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Effectiveness of Soil Conservation Practices as Climate Change Adaptations in Eastern US Corn-Soybean Production

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Climate change is projected to affect the atmospheric variables that control crop production in the Eastern United States (US). Given that changes in these variables over the next decades are currently unavoidable, crop production will need to adapt to the expected changes in order to prevent or reduce yield losses. The main objectives of this study were: 1) to evaluate the effects of climate change on yields in rainfed corn (Zea mays L.)-soybean (Glycine max (L.) Merr.) rotation systems in the Eastern US and 2) to test two soil conservation practices—no tillage and winter cover cropping with rye (Secale cereale L.)—for their effectiveness as climate change adaptations in these systems. We used the Agricultural Policy/Environmental eXtender (APEX) model to simulate corn-soybean rotation systems in the future (2041–2070) at nine land grant university research farms located throughout the Eastern US corn-soybean production belt from New York to Georgia. The simulated effects of climate change on yields varied depending on the climate model used, ranging from decreases to increases. Mean corn yields experienced decreases of 15–51% and increases of 14–85% while mean soybean yields experienced decreases of 7.6–13% and increases of 22–170%. Yield decreases were most common under the climate model predicting the highest increase in temperature and a reduction in precipitation, whereas yield increases were most common in the climate models predicting either a relatively small increase in temperature or a relatively large increase in precipitation. In many cases, the effects of climate change on yields worsened with time within the 30-year future period. The effects of climate change differed between the northern, central, and southern regions of the Eastern US, generally improving with latitude. Climate change generally affected corn yields more negatively or less positively than it did soybean yields. No tillage and rye cover cropping did not serve as effective climate change adaptations in regards to corn or soybean yields. In fact, planting rye after corn and soybeans reduced mean corn yields by 3.1–28% relative to the control (no cover crop). We speculate that this yield decrease occurred because the rye cover crop reduced the amount of soil water available to the following corn crop.