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Climate variability and the European agricultural production

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By 2050, the global demand for maize, wheat and other major crops is expected to grow sharply. To meet this challenge, agricultural systems have to increase substantially their production. However, the expanding world population, coupled with a decline of arable land per person, and the variability in global climate, are obstacles to achieving the increasing demand. Creating a resilient agriculture system requires the incorporation of preparedness measures against weather-related events, which can trigger disruptive risks such as droughts.

This study examines the influence of large-scale climate variability on agriculture production applying a robust decision-making tool named fast-and-frugal trees (FFT). We created FFTs using a dataset of crop production and indices of climate variability: the El Niño Southern Oscillation (SOI) and the North Atlantic Oscillation (NAO). Our main goal is to predict the occurrence of below-average crop production, using these two indices at different lead times.

Initial results indicated that SOI and NAO have strong links with European low sugar beet production. For some areas, the FFTs were able to detect below-average productivity events six months before harvesting with hit rate and predictive positive value higher than 70%. We found that shorter lead times, such as three months before harvesting, have the highest predictive skill. Additionally, we observed that the responses of low production events to the phases of the NAO and SOI vary spatially and seasonally.

Through the comprehension of the relationship between large scale climate variability and European drought related agricultural impact, this study reflects on how this information could potentially improve the management of the agricultural sector by coupling the findings with seasonal forecasting system of crop production.