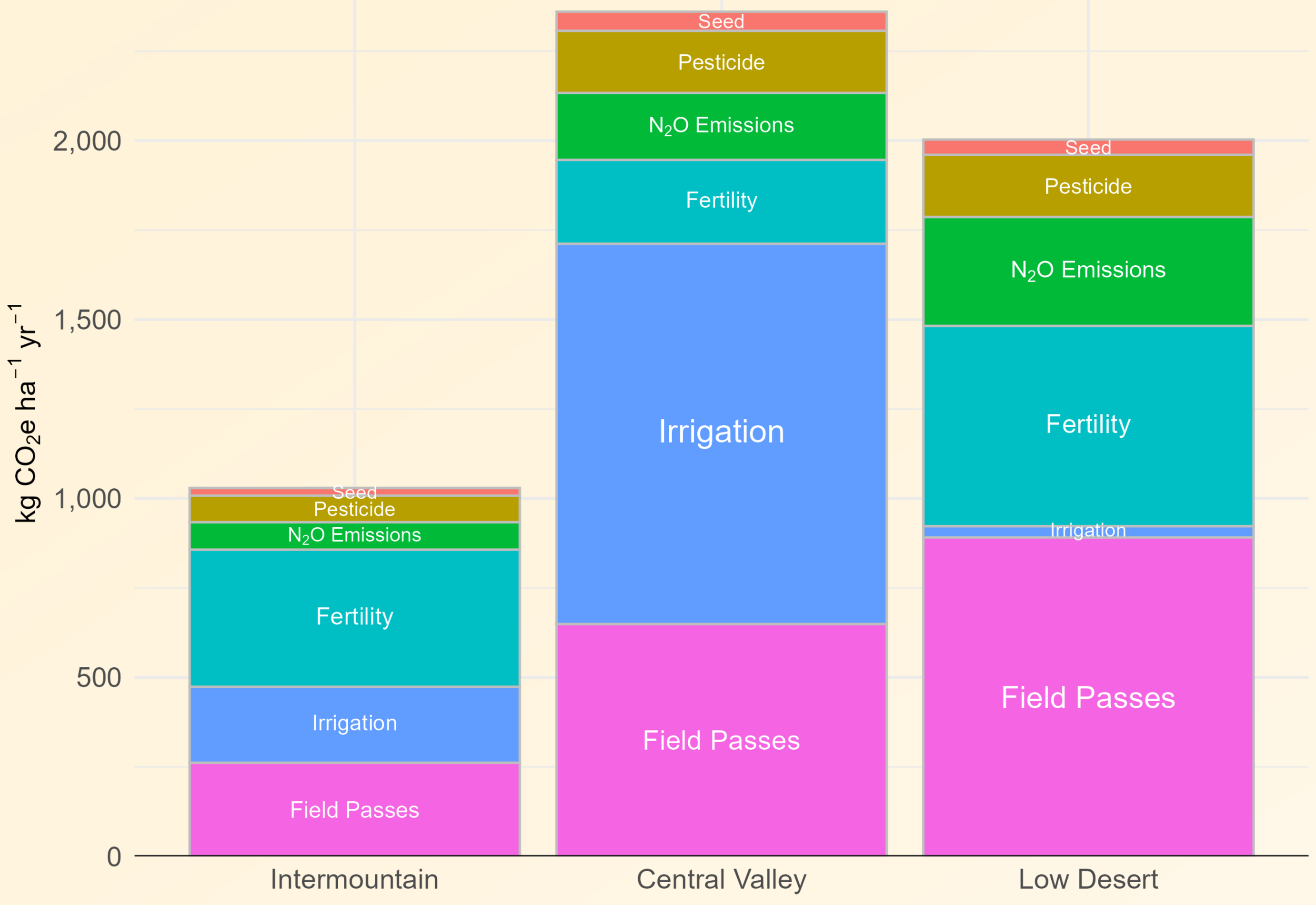


Figure 1. Carbon footprint of base scenarios by region.

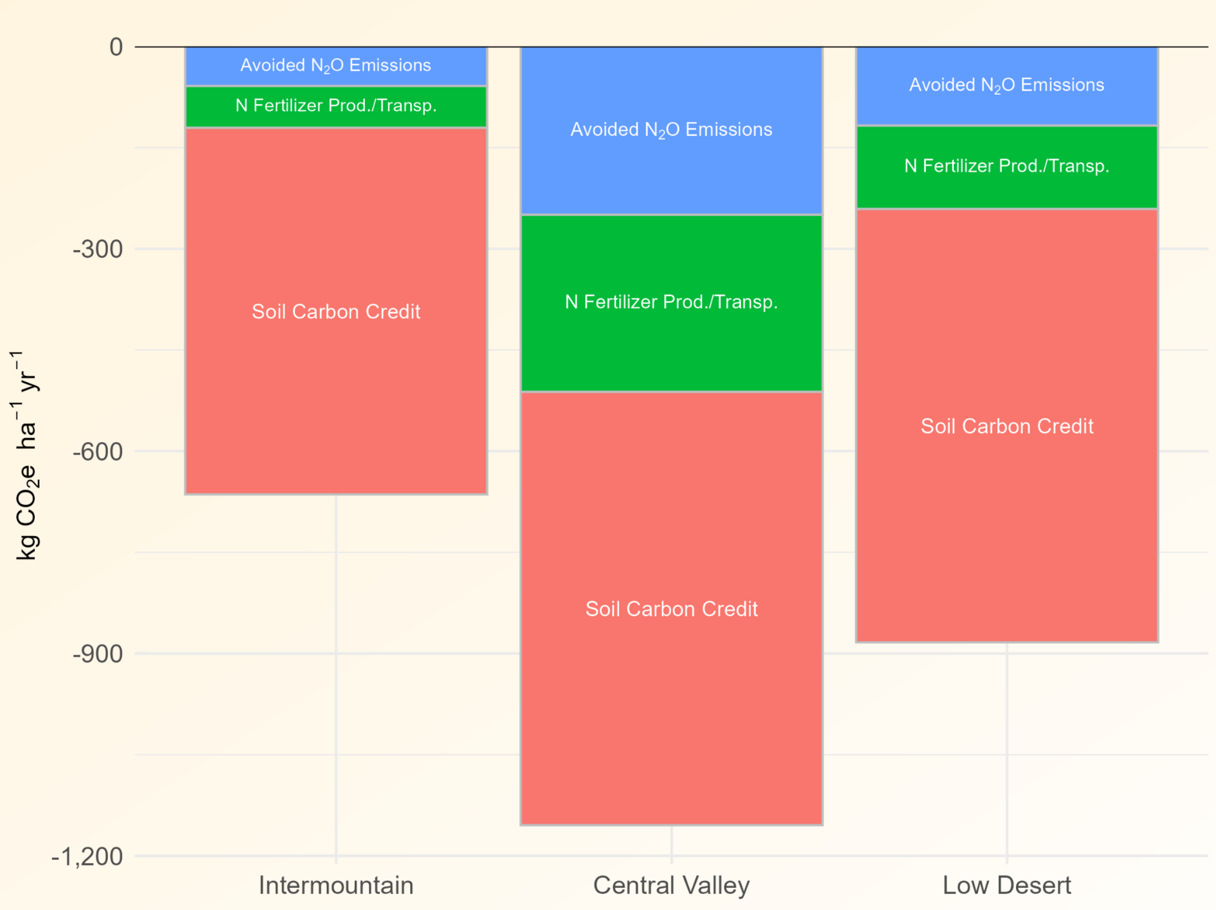


Figure 2. Offset potential of base scenarios by region.

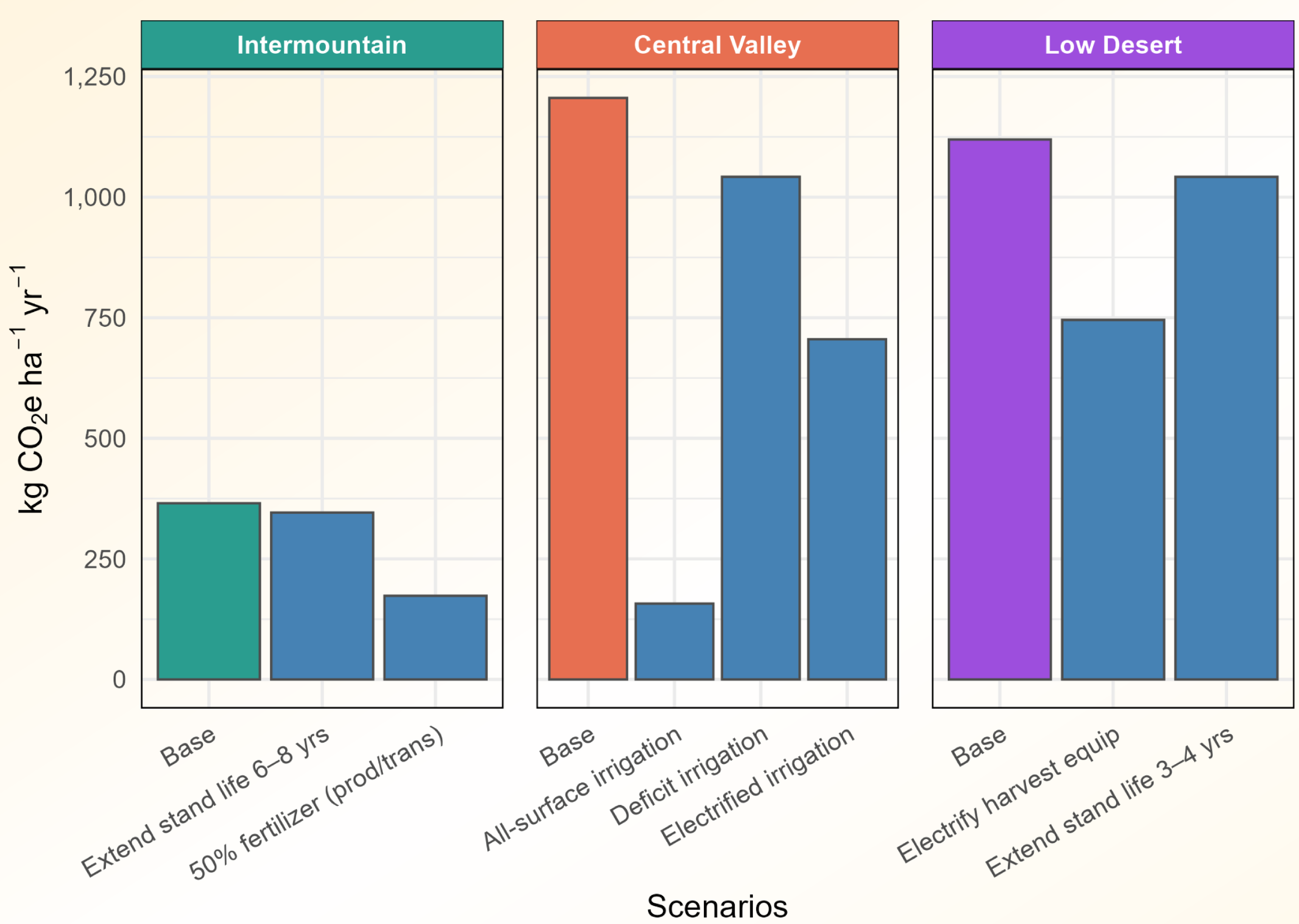


Figure 3. Net emissions with mitigation scenarios by region.

Conclusions

Yields and emissions by region:

- Intermountain: low yields, low emissions
- Central Valley: highest yields, high emissions
- Low Desert: moderate yields, high emissions

Top 3 scenarios that make the largest changes in CO2 eq/ha/year from baselines:

- Intermountain: emissions are low
- Central Valley: change ground irrigation to surface irrigation
- Low Desert: electrify harvest equipment

Future work

Perform extension and outreach with alfalfa growers and industry to raise awareness about management practices influencing GHG emissions in California.

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