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Agriculture and climate change: Modeling issues and future directions

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Abstract: Climate change will be one of the multiple challenges that agriculture will face in the next few decades. These include primarily increased food demand due to a growing global population and increased standards of living, as well as increased demand for bio-energy to reduce the use of, and dependence upon, fossil fuels. At the same time, the environmental footprint of agricultural production will need to be reduced to achieve better sustainability of land use including reduced net greenhouse gas emissions. Climate change will superimpose its specific challenges—modified growing environments characterized by increased stresses on plant growth due to warmer, drier and/or wetter conditions, including more extreme events—on such already demanding trends.

How helpful are current modeling approaches in helping farmers and policy makers alike find workable solutions? This paper highlights recent progress and problems in modeling, with a focus on integration of eco-physiology and socio-economic issues across temporal and spatial scales. Challenges include, on the one hand, planning for effective adaptation solutions that reduce climate risks and safeguard food security; on the other, devise robust mitigation responses that help reduce greenhouse gas emissions and/or sequester carbon in agro-ecosystems. The limitations and advantages of modeling approaches will need to be made explicit if science is to significantly contribute to these critical areas of decision-making.

Abstract only