

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
<https://doi.org/10.5194/hess-2021-600-RC1>, 2022
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Comment on hess-2021-600

Anonymous Referee #1

Referee comment on "Machine-learning approach to crop yield prediction with the spatial extent of drought" by Vitali Diaz et al., Hydrol. Earth Syst. Sci. Discuss.,
<https://doi.org/10.5194/hess-2021-600-RC1>, 2022

General comments:

The paper is very interesting and I think it is related to the main objectives of the journal. The authors use statistical models to try to adjust the annual rice yield with the area affected by droughts. They use SPEI at different scales and with a threshold of -1 to define droughts.

However, I have observations. Among them is the difficulty to follow the reading due to the order in which the information is presented. On the other hand, I think there are many assumptions in the methodology and in the way results are shown that should be further discussed. The methodology used is not 100% justified, as it leaves many options and questions open.

I elaborate on these issues below.

Specific comments:

I recommend reordering the information to make it easier to read. For example, section 2.1 explains a lot of information that is formally presented in section 3. Information that could be presented in the introduction (for example) or by arranging the text in a more coherent way.

The title and abstract I think should emphasise the area of study, because while the methodology is appropriate and interesting, a broader study at a global level is needed to generalise it. Therefore, I believe that specifying the region of the research is necessary.

The paragraph starting on line 101 explains the different sources of agricultural data in India. I recommend without extending the text too much to discuss with bibliographical sources (if available, otherwise make it clear) the different sources with their pros, cons and quantitative differences at different spatio-temporal levels.

Saying that using the area affected by droughts could be discussed more in the introductory line, so as to justify its use. Some studies discuss this issue, for example:

Araneda-Cabrera, R.J., Bermudez, M., Puertas, J., 2021c. Assessment of the performance of drought indices for explaining crop yield variability at the national scale: Methodological framework and application to Mozambique. *Agric. Water Manag.* 246.
<https://doi.org/10.1016/j.agwat.2020.106692>

Use at least 1 or 2 model fit indicators to get a better picture of the results (e.g. R²).

In line 270 in the ANN model incorporation, the 85% and 15% data split is arbitrary. Although it is valid in principle, I believe that the possibility of obtaining the fact that different model fit values can be obtained each time it is used should be discussed, due to the randomness that exists in the selection of these variables. Several methods can be used to decrease this randomness (e.g. running the model 10 times, averaging the results or averaging the 10 RMSEs, etc.).

Rice is a crop that may depend on water from regulation or other sources. Is it the best example to fit with SPEI? Since this is a meteorological index, which, although it correlates very well with agricultural droughts when using 3–12-month scales, it does not detect the possible regulations that rice may have. Are we sure that it is a rainfed production in the whole area or where there is irrigation? These issues are not even mentioned in the results, which confuses the reading.

To this last fact I also have two doubts. One is an observation of lack of clarity in figure 3, it could be further improved to appreciate the time series of rice crops. And the second is to discuss the use of a scale of 0.5. Is it in accordance with the agricultural data available and for the purposes of using it to calculate the area affected by droughts?

Figure 5 could be improved or summarised and shown separately (including as supplementary material and/or tables).

The limitations of the work are mentioned, but I think they could be expanded, so that the application of the methodology is justified despite the limitations.

Are the presented results (equations) suitable for operational use in the region?