

# Predicting Impacts From Climate



## Variations

**W**eather” is the temperature, wind, rain, humidity, sunshine and cloudiness that we see on a daily basis. But “climate” is the average of day-to-day weather, over months, years, or centuries.

Climate varies over time, and forecasts of next season’s through next year’s climate are being issued monthly by the National Oceanic and Atmospheric Administration (NOAA). ARS scientists are working to translate these climate forecasts into useful information for farming and water management in the coming year.

“It’s the short-term variations or departures from the long-term averages—like droughts and floods during the crop growing season—that farmers are concerned about. Those are the climate and weather issues we focus on,” says Jeanne Schneider, a meteorologist at the ARS Great Plains Agroclimate and Natural Resources Research Unit in El Reno, Oklahoma.



### Making Forecasts More Useful to Farmers

Since 1995, NOAA has issued seasonal climate forecasts covering large regions—about half the size of Oklahoma or three times the size of smaller states such as Maryland. But these forecasts have seen little use in agriculture. One problem was that they cover too large an area for direct agricultural application. Another problem was that seasonal forecasts are issued for 3-month periods, which are too long for effective agronomic applications. Also, no one was sure how useful the forecasts were for specific regions.

Schneider found that NOAA predictions of periods of above-average temperatures were dependable enough to have potential usefulness for agriculture over most of the lower 48 states. “But currently available forecasts for cooler-than-average temperatures are generally too unreliable for many uses anywhere in the country,” she says.

Forecasts for wetter- or drier-than-average conditions were mostly useful in regions known to experience the strongest El Niño or La Niña effects on precipitation—about 10 percent of the lower 48 states. In these regions, seasonal precipitation predictions may

assist crop insurance programs and other agricultural enterprises that operate at regional scales.

Schneider and ARS hydraulic engineer Jurgen Garbrecht continue to work with NOAA to meet the needs of farmers and other users. The forecasts have evolved greatly over the years, and major improvements continue to be made.

### Adding Forecasts to Computer Models is Next

Garbrecht, Schneider, and ARS hydrologist John Zhang are researching ways to apply seasonal climate forecasts at the farm level by developing computer models for climate-related decision support.

Schneider developed new methods to downscale seasonal forecasts to the farm scale and express them in 1-month increments. Garbrecht modified an ARS-developed software program to generate daily weather outcomes corresponding to these monthly climate forecasts. And Zhang developed a winter wheat grazing model to assess potential impacts of the seasonal forecasts on forage, beef, and grain production. The forecast-derived information can then be used to anticipate grazing opportunities, estimate crop yields, adapt management and agronomic operations, reduce climate-related risks, and increase profitability.

“Given the rapid rate of development of forecast

methodologies, farmers and ranchers can expect continuing improvements,” Schneider says. “Demonstrations of specific agricultural applications in regions that currently benefit from forecasts should help spur wider use elsewhere as forecasts improve.”—By **Don Comis**, ARS.

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