

Inter-decadal climate variability in the Argentinean Pampas: impacts of plausible future scenarios on agricultural systems

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*Abstract presented at the Open Science Conference
of the Earth System Science Partnership (ESSP)
Beijing, China, 9-12 November 2006*

Important changes in the climate of the Argentinean Pampas were observed during the second half of the 20th century (e.g., increases in precipitation and minimum temperatures, decreases in maximum temperatures). This decadal variability, together with the availability of new production technologies and changes in the global economic context led to significant changes in agricultural production systems (e.g., land use patterns, crop yields, etc.). One relevant question is how these systems, which evolved partly in response to enhanced climate conditions, will respond if climate conditions change. Although currently it is difficult to anticipate climate conditions 20-30 years hence, we can propose a set of plausible climate scenarios and explore their possible impacts on agricultural systems. We begin by defining a set of plausible and interesting inter-decadal scenarios (e.g., a return to a drier epoch, the persistence of current conditions but with increased inter-annual variability, continuation of the recent trend toward wetter conditions). Then, stochastic non-parametric weather generators are used to simulate multiple realizations of daily weather consistent with proposed decadal scenarios. Finally, we use these synthetic climate series, crop growth and financial models and realistic models of risky decision-making to compute risk metrics (e.g., probability of yields or profits being below a threshold) and determine economic sustainability and optimal management of current production systems under the various climate trends. Preliminary results show clear impacts on current agricultural systems (e.g., higher probabilities of negative economic results if climate returns to drier conditions). Further, with current technologies and economic context, decision models suggest to adapt agricultural management differently under each plausible scenario (i.e., crop mixes, crop management). In addition to the simple but unrealistic assumption of constant technology, we plan to simulate the interaction of changing climate and technological innovations (e.g., simulation of anticipated biotechnological innovations by modifying parameters of biophysical crop simulation models).

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