

Adaptation pathways to maintain global wheat production through the 21st century

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Abstract

Agricultural adaptation has the potential to reduce the negative impacts of climate change on crop yields. However, few studies have assessed the course of adaptation along with the progress of climate change for each of the current major food producing countries. Describing the pathways of adaptation (i.e., temporal sequences of adaptation) is useful because these show us the timing and intensity of the adaptations required. In this study, we developed adaptation pathways for the current major wheat-producing countries based on sequential introduction of the minimum adaptation measures necessary to maintain current wheat yields through the 21st century. We considered two adaptation options: (i) expanding irrigation infrastructure; and (ii) switching crop varieties and developing new crop varieties. The adaptation pathways differed markedly among countries. We found that forecasting the adaptation necessary in the future is important to achieve the benefit of the adaptation; in other words, the negative impacts of climate change could be moderated by implementing adaptations steadily according to forecasts of the necessary future adaptations, as compared to missing the appropriate timing to implement adaptations.