Incorporation of impact of Drip on PET for crops

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This Note deals with the impacts of drip irrigation on the crop water requirement and how to incorporate suitable factor for taking this into account. The effect of both crop transpiration and soil evaporation are integrated into a single crop coefficient. The Kc coefficient incorporates crop characteristics and averaged effects of evaporation from the soil. For normal irrigation planning and management purposes, for the development of basic irrigation schedules, and for most hydrologic water balance studies, average crop coefficients are relevant and more convenient.

Evapotranspiration during the initial stage for annual crops is predominately in the form of evaporation. Therefore, accurate estimates for Kc_{ini} should consider the frequency with which the soil surface is wetted during the initial period. Where the soil is frequently wet from irrigation or rain, the evaporation from the soil surface can be considerable and Kc_{ini} will be large. On the other hand, where the soil surface is dry, evaporation is restricted and the Kc_{ini} will be small. The value of Kc_{ini} is affected by the evaporating power of the atmosphere, i.e., ETo. The higher the evaporation power of the atmosphere, the quicker the soil will dry between water applications and the smaller the time-averaged Kc will be for any particular period. As the amount of water available in the topsoil for evaporation and hence the time for the soil surface to dry is a function of the magnitude of the wetting event, Kc_{ini} will be smaller for light wetting events than for large wettings.

The crop coefficient for the initial growth stage can be derived from Figures 1, 2 and 3 which provide estimates for Kc_{ini} as a function of the average interval between wetting events, the evaporation power ETo, and the importance of the wetting event.

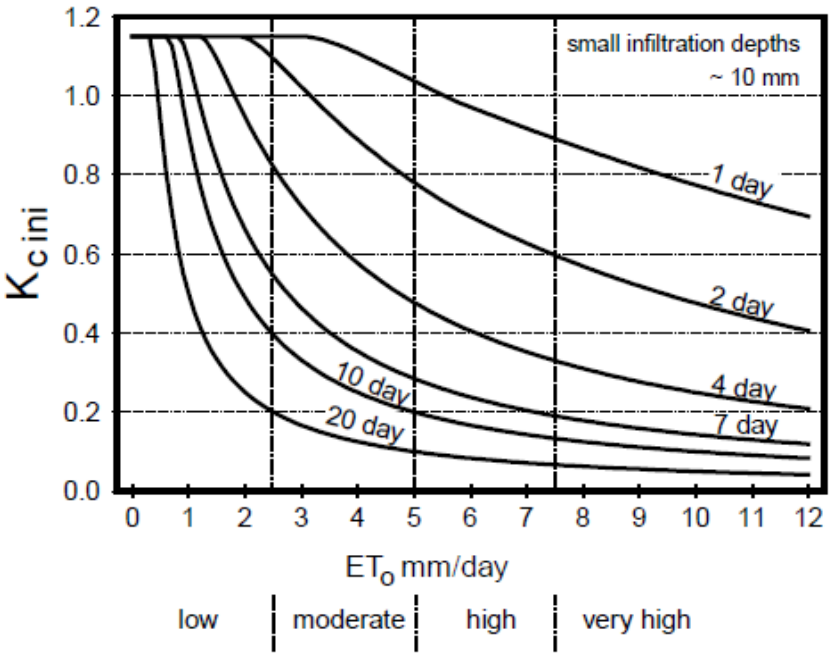

Fig 1 Relation of Kc ini to ETo and the interval between irrigations for all soil types when wetting events are light to medium (3-10 mm per event)

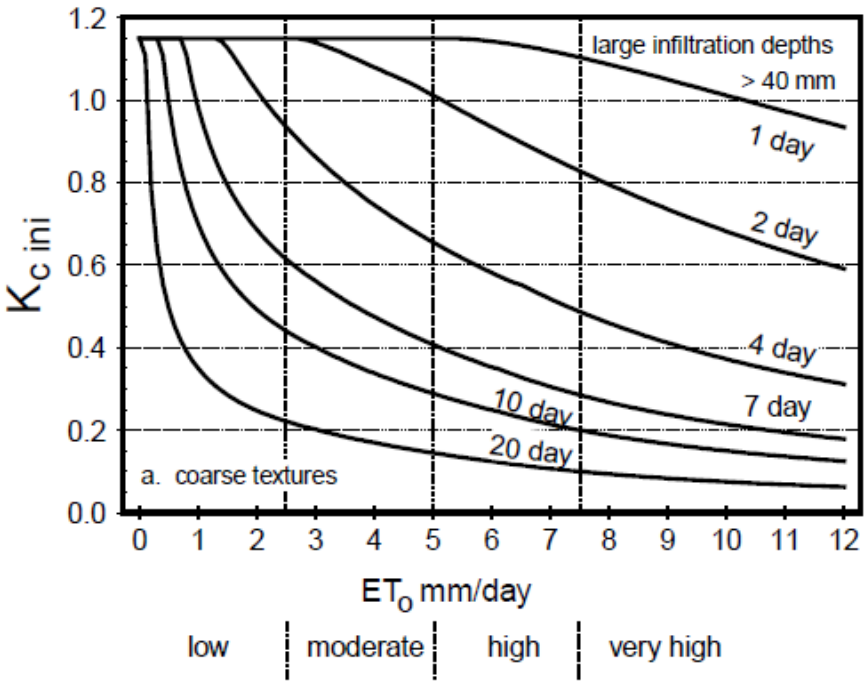

Fig 2 Relation of Kc ini to ETo and the interval between irrigations for coarse texture soil types when wetting events are equal or greater than 40mm

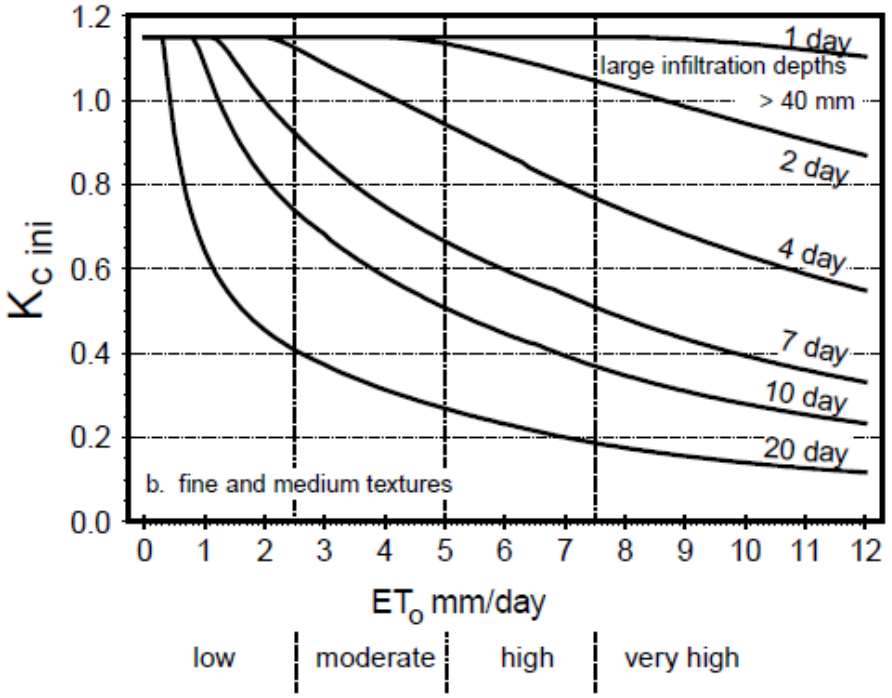

Fig 3 Relation of Kc ini to ETo and the interval between irrigations for fine and medium texture soil types when wetting events are equal or greater than 40mm

Adjustment to wetting by drip irrigation

Many types of irrigation systems wet only a fraction of the soil surface. For example, for a drip system, the fraction of the surface wetted, fw, may be only 0.4. For furrow irrigation systems, the fraction of the surface wetted may range from 0.3 to 0.8. Common values for the fraction of the soil surface wetted by irrigation or precipitation are given in Table 1. When only a fraction of the soil surface is wetted, the value for Kc ini obtained from FAO or from Figures 1,2 or 3 should be multiplied by the fraction of the surface wetted to adjust for the partial wetting:

Kc ini = fw Kc ini (FAO, Fig)

where fw the fraction of surfaced wetted by irrigation or rain [0 - 1], Kc ini (FAO,Fig) the value for Kc ini from FAO or Figure 1,2 or 3.

In addition, in selecting which figure to use (i.e., Figure 29 or 30), the average infiltrated depth, expressed in millimeters over the entire field surface, should be divided by fw to represent the true infiltrated depth of water for the part of the surface that is wetted.
Iw = I/ fw

where Iw irrigation depth for the part of the surface that is wetted [mm], fw fraction of surface wetted by irrigation, I the irrigation depth for the field [mm].

When irrigation of part of the soil surface and precipitation over the entire soil surface both occur during the initial period, fw should represent the average of fw for each type of wetting, weighted according to the total infiltration depth received by each type.

Table 1 **Common values of fraction fw of soil surface wetted by irrigation or precipitation**

Sr	**Wetting event**	**fw**
1	Precipitation	1
2	Sprinkler irrigation	1
3	Basin irrigation	1
4	Border irrigation	1
5	Furrow irrigation (every furrow), narrow bed	0.6-1.0
6	Furrow irrigation (every furrow), wide bed	0.4-0.6
7	Furrow irrigation (alternated furrows)	0.3-0.5
8	Drip irrigation	0.3-0.4