Making the best use of a limited irrigation water supply

Gerald W. Buchleiter
Agricultural Engineer
USDA-ARS Water Management Research
Fort Collins, CO

Greater competition for limited water supplies

Droughts over the past several years, regulations to satisfy court decrees, and increasing competition from non-agricultural users, have significantly reduced water supplies available for irrigated agriculture. The Statewide Water Supply Initiative (SWSI) and the Drought and Water Supply Assessment are two extensive studies completed by the Colorado Water Conservation Board in 2004, that emphasize the critical nature of water in Colorado. The SWSI study predicts that 85% of the projected population growth of 2.8 million people by 2030, will live on the Eastern Slope. This development will result in up to 20% reduction in irrigated acreage and 22% of the projected water needs cannot be met with existing or planned projects.

A recent USGS survey of 30 wells monitored in the central Ogallala Aquifer in eastern Colorado and western Kansas, indicated nitrate levels exceeding the drinking water standard of 10 ppm in a 1/3 of the wells and atrazine was detected at significant levels in 70% of the wells.

The bottom line is that there will likely be unprecedented pressure on irrigated agriculture to use water more efficiently and decrease water quality degradation.

Current research areas

Irrigation with a limited water supply

A long term limited irrigation study is getting underway this summer at Colorado State University's ARDEC facility near Fort Collins. The WMR is cooperating with DwayneWestfall and Neil Hansen from the Soil and Crop Sciences Dept. at CSU to look at a range of options for maximizing crop production with a limited water supply. Replicated plots are irrigated with both sprinkler and furrow irrigation systems using several irrigation strategies. Research results will provide information to develop recommendations about how to change crops, cropping systems, irrigation methods and strategies, to maximize crop production for water supplies ranging from rainfed to full irrigation.

Precision Farming

A field study on the Byron and Nate Weathers Farm near Yuma was initiated to characterize the variability of soil water and nitrogen and their impacts on corn yield. These producers use strip tillage to reduce production costs and erosion, while increasing surface residue that reduces soil surface evaporation and increases soil organic matter. They are also experimenting with variable rate technology to vary plant populations based on bulk soil electrical conductivity maps and intend to variably apply nitrogen as needed through the season. Our efforts are focused on monitoring soil moisture conditions and nitrogen sufficiency of the corn crop through the season and relating

measured variabilities in the components of the water and nitrogen budgets with the yield data collected at harvest as well as the producer's yield maps.

Improving flow measurement

As water supplies get tighter and there is an increased awareness to quantify water uses, accurate flow measurement is becoming much more important to producers and other water users that desire to more effectively manage their water. Although there are numerous technologies available for water measurement, good installation and maintenance practices are essential to obtain quality data for making management decisions. A combination of laboratory and field tests are planned to evaluate some of the easier to use methods to provide information that producers and/or consultants can use to measure irrigation amounts and evaluate irrigation practices.

COAGMET (Colorado Agricultural Meteorological Network)

Since its inception, data from the COAGMET has been used by producers, crop consultants, researchers, governmental agencies and others ag businesses for a variety of applications ranging from pest and disease prediction, crop water use and irrigation scheduling, growing degree days, wind conditions for pesticide applications, etc. Although funding for COAGNET has always been very tight, use of its data is increasing, making it imperative that the data be of good quality and as complete as possible. WMR continues to provide technical support for maintaining and upgrading the current weather station network around the state. We have initiated a more rigorous program to calibrate the sensors at the weather stations on a regular basis, so the data quality is documented and hopefully improved over time. As the use of these data expands into applications dealing enforcement of laws and regulations, data quality is a very important issue that we are trying to address with better equipment calibration and maintenance practices and data quality checking procedures.