

The following is a summary of the FY2009 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 and the research approach are the same as in Project Progress Report FY2007.

Accomplishments

Utility of seasonal climate forecasts tested for winter wheat grazing operation.

Profits generated from grazing livestock on winter wheat vary with number of livestock grazed and anticipated forage availability during the grazing season, which in turn depends on seasonal climate. Scientists at the USDA-ARS Grazinglands Research Laboratory, El Reno, OK, explored the potential utility of seasonal climate forecasts for Oklahoma to determine if these forecasts could help anticipate fall-winter forage production and lead to actionable information that increased profits or reduced risks of grazing operations. Results suggested that strong seasonal climate forecasts, early in the forage production season, could lead to useful decision information. However, forecasts issued over the last 12 years revealed that useful forecasts were few in Oklahoma, about once every three years. The study established that seasonal climate forecasts in Oklahoma are not a viable option for developing, on a yearly basis, decision information that enhance estimation of stocking rate. Development of operational decision support should focus on soil water at decision time and establish risk based on average climatic conditions.

Best management for winter wheat grazing under various climate and market scenarios.

Grazing winter wheat is a complex system involving interaction and tradeoffs between beef and wheat production while at the same time being subjected to varying climatic, soil water, and market conditions. Scientists at the USDA-ARS Grazinglands Research Laboratory, El Reno, OK, reviewed Oklahoma agricultural production and income statistics and historical climate records to identify scenarios of climate, market and initial soil water conditions that favored either grain production, beef production, or grain and beef production. Based on computer simulation, economically optimal winter wheat planting dates and livestock grazing intensities were identified for each scenario. General guidelines were developed for selecting planting dates and grazing intensities for known wet/dry initial soil water and anticipated climate and market conditions. Consideration of these guidelines at the planning stage of winter wheat grazing operations may direct attention to optimal grazing opportunities, reduced risk, and increased profit margins.

International Cooperation/Collaboration

- CHINA

Informal collaboration with the Institute of Soil and Water Conservation, Northwest A&F University, Yangling, China. A Ph.D. student is applying the Wheat/Grazing model to support decision making and to evaluate the model's ability for use in managing dual-use winter wheat in Oklahoma under selected climate scenarios. The student is conducting sensitivity and uncertainty analyses of the Wheat/Grazing model to assist in decision making.

- MEXICO

Collaboration with local, state, federal, and university partners from Mexico, along with ARS Conservation and Production Research Laboratory, Bushland, TX, and partners from University of Georgia and Texas A&M University. A workshop is planned in the Calera Aquifer Basin, Zacatecas, Mexico. The workshop will identify common issues associated with variable climate, drought, and declining water table levels and develop joint research opportunities.

Publications

Chen, J., Zhang, X.J., Liu, W.J., Li, Z. 2009. Evaluating and extending CLIGEN precipitation generation for the Loess Plateau of China. *Journal of the American Water Resources Association*. 45(2):378-396.

Zhang, X.J., Liu, W., Li, Z., Zheng, F. 2009. Simulating site-specific impacts of climate change on soil erosion and surface hydrology in the southern Loess Plateau of China. *Catena*. Available: www.elsevier.com/locate/catena/doi/10.1016

Zhang, X.J., Phillips, W.A., Garbrecht, J.D., Steiner, J.L., Hunt, L.A. 2008. A wheat grazing model for simulating grain and beef production: Part 1 - model development. *Agronomy Journal*. 100(5):1242-1247.