Changing Cropland in Changing Climates: Quantifying Two Decades of Global Cropland Changes

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Science Questions

- How has cropland area changed over the past twenty years in regions with significant climate trends?
- What climate factors are most strongly associated with changes in cropland area?

Analysis

- Calculated linear trend in crop area and climate metrics
- Identified patterns using correlation and linear trend estimations (2001-2018)

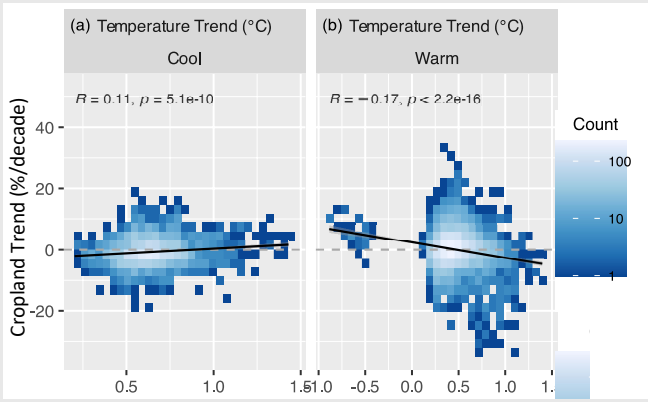
Metrics	Data Source
Cropland area	MODIS Terra+Aqua Combined Land Cover product (MCD12Qv6)
Temp, extreme heat, precip, PET	European Centre for Medium-Range Weather Forecasts Reanalysis v5 (ERA5)
Drought/ Wetness	Standardized Precipitation-Evapotranspiration Index (SPEI)

Results

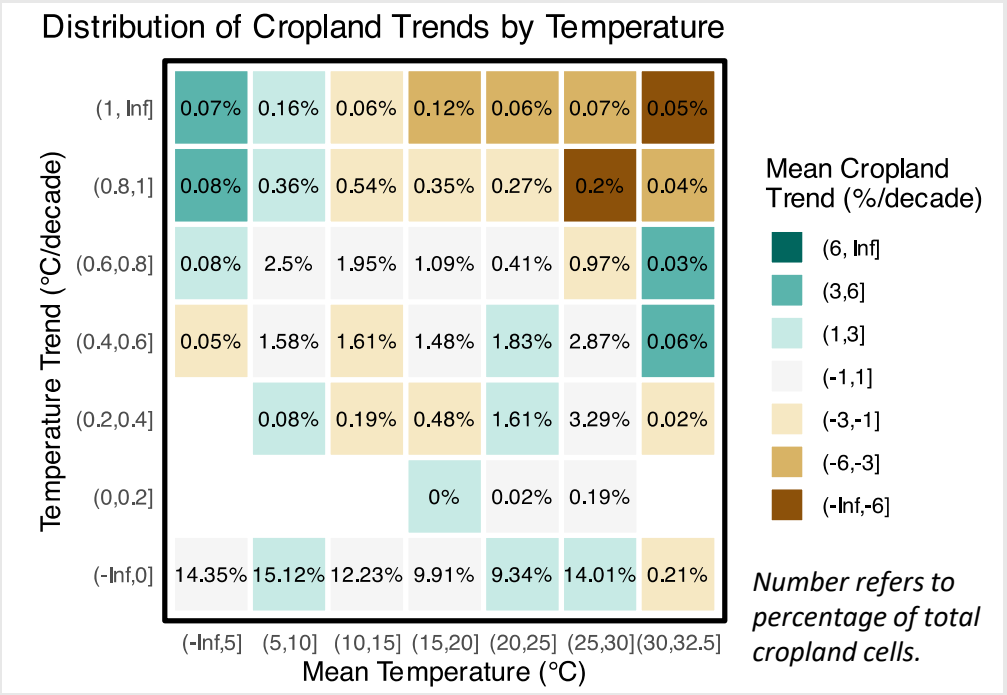
- Climate trends explained little overall variability in cropland area changes, but increasing mean temperature, extreme heat, PET, and drought were associated with higher levels of cropland loss
- Patterns generally reflected underlying climate suitability (increasing temperature was associated with cropland loss in hot regions and gains in cool regions)
- Strongest patterns occurred at extremes (regions with high cropland change; regions with borderline climate suitability)

Significance

- Agricultural adaptation to climate change affects not only food security but larger land use changes, with implications for the environment, ecosystem health, and carbon storage
- Understanding large-scale response patterns can provide context for local land use changes, and provide cross-regional comparability



Top: Correlation between temperature trends and cropland area trends, 2001-2018, in (a) cool regions and (b) warm regions.
Bottom: Distribution of cropland trends by mean temperature and temperature trend.



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