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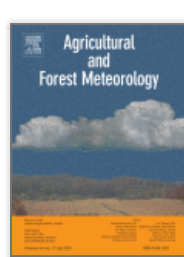
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## No historical evidence for increased vulnerability of French crop production to climatic hazards

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### Highlights

- Long-term multi-crop yield data with **high spatial resolution** are analysed in France.
- Novel, non-parametric climatic hazards concept is introduced to study climate risks.
- Vulnerability to climatic shocks has not increased in the last six decades.
- Heat-related hazards have increased and may rise further with climate change.
- Compound climatic hazards can cause severe yield losses.

### Abstract

Recent adverse weather events have questioned the stability of crop production systems. Here, we assessed the vulnerability of eleven major crops in France between 1959 and 2018 as a function of climate, crafting a novel hazard framework that combines exposure and sensitivity to weather-related hazards. Exposure was defined as the frequency of hazardous climate conditions. Sensitivity of crops was estimated by the yield response to single and compound hazards, using observed yields available at département (county) level. Vulnerability was computed as the exposure-weighted average of crop sensitivities. Our results do not reveal any evidence for historically increased vulnerability of French crop production. Sensitivity to adverse weather events, and thus the overall vulnerability, has significantly decreased for six of the eleven crops between 1959 and 2018, and shown no significant decline or remained stable for the other five. Yet compound hazards can induce yield losses of 30% or more for several crops. Moreover, as heat-related hazards are projected to become more frequent with climate change, crop vulnerability may rise again in the future.

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### Keywords

Multi crop; Weather; Exposure; Sensitivity; Non-parametric; Long-term

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