

## Climate Change Effects on Agriculture

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**Abstract :** Agricultural production is sensitive to weather and thus directly affected by climate change. Plausible estimates of these climate change impacts require combined use of climate, crop, and economic models. Results from previous studies vary substantially due to differences in models, scenarios, and data. This paper is part of a collective effort to systematically integrate these three types of models. We focus on the economic component of the assessment, investigating how nine global economic models of agriculture represent endogenous responses to seven standardized climate change scenarios produced by two climate and five crop models. These responses include adjustments in yields, area, consumption, and international trade. We apply biophysical shocks derived from the Intergovernmental Panel on Climate Change's representative concentration pathway with end-of-century radiative forcing of 8.5 W/m<sup>2</sup>. The mean biophysical yield effect with no incremental CO<sub>2</sub> fertilization is a 17% reduction globally by 2050 relative to a scenario with unchanging climate. Endogenous economic responses reduce yield loss to 11%, increase area of major crops by 11%, and reduce consumption by 3%. Agricultural production, cropland area, trade, and prices show the greatest degree of variability in response to climate change, and consumption the lowest. The sources of these differences include model structure and specification; in particular, model assumptions about ease of land use conversion, intensification, and trade. This study identifies where models disagree on the relative responses to climate shocks and highlights research activities needed to improve the representation of agricultural adaptation responses to climate change.

**Keywords :** climate change, agriculture, weather change, danger of climate change

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