Revised FAO Methodology for Crop Water Requirements

As part of FAO's mandate to assist its member countries to increase and sustain agricultural production, the Land and Water Division has been instrumental in the development of a globally-accepted methodology for the prediction of crop water requirements. The methodology was published first in 1974 as No 24 in the FAO Irrigation and Drainage Series, revised in 1977 and became an international standard, extensively used worldwide.

Advances in research and the more accurate assessment of crop water use have revealed weaknesses in the FAO No-24 methodologies. The FAO Penman was found frequently to over-predict reference evapotranspiration (ETo) while the other FAO-recommended ETo equations, namely the FAO Radiation, the FAO Blaney-Criddle, and the FAO Pan Evaporation methods, showed variable adherence to the reference crop evapotranspiration standard of grass. Furthermore, the problem of using grass as a reference crop resulted in inconsistencies under different climatic conditions.

A consultation of experts and researchers was organized by FAO in May 1990 in Rome, in collaboration with the International Commission for Irrigation and Drainage and with the World Meteorological Organization, to review the FAO No-24 methodologies and to advise on the revision and update of procedures. The panel of experts recommended the adoption of the Penman-Monteith method and a revised definition and calculation procedures for estimating reference evapotranspiration.

To follow up on the recommendations of the expert consultation, a working group was established to carry out additional studies directed to the further validation of the Penman-Monteith method and to improve or replace the original radiation and temperature methods when insufficient climatic data are available. Furthermore, a review and update of the crop coefficients in light of the newly defined concept for the reference crop were undertaken.

The new FAO-Penman-Monteith method has been proved to have global validity as a standardized reference for grass evapotranspiration and has found recognition by the International Commission for Irrigation and Drainage, by the World Meteorological Organization as well as by a large number of scientific studies.

Procedures have been established to estimate missing climatic data which allow the FAO Penman-Monteith method to be used under all conditions. This eliminates the use of any other method and increases the transparency and consistency of reference and crop water requirement studies.

The change of ETo definition to a hypothetical crop with fixed parameters has, to a large extent, eliminated problems related to the previous requirements in measuring a living reference ETo and will further facilitate the calibration of crop coefficients for the estimation of crop water use.

Further details on the updated methodology are provided in the Irrigation and Drainage Paper No 56.: "Crop Evapotranspiration - Guidelines for computing crop water requirements" [link to http://www.fao.org/docrep/X0490E/X0490E00.htm] "