Quantification of Climate Change Impacts on Irrigation Water Demand in the Arkansas River Basin- Spatial Approach

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The Arkansas River basin in Colorado, depends on surface irrigation to provide most of the water required for crop growth. Climate change, which might impact irrigation, may critically affect the region’s future economy. Changing climate and elevated atmospheric CO\textsubscript{2} are expected to influence irrigation by changing temperature, humidity and thus evapotranspiration. Therefore, it is an imperative task to model the combined impacts on irrigation of both the general warming and specific physiological responses of crops to the elevated levels of atmospheric CO\textsubscript{2}.

This paper reports on the current and potential assessments of climate change impacts on irrigation water demand. Historical and future scenarios of climate data are used to reproduce the spatial complexity of actual and projected irrigation water demand and to quantify the impacts of climate on irrigation. The climate data are extracted at high resolution (0.5 deg x 0.5 deg) from runs of two general circulation models (GCMs), the Canadian Climate Center model (CCC) and the Hadley Center model (HadCM2) from the UK.

The prime variable in estimating irrigation demand is evapotranspiration (ET), which is modeled using a consumptive use (CU) model. The Integrated Decision Support Consumptive Use (IDSCU) Model was developed by the Integrated Decision Support Group (IDS) at Colorado State University. The model incorporates monthly and daily ET estimation methods and is capable of accommodating the variability of the crops and soils within the model area. The computation of ET includes an option for calculating a soil moisture budget. For this study, ET is estimated using the Penman-Monteith method. The IDSCU Model was run on 5 representative farms under current climate conditions and under two climate change scenarios (CO\textsubscript{2} 365 and 560 ppm). The presentation will report on the methodology and the

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