Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC12
https://doi.org/10.5194/hess-2022-96-RC12, 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on hess-2022-96

Anonymous Referee #12

Referee comment on "FarmCan: a physical, statistical, and machine learning model to forecast crop water deficit for farms" by Sara Sadri et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-96-RC12, 2022

In this paper, the authors proposed a machine learning method to predict soil moisture, evapotranspiration and potential evapotranspiration from precipitation forecast. Based on this statistical forecast, the real-time prediction of needed irrigation can be achieved.

General comments:

The topic of this paper is suitable to HESS. However, I believe there are some fatal flaws in this paper. I recommend the editor to reject this paper.

First, it is unclear for me if their statistical model has a significant added value for predicting future conditions. Since they found that there is no significant relationship between P and PET (and ET), I guess that the initial condition of ET and PET is the major source of predictability of them (although they did not clarify this point). In this case, the authors may be able to replace their prediction of ET and PET with the persistent model. I think Figure 7 also implies that the persistent model is effective to predict them and it is not absolutely necessary to predict the dynamic change in ET and PET. In addition, the temporal change in soil moisture is also important, but the skill of their model to predict soil moisture is not actually good according to Figure 9. Although the precipitation prediction significantly contributes to the prediction of needed irrigation through equation (1), precipitation prediction comes from the existing data and is not the contribution of this work. In summary, without more detailed comparisons between their prediction and some benchmarks such as a persistent model, I cannot be very convinced that the

authors' statistical model really provides an added value.

Second, it is unclear for me how this work contributes to estimating crop water conditions at farm scales since they fully relied on satellite observation with coarse grid sizes. Specifically, the size of the original footprint of SMAP is approximately 50km, which is apparently not a farm scale. Although it might be possible to integrate local information into the authors' proposed framework, I could not find any contributions to farm-scale water resource management in the present work.

Specific comments:

Major points:

L165-167: This description is a bit ambiguous for me. I believe that the authors used the forecast of P. Please explicitly say the P prediction was used in this paper.

L171-175: It is necessary to show the advantage of integrating the local information into the model more clearly. I'm not very convinced that how this information contributes to water resource management since the prediction itself is not provided in a farm scale.

L310: In Figures 7 and 8, please show the prediction of SM and RZSM in addition to ET and PET.

L320: KGE of soil moisture is not included in Table 4. Why? Please include it.

Minor points:

L167: Please remove “?”.

L181: “P” appears twice.