

Refinement of Rice Water Consumptive Use During the Growing Season

Purpose

The purpose of these studies is to evaluate and refine rice water consumptive use during the growing season in the Sacramento Valley for M206, the most common paddy rice variety grown in the Sacramento Valley.

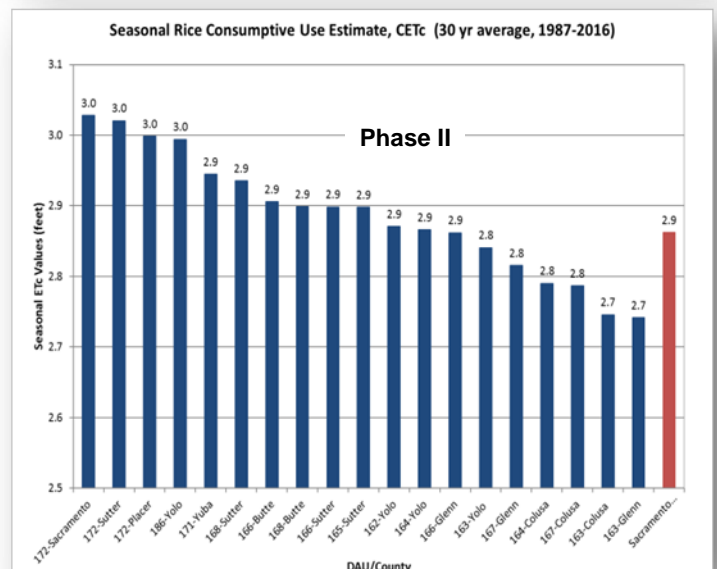
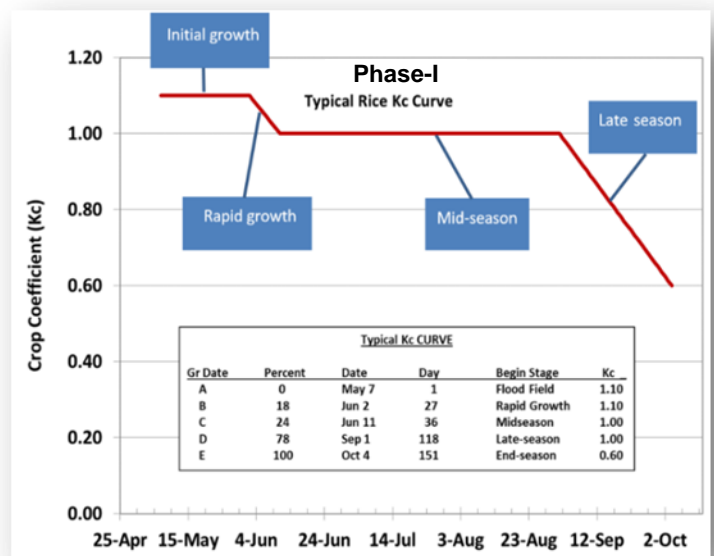
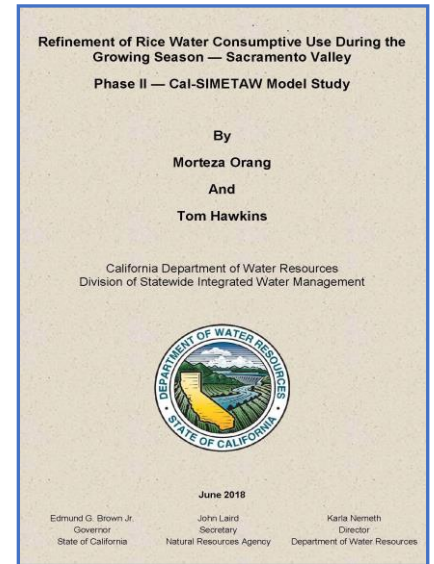
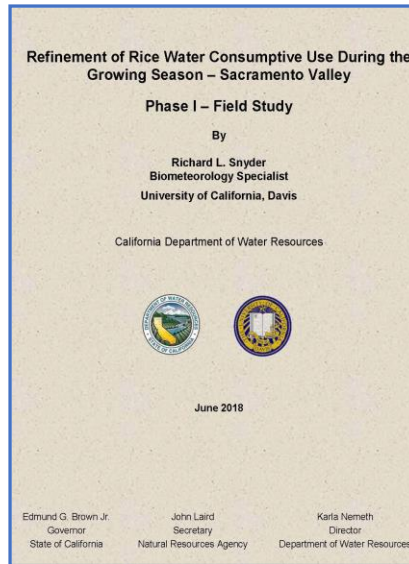
Methodology

The current rice crop coefficient (Kc) in the Sacramento Valley region, based on the California Department of Water Resources' (DWR's) Bulletin 113 of 1975, needs to be updated to represent current growing conditions and reflect significant advancement in the development of rice varieties during the past 40 years (e.g., a reduced growing season to harvest and reduced canopy height).

Phase-I of the *Refinement of Rice Water Consumptive Use During the Growing Season* consists of a field study. It was prepared by Richard Snyder of the University of California, Davis. It is based on the evapotranspiration (ET) data collected from nine paddy rice fields in the Sacramento Valley from 2011 to 2013. This study used energy balance techniques to develop a typical Kc curve. A crop coefficient is the ratio of crop evapotranspiration (ETc) to reference evapotranspiration (ETo). ETo is an estimate of evapotranspiration rate of a 4- to 6-inch tall, well irrigated, cool-season grass.

$$Kc = \frac{ETc}{ETo}$$

Phase-II of the *Refinement of Rice Water Consumptive Use Estimates During the Growing Season* consists of a Cal-SIMETAW model study. It was prepared by DWR and uses the newly developed Kc curve to estimate seasonal cumulative evapotranspiration of rice (CETc) for each of the California Water Plan's 19 detailed analysis units/counties within the Sacramento Valley from 1987 to 2016, based on 2014 land use data.

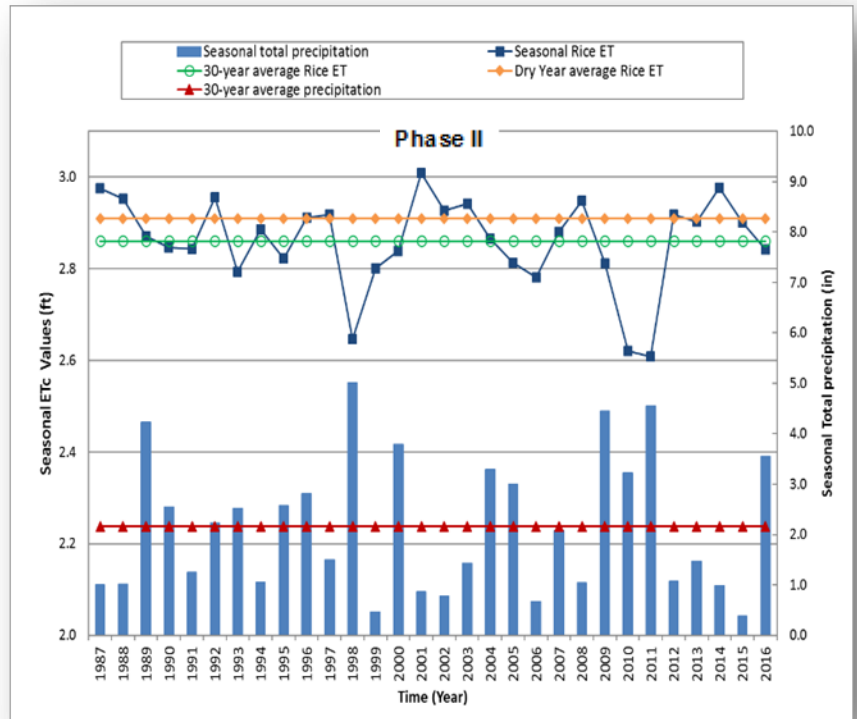


Under current agricultural practices, soils are generally saturated or flooded during the growing season. As such, the standard approach of including the evapotranspiration of applied water (ET_{aw}) was not used in this study. Instead, the focus of rice water use was entirely based on crop evapotranspiration.

Results

In the *Phase I – Field Study*, using the developed K_c curve and historic mean daily ET_o rates from the California Irrigation Management Information System station in Colusa, the average CET_c during the 1986–2010 period was computed to be 2.8 feet. In the *Phase II – Cal-SIMETAW Model Study*, the CET_c for the 1987–2016 period was estimated to be 2.9 feet, which matched closely with the field study. This is approximately 12 percent lower than the currently used value of 3.3 feet, which is based on Bulletin 113 of 1975.

The K_c values for the various growth periods developed for the M206 variety can be used as an approximation for other rice varieties, provided that growth dates are adjusted in accordance with the characteristics of the variety.



Recommendations

Following are the recommended actions based on the findings from the studies:

1. Update DWR Bulletin 113, *Vegetative Water Use in California*, to reflect the revised K_c for rice in the Sacramento Valley.
2. DWR-led programs may begin using the new typical rice K_c curve and apply the long-term average CET_c estimate of 2.9 acre-feet/acre to evaluate the consumptive water use of rice during the growing season in the Sacramento Valley.
3. Use the revised K_c for water balance analysis in California Water Plan Update 2018.
4. Initiate a study, contingent on funding, to evaluate how the new rice K_c curve affects water balances in the Sacramento Valley region.



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