***Interactive comment on* "Green and blue water footprint reduction in irrigated agriculture: effect of irrigation techniques, irrigation strategies and mulching" *by* A. D. Chukalla et al.**

Reply to Anonymous Referee #2

We thank Referee #2 for the comments; below we give the reply to the comments.

The comments

This paper conducts an investigation on the effects of different management practices on the consumptive water footprint of three crops grown in three different soils considering four environments. The objective of the paper is clear, the writing is concise and the development of the argument can be followed well.

To my knowledge this is the one of the first papers regarding the study of the water footprint reduction using the AquaCrop model. Today many papers contribute to the literature on the water footprint; using databases as for example the one developed by Mekonnen and Hoekstra (2011, 2012), but little studies refer to the effects of different water management practices in the context of water scarcity. In my view, it is important to go deeper in the understanding and interpretation of water footprint input data. *Thus, as far as I am concerned, an original and relevant contribution is definitely present in the well-informed analysis of the different management practices on evapotranspiration, yield and consumptive water footprint as well as in the study on the variability of the ratio of green to blue water footprint. This contribution is very interesting, and should be highlighted in the abstract, introduction and conclusion.*

The introduction is concise, summarizes previous studies on the same line and clearly defines the main objective of the paper. *I suggest that the authors strengthen the contribution of this study on the existing literature and specify the relationship of their work with other studies on the water footprint at different scales (global, national, local). It would be interesting to see how this study could help to interpret and clarify the results on other work.* I personally believe that this work can contribute to the interpretation of scientific literature that utilizes the water footprint concept. The methodology is clearly explained and developed in detail. Similarly, the input data and their sources are well defined. *However, in my opinion the study lacks an assessment of the sources of uncertainty (accuracy of the databases used, methodology utilized, assumptions made, etc.). If possible, it might be better to develop this point. This discussion would add value to your study and would help to improve the understanding of the results observing the possible drawbacks for their interpretation.*

The discussion warns on the need to validate the model results with field experiments, which as the authors acknowledge is important but costly. This is in my view an important point that makes the reader to be cautious when drawing general conclusions from this study. *I would also develop on the possibility to extend this study for more crops and regions. Finally, the authors could go deeper in the recommendations for action to improve sustainable water use provided from the results obtained. Policy implications would be a plus, also looking at the possibility/caution when extending the findings to other*

scales (local, regional, national, global), since many studies on the water footprint have been carried out in this line over the last decade.

Overall Recommendation: Considering the above strengths and weaknesses of the contribution it is recommended that the paper may be accept after minor revisions.

Reply to the comments: these remarks will be incorporated in the revised version of the paper.

We agree with the reviewer observation that the main contribution of the paper lies in the structured analysis of the influence of multiple factors in agricultural management on the water footprint and its components. We will edit abstract, introduction and conclusion to properly highlight this contribution.

The sensitivity of AquaCrop-simulated yields to model parameters, under diverse environmental conditions, was studied by Vanuytrecht et al. (2014). That study shows that the parameters describing crop responses to water stress were not often among those showing highest sensitivity. However, the particular root and soil parameters indeed need attention during calibration.

In our study we used the observed climatic data from the European Climate Assessment and Dataset, ECA (Klein Tank et al., 2002). The data in the ECA goes under homogeneity test and the missing data is filled with observations from nearby stations (i.e. within 12.5 km and with height differences less than 25m) (Klein Tank, 2007). The soil texture was identified from European Soil Database (Hannam et al., 2009). Observed soil data at one of the sites representing the humid environment (at Bologna, Italy) was shown to be comparable to the soil type and characteristics from the European Soil Database.

We did not perform a specific sensitivity analysis for these inputs or a specific uncertainty analysis propagating parameter uncertainty through the model, which both would be interesting. The current analysis, however, already shows the robustness of the AquaCrop-simulated effects of irrigation method, irrigation strategy and mulching for a large set of conditions for soil, crop, climate and weather. Together with the sensitivity results of Vanuytrecht et al. (2014), we believe the overall evidence to support the conclusions is strong.

Indeed, as suggested, it is worthy to extend this study to cover more crops and regions and to give recommendations for improving sustainable water use and give policy implications. By ranking of irrigation methods, irrigation strategies and mulching methods the paper is already meant to serve in this direction; formulations are still with caution as relevant considerations on grey water and e.g. possible economic trade-offs are outside the scope of the present paper. This will be studied in subsequent papers, with the help of a model that can handle additional management practices like fertilizer application scenarios, and on larger spatial scale, i.e. farm and/ or basin scale.

References:

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