The following is a summary of the FY2008 progress report for the 2004-2009 research project entitled:

INTEGRATION OF CLIMATE VARIABILITY AND FORECASTS INTO RISK-BASED MANAGEMENT TOOLS FOR AGRICULTURAL PRODUCTION AND RESOURCE CONSERVATION

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Project Objectives

(a) Evaluate the utility of climate variations and forecasts for agriculture and resources conservation applications.

(b) Develop risk-based decision tools that take into consideration climate variations and forecasts for practical decision applications in agriculture and natural resource management.

(c) Demonstrate climate-related decision and application opportunities for a livestock grazing enterprise and a reservoir water-level management plan.

The guiding principle underlying this project is the bridging of the gap between emerging climate knowledge and application of climate information to problem-solving by developing decision tools for real-life applications that meet the requirements of producers and resource managers.

Approach

Decadal-scale climate variations are identified by a trend analysis of historical climate data published by NOAA's National Climate Data Center, and the utility of seasonal climate forecasts by NOAA's Climate Prediction Center are evaluated in terms of forecasted and observed departure from average conditions. Statistical characteristics of climate variations and forecasts are quantified in terms of basic distribution statistics and probability of exceedance curves (POE). Associated weather outcomes are developed using a weather generator, which will drive selected crop and hydrologic models that simulate climatic impacts on forage production and natural resources. Collaborating producers will capture their decision process using a journaling approach which will identify critical decision variables for which POE curves will be developed. The POE curves will reflect the risk and uncertainty of forecasted impacts and represent the basic decision information for decision makers. Two case studies, the management of a fall forage-grazing system in central Oklahoma and water-level regulation for Lake Texoma reservoir, will be used to demonstrate the management potential offered by climate variations and forecasts.

Accomplishments

Local Impact Forecasts derived from Seasonal Climate Forecasts:
Seasonal climate forecasts issued by NOAA's Climate Prediction Center appear to offer an opportunity to reduce climate-related risks in agricultural and water resource management. However, use of seasonal climate forecasts has been limited, in part because methods to translate regional climate forecasts into local agronomic or hydrologic impact forecasts (for example, crop productivity or streamflow) have not been offered. Scientists within the Great Plains Agroclimate and Natural Resources Research Unit in El Reno, OK, have developed a method to downscale seasonal climate forecasts into sequences of location specific daily weather outcomes. The intended application of the methodology is for areas of the U.S. where seasonal climate forecasts have demonstrated utility. The methodology to downscale seasonal climate forecasts to daily weather enables development of location and application specific climate-related decision information for agricultural production and water management.

Multi-Year Pluvial Periods Greatly Impact Watershed Sediment Yield:
Multi-year pluvial periods increase watershed sediment yield and accelerate reservoir sedimentation thereby diminishing effectiveness of reservoir function and shortening the expected useful life of reservoirs. Scientists within the Great Plains Agroclimate and Natural Resources Research Unit in El Reno, OK, estimated watershed sediment yield based on available sediment and discharge measurements. The strong sensitivity of runoff and sediment yield to variations in annual precipitation persisting over several years was demonstrated for central Oklahoma climatic and physiographic conditions. The findings of this research emphasize the need to design conservation practices and test their effectiveness under multi-year pluvial periods as soil erosion and sediment movement are highest during these periods.

Publications

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