

2011-12 TWRI Mills Scholarship Application

Applicant:

Jinfei Sheng

Faculty advisor:

Dr. Bruce McCarl,

University Distinguished Professor, Department of Agricultural Economics

Texas A&M University,

College Station, TX, 77843-2124

Email: mccarl@tamu.edu

Phone: [\(979\) 845-1706](tel:(979)845-1706)

Proposed Research: El Nino- Southern Oscillation's impacts on Texas water resources

With the increasing impacts of climate on water resources and drought incidence, an important question is what's climate impacts on water resources. Cai (2009) provides a statewide analysis on climate change showing significant effects on water and the economic value it generates. However she ignores the issue of El Nino Southern Oscillation (ENSO) that strongly alters Texas water availability (La Nina is associated with drought conditions as is being observed in spring 2011). Chen, Gillig, McCarl, and Williams (2005) investigates the ENSO's effect on water management and value in the Edwards Aquifer region finding strong reasons to take it into account in regional water planning. . However, wider state level issues have not been investigated. Furthermore Timmerman et al and others indicate that we will see more frequent and severe La Nina and El Nino events which would raise the frequency of droughts and flooding increasing variability. This project will conduct a complete economic and statistical analysis about the ENSO impact on water resources in Texas pre and post climate change, which will fill the gap in this research field.

More specifically, I will conduct a through investigation in the following aspects:

(1) the ENSO phase La Nina means less rainfall while El nino generally means more, I will provide estimation and forecasts on rainfall in Texas during the La Nina, Nuetral and El Nino phases looking at the full distribution including incidence of extremes.

(2) With solid foundation and training in statistics, I will make an analysis of the statistical distribution of ENS effects on water resources and their value in Texas. I will divide Texas into a regions based on crop reporting districts and then investigate the distributions for each region. I will do an examination of sifts in means, variance, skewness, and kurtosis plus extreme drought and flooding events.

(3) I will examine how climate change affects the ENSO conditional and total distributions given IPCC forecasts and Timmerman et al's results about increased frequency and strength of ENSO events.

(4) Based on the statistical distributions and the climate induced shifts, I will adapt the Cai economic models to analyze economics implication of ENSO's impacts on water resource. For example, regional economic welfare implications.

(5) A more interesting question for policy-maker might be the implications of the economic and statistical analysis for water management policy and climate change adaptation. This will be another important part of the project. A through discussion of suggested policies for water resources and climate change adaptations in Texas under existing and altered ENSO event frequency will be provided, ranging from agricultural irrigation (say crop) to municipal use for drinking water.

Academic Qualification:

Graduate GPR:

Undergraduate GPR:

GRE:

Relevant courses: Climate change and water resource, Statistics Inference I&II, Statistics Design I&II, Microeconomics Theory I&II, Econometrics I, Applied Econometrics, Regression analysis.

Proposed use of funds:

The funds will be used to cover fees for my study and cost in conducting research, such as buying books and other related materials. Also, I intend to use the funds to support the travel to present research paper in Agricultural and Applied Economics Association or/and American Economics Association in 2012.

Intended career path:

After finishing the PhD, my goal is to become a professor at a research university and conduct research on theoretical and applied economics with one emphasis on water resources and climate change.

Reference

Cai, Yongxia, "Water Scarcity, Climate Change, and Water Quality: Three Economic Essays," Doctorate Dissertation, Texas A&M University, May 2009.

Chen, Chi-Chung, Dhazn Gillig, Bruce McCarl, Lynn Williams, "ENSO impacts on regional water management: case study of the Edwards Aquifer," *Climate Research*, Vol.28, 2005.

Chen, C.C., B.A. McCarl, and R.M. Adams, "Economic Implications of Potential Climate Change Induced ENSO Frequency and Strength Shifts", *Climatic Change*, 49, 147-159, 2001.

Timmermann, A., J. Oberhuber, A. Bacher, M. Each, M. Latif, and E. Roeckner.

"ENSO Response to Greenhouse Warming." *Nature* (April, 1999): 694-97.