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The decreasing vulnerability of French crop production to climatic hazards

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Recent adverse weather events in Europe have questioned the stability of crop production systems. 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, while sensitivity of crops was estimated by the yield response to single and compound hazards. We used reported yields available at departement (county) level. Vulnerability was computed as the exposure-weighted average of crop sensitivities. Our results do not reveal any historical evidence for an increased vulnerability of French crop production. Rather, the 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. Our results may support insurance design by identifying single and compound hazards that can severely affect yields.