Sensitivity of Irrigation Water Supply to Climate Change in the Great Plains Region of Colorado

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Abstract: Increasing amounts of atmospheric carbon dioxide are expected to raise atmospheric temperature and lead to significant changes in global climate during this century. Global warming may have tremendous consequences for irrigated agriculture around the world. This paper investigates the possible effects of such climatic changes on water resources available for agriculture in the Arkansas River Basin in Colorado. The potential impacts of climate change on this region include changes in winter snowfall and snow melt, seasonal rainfall amounts and intensities and winter and summer time average temperatures. For this study, a framework was developed to quantify the effects of these seasonal impacts on the availability of irrigation water. Monthly surface water supplies, consumptive use, and water balances were estimated using neural networks, consumptive use, and water balance models respectively. Two transient climate scenarios extracted at high resolution from two General Circulation Models (GCMs); the HAD (Hadley Center) and the CCC (Canadian Center) were used. The climate scenarios were run assuming a 1% annual increase in CO_2 concentrations. The methodology and results described in this study are contributing to the national analysis of impacts of climate change on the water sector.The frame work developed as part of this research will help a region plan for changes in water supply and demand and will give decision-makers a tool for evaluating the impacts of climate change. Furthermore, the data driven nature of the frame work makes it flexible so that it can be applied to different areas.

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