

Different responses of cereals to interacting climatic indicators in Northern Europe.



Faranak Tootoonchi*, Giulia Vico

* Swedish university of agricultural science (SLU)

✉ faranak.tootoonchi@slu.se @faranak_ttch

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Motivation

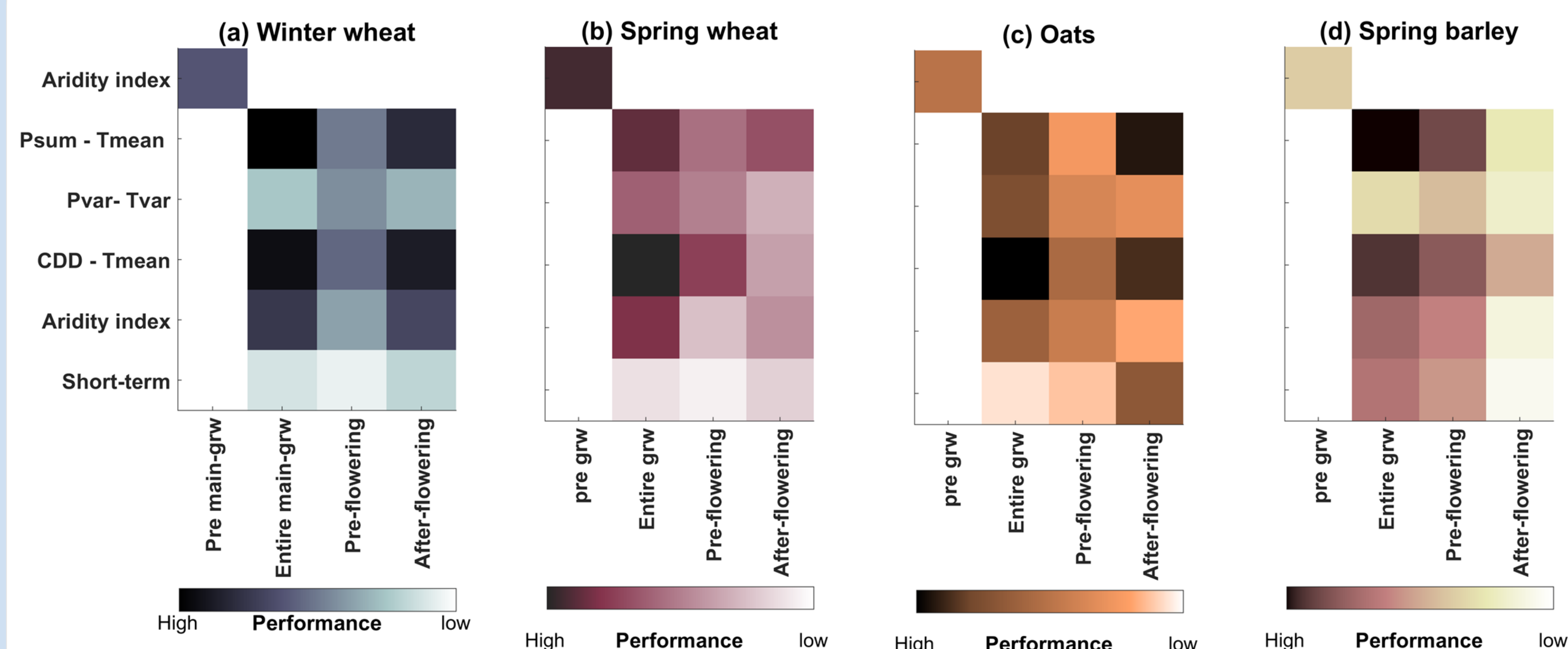
Crop yield variability is largely explained by climatic conditions such as precipitation, temperature, and their interactions.

At high latitudes the net positive or negative effects of changes of climatic conditions on crop yields are still not known.

The response of crops at different physiologically relevant developmental stages, and the role of legacy effects of climatic conditions over critical pre-growing periods are infrequently examined.

Result

Performance of statistical models, differing in explanatory variables and period, for four crops based on akaike information criterion.



Entire growing season was the period best explaining the yields, due to the sub optimal ranges of climate conditions and the low frequency of short term damaging climatic conditions.

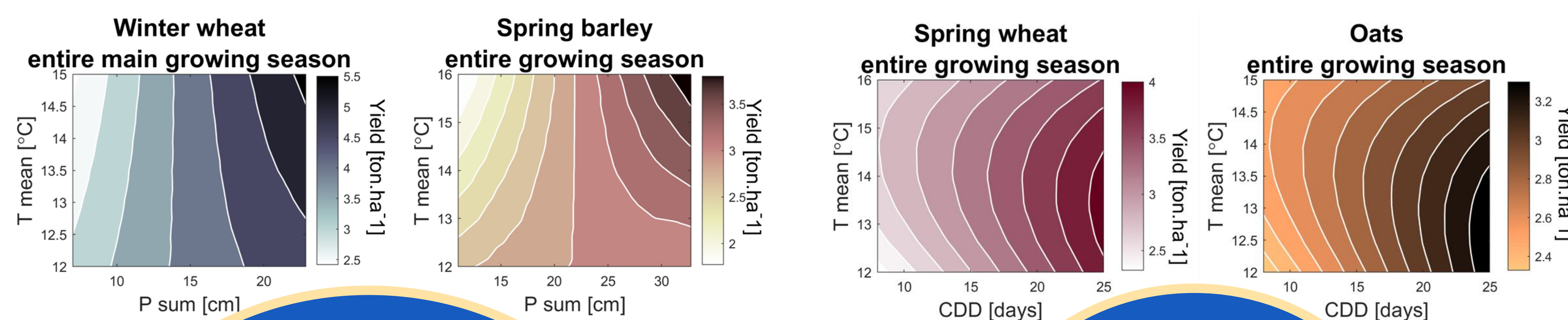
Data and Methods

Indicators: Reflect various attributes of precipitation and temperature.

Data: Data of 1965-2020 for Sweden over the periods (1) Pre-sow, (2) entire growing season, (3) pre-flowering, (4) after-flowering.

Models: Linear mixed effect models for (1) interacting indicators, (2) non interacting short-term indicators e.g. number of hot days, and (3) the composite indicator dryness index.

Crop yield as a function of best performing set of climatic indicators. CDD is the dry period with the longest length. The ranges of the climatic indicators correspond to the 5th and 95th percentiles of each indicator.



Implications under climate change

In future climates, benefits from higher temperatures and longer growing seasons will only be achieved under increasing precipitation or irrigation.

Benefits from high temperatures were only achieved when sufficient amount of precipitation was available for the crops.

Combinations of extended dry periods and high temperatures were a limiting factor for spring crops.

