Carbonleap.io: AI-Powered Hyperlocal, Needs-Based Climate and Financial Risk Assessments–An Agriculture Case

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INTRODUCTION

The agriculture, forestry, and land use (AFOLU) sectors contribute up to 33% of anthropogenic GHG emissions and are the primary global drivers of deforestation, biodiversity loss, and global water consumption. Despite this, they received less than 5% of global climate finance in 2019/20 [1].

Transitioning the agrifood system to a resilient, low-emissions 1.5°C-aligned pathway requires:

- 7 x annual investment (USD 1.3 trillion)
- Closing gaps in planning, finance and data

Viticulture provides a compelling entry point to the challenges within agrifood systems. The sector is:

- Composed of >50% small producers, with small sustainability teams and limited resouces [2].
- Increasingly impacted by climate change.

The agrifood system needs tools that empower small producers to integrate climate considerations into financial flows and access high-resolution, actionable insights for site-specific adaptation and mitigation.

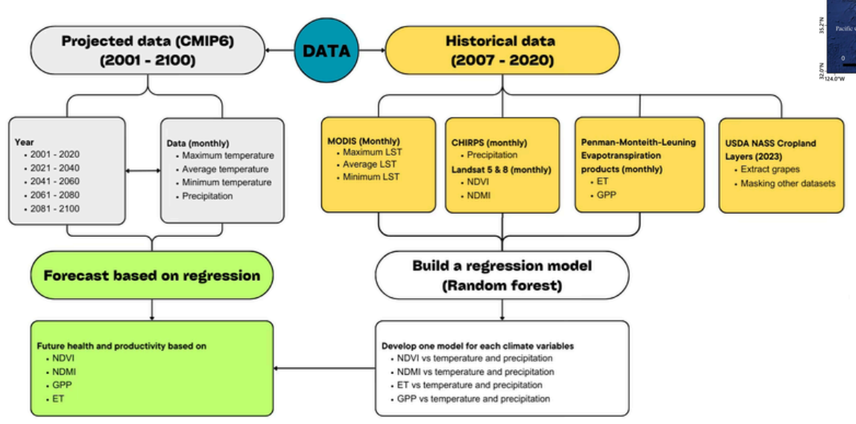
OBJECTIVE

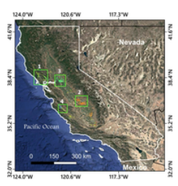
Democratize climate intelligence to promote resilience in the agrifood system.

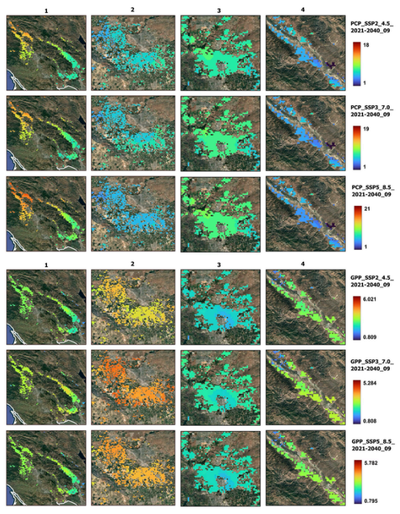
CarbonLeap offers an accessible, affordable, traceable, and transparent platform that integrates climate, business, policy, and industry-specific information for tailored guidance. It enables small producers to streamline sustainability, mitigate risk strategically, and harness high-resolution climate overlays.

METHODOLOGY

Study Area: California (American Viticultural Areas
1 km² downscaled CMIP6 data



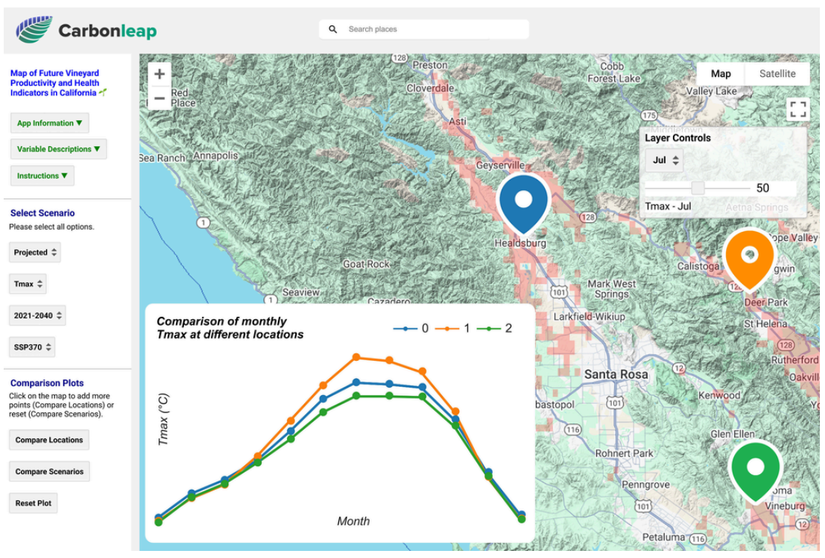




RESULTS

- Good performance for ET and GPP; NDVI and NDMI need improvement–iid assumption is not entirely correct.
- Precipitation increased in the North Coast when comparing SSP2-4.5, SSP3-7.0, and SSP5-8.5 for the epoch 2041–2060 in June, with higher values observed from SSP5-8.5 to SSP3-7.0 to SSP2-4.5.
- Most scenarios show a decrease in NDVI, NDMI, and GPP, while ET increases as the emission scenario intensifies.

CARBONLEAP FOR VINEYARDS



Application Features

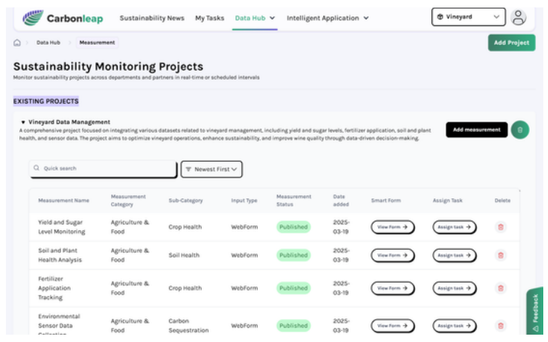
- Interactive map and time-series viewer
- Explore vineyard health indicators under emission scenarios
- Supports irrigation scheduling, varietal planning, and investment

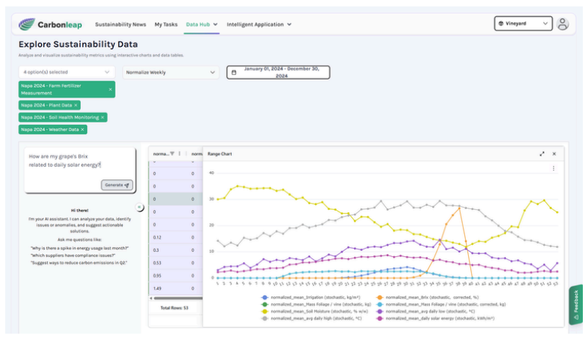
Practical Use Cases

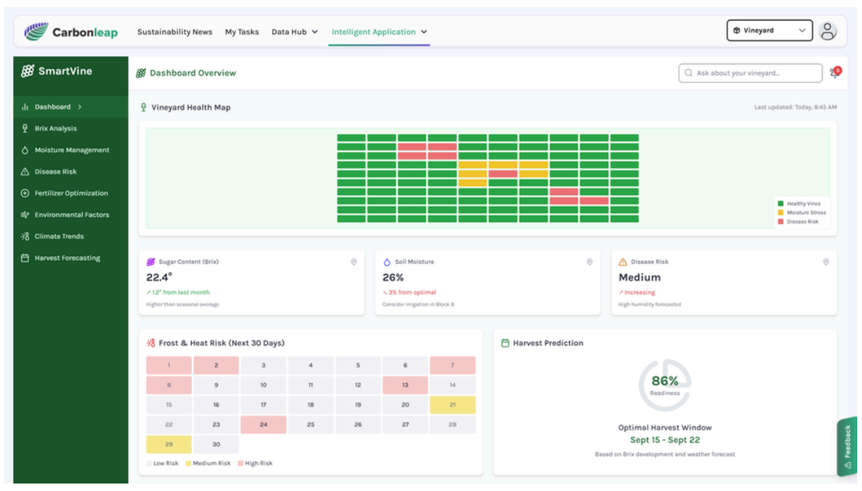
- Farmers–Optimize irrigation, choose resilient varietals
- Wineries–Anticipate shifts in flavor profiles, relocate
- Policymakers–Inform drought mitigation & subsidy targeting
- Investors–Derisk land acquisition strategies

Data integration

Climate + Finance + Policy







NEXT STEPS

- Integrate field-based observations and management data
- Improve ML models
- Address missing vineyards in training dataset
- Build pipelines to deliver localized strategies
- Expand financial risk estimations
- Identify viticulture hotspots
- Link real-time alerts and market signals

REFERENCES

1. Chiriac, D., Vishnumolakala, H., & Rosane, P. (2023). Landscape of climate finance for agrifood systems. Climate Policy Initiative.
2. Eurostat. (2022). Vineyards in the EU - statistics. https://ec.europa.eu/eurostat/

CONTACT US

Interested in collaborating or supporting our mission?
We'd love to hear from you — reach out at info@carbonleap.io.

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