Many expressions of water use efficiency (WUE) have been proposed in literature, but the most diffuse one is based on the ratio between crop yield and cumulative actual evapotranspiration ($ET_a$). Another important index to estimate the path of water productivity in time is given in term of the dry biomass per relative water consuming by evapotranspiration ($WUE_b$), evaluated during the whole growing season.

At plot scale, there are two different methods for estimating $ET_a$: the direct and the indirect method, both based on the Penman-Monteith model. In particular, in the direct approach the measurements of meteorological variables must be done on the crop, while in the indirect one it is enough to measure the meteorological variables on a reference grass (to obtain the reference evapotranspiration, $ET_0$) and to estimate $ET_a$ as product of $ET_0$ and a crop coefficient $K_c$. This latter can be calculated by means of two approaches: the single and the dual crop coefficient approaches.

In this work we evaluate the $WUE$ and the $WUE_b$ using the above mentioned methods of $ET_a$ estimation (direct, single $K_c$, dual $K_c$) for a sugar beet crop cultivated in Capitanata Plain (southern Italy) during two experimental field campaigns planned for the Italian project AQUATER. The crop has been maintained in well water conditions; the weather variables were measured at the centre of the 5 ha plot and in the same time at a reference grass field situated at few kilometres from the experimental field. Moreover, the actual evapotranspiration has been measured directly by eddy covariance method using a three dimensional sonic anemometer and a fast analyser of water vapour concentration in atmosphere. The suggestion by the FAO56 book has been used to calculate either the $ET_0$ or the single and dual $K_c$. All the measurements have been done at hourly scale, but the estimation are presented at daily scale, along the whole cropping season. The results show that for both $WUE$ indicators ($WUE$, $WUE_b$), the direct method of $ET_a$ calculation gave better performances with respect to the indirect ones, with worst results for the single crop coefficient approach.

Since the two $WUE$s had different values for the two years of the experiments, an attempt of normalising the $WUE$, dividing by the water vapour deficit, has been carried out in order to establish a suitable univocal relationship between the crop production and the water losses.