Almond Board of California

Irrigation Scheduling using Evapotranspiration (ET) and Updated Almond Crop Coefficients (Kc)

A first step toward optimum irrigation scheduling is to understand the changing demand of almond trees based on water use by evapotranspiration, or ET. ET scheduling accounts for the loss of water through soil surface evaporation and transpiration through openings in the leaves. In almonds, ET will change throughout the year according to weather (e.g., heat and humidity impact evaporation) and time of year or crop stage (e.g., lower leaf surface in early season equals lower transpiration).

The amount of almond water demand (ETc) can be calculated using this equation: ETc = ETo x Kc.

ETo represents water use by a reference crop, which is grass pasture. Evapotranspiration rates for reference crops can be found through a number of sources including the free state-operated CIMIS system (http://www.cimis.water.ca.gov) or through various free or fee-based services. Note that ETo is multiplied by a scientifically based crop coefficient (Kc). The Kc is a simplified way of representing the ratio of water use by the crop in question (ETc), almonds in this case, to the reference ETo, which is water use by grass pasture. Almond crop coefficients have been updated by recent research and are shown in the table below.

Estimates of the monthly crop coefficient (Kc) values for mature almond trees for research performed within California. The more recent Kc values (Sanden, Goldhamer) are recommended for use with a grass reference crop (ETo).

	Almond Production Manual (1996)	Sanden (2007)	Goldhamer (2012)
March	0.54	0.59	0.20
April	0.63	0.78	0.67
May	0.76	0.92	0.95
June	0.85	1.01	1.09
July	0.94	1.08	1.15
August	0.94	1.08	1.17
September	0.93	1.02	1.12
October	0.82	0.89	0.85
November	0.70	0.69	

References
1.) Doll, David. 2010. "Irrigation Scheduling 101" in Irrigation Module of California Almond Sustainability Manual, pages16-25.
2.) Goldhamer, David. 2012. Almond in Grop Yield Response to Water. FAO Irrigation and Drainage Paper No. 66, P. Steduto, T.C. Hsiao, E. Fereres, and D. Raes, eds. Food and Agriculture Organization of the United Nations, Rome, Italy, pp. 246:296.
3.) Sanden, Blake. 2007. Fall irrigation management in drought year for almonds, pistachios, and citrus. September Kern Soil and Water Newsletter, Univ. CA Coop. Ext, Kern County. 8 pp.