EGU2020-6876
https://doi.org/10.5194/egusphere-egu2020-6876
EGU General Assembly 2020


# Simple and spatialize approach to optimize irrigation water and wheat yield in the semi-arid areas

**Said Khabba**[1,2], Jihad Toumi[1], Salah Er-Raki[2,3], Jamal Ezzahar[2,4], Michel Le Page[5], Abdelghani Chehbouni[2,5], and Lionel Jarlan[5]

[1]LMFE-FSSM, University Cadi Ayyad, Marrakech, Morocco (khabba@uca.ma)
[2]CRSA, Université Mohammed VI Polytechnique, Ben Guerir, Morocco
[3]LP2M2E-FSTM, University Cadi Ayyad, Marrakech, Morocco
[4]MTI-ENSA, University Cadi Ayyad, Safi, Morocco
[5]CESBIO, centre d'Etudes Spatiales de la BIOsphère, Toulouse, France

In this study, we developed a simple and spatialized wheat yield method based on the Monteith's three efficiency model. The originality of the method consists in: (1) the expression of the conversion coefficient ($\varepsilon_{conv}$) by considering an appropriate stress threshold ($k_{sconv}$) for triggering irrigation, (2) the substitution of the product of the two maximum coefficients of interception ($\varepsilon_{imax}$) and conversion ($\varepsilon_{conv\_max}$) by a single parameter $\varepsilon_{max}$, (3) the modeling of $\varepsilon_{max}$ as a function of the Cumulative Growing Degree Days (CGDD) since sowing date, and (4) the dynamic expression of the harvest index HI as a function of the CGDD and the final harvest index $HI_0$ depending of the maximum values of the Normalized Difference Vegetation Index (NDVI).

The calibration and validation of the proposed model were performed by using observed dry matter (DM) and grain yield (GY) on wheat conducted on the irrigated zone R3 of the Haouz plain (center of Morocco), during three agricultural seasons 2002/2003, 2008/2009 and 2012/2013. The model calibration allowed the parameterization of $\varepsilon_{max}$ in four periods according to the wheat phenological stages. By contrast, a linear evolution was sufficient to represent the relationship between HI and CGDD. The model validation was performed at the field and regional scales. For the field scale, the obtained results showed a good agreement between the estimated and observed values of DM and GY with Root Mean Square Error (RMSE) of about 1.07 t/ha and 0.57 t/ha for DM and GY, respectively. Likewise, at the regional scale, the proposed approach was tested over the irrigated district (R3) by using Landsat/spot images for mapping GY and DM. The RMSE values were 1.21 t/ha and 0.34 t/ha between measured and simulated DM and GY, respectively.