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Ag Water NetWORK

Water and Agriculture: Valuing our Essential Resources

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Part 1 in a 2-part Series

This summer, like every summer, a cornucopia of Colorado grown foods will appear at grocery stores and farmers markets across the state. Coloradoans will once again be biting into juicy Palisade peaches and enjoying ripe Rocky Ford cantaloupe. What is the primary ingredient of these delicious products? Water. Cantaloupe and peaches are about 90 percent water. Those golden kernels of savory Olathe sweet corn? About 72 percent.

It takes a lot of water to grow food – but the amount that ends up in the food itself is a small part of the story. More than 99 percent of the water used by irrigated crops or turf is drawn through the roots and transpired through the leaves. Only about a tenth of one percent (0.1%) of the water taken up by plants is actually used to produce plant tissue.[1] In other words, crops use a lot of water to conduct photosynthesis and manage heat stress.

Image courtesy of Northern Water

Evapotranspiration (ET) is the term used to describe the water used by plants. Evapotranspiration is the water loss occurring from the processes of evaporation and transpiration. Evapotranspirative losses are determined by the combination of solar radiation, temperature, humidity and wind.[2]

In Colorado, irrigation water rights are based on the historic ET of the crops grown plus any transit water that has historically been needed to deliver the water from the source to the field. The term “consumptive use” (CU) describes the measure of an irrigation water right, and includes these two elements. Crop water use, consumptive use and evapotranspiration (ET) are terms used interchangeably to describe the water consumed by a crop.[3]

If farmers use more efficient irrigation methods, won’t they use less water?

Efficiency is often confused with conservation. Efficiency refers to the amount of water applied compared with the amount of water used by plants. If 100 acre-feet of water is applied to a field over a growing season and the crop consumptive use is 50 acre-feet, then the system is 50 percent efficient. The remaining half runs off the end of the rows and percolates down below the root zone. Surface and subsurface flows coming off flood and furrow irrigated fields may recharge groundwater, support stream flows, and be used by others downgradient - including other farmers, municipalities, industries, and domestic well owners. This practice enables multiple uses of water within basin systems and increases the water supply for aquatic life and downstream users in the latter part of the irrigation season.[4] In many basins in the West, total diversions vastly exceed total flows in the river, which demonstrates the multi-use aspect of return flows.

Irrigation efficiency is not included as a variable affecting plant ET. Greater irrigation efficiency does not mean lower total crop water use. In fact, improved irrigation efficiency may *increase* crop consumptive use. A more efficient irrigation method typically delivers water to crops in a more uniform and timely manner, creating conditions that optimize plant growth and yield, resulting in correspondingly higher evapotranspiriation.

Other efficiency improvements like lining ditches and canals, may allow an irrigator to divert less water, but will negatively impact return flows. Those same lining projects may also harm flora that grow along ditches and canals. Some of these plants we value for their aesthetics and habitat while others can be an invasive nuisance. The typical end result of improved irrigation delivery efficiency is that non-consumptive use water is not 'saved,' it is redistributed away from return flows back to the river where it can be diverted by other water right holders.

Image: Phil Brink

References:
1. Understanding Plant Water Use: Evapotranspiration www.coagmet.colostate.edu/extended_etr_about.php
2. ibid.
3. Fact Sheet No. 4.718, CSU Extension.
4. Completion Report No. 190, Colorado Water Resources Research Institute