Reviewer's comments: manuscript egusphere-2024-1149

In this study, the authors used a multi-index approach (exposure, risk, vulnerability) to model the impacts of drought events on agricultural systems in the German federal state of Brandenburg, considering the LST/NDVI ratio as the response variable. The scientific approach used is valid. It reflects the multifactorial complexity of the implications of drought for the productivity of the region's farming systems. However, there are a few points of clarification, particularly in the methodology section. My comments and remarks are as follows:

Comment 1

« Empirical associations to the impact indicators on both spatial levels are compared. Non-linear models explain up to about 60% variance in the yield gap data, with lumped models for all crops being more stable than models for individual crops». This is imprecise, you must specify the names of the nonlinear models as well as for the grouped models. It is also important to include in the abstract the performance statistics of the models used.

Comment 2

"Rye is found less vulnerable than wheat, despite growing on poorer soils". The fact that rye grows on poorer soils is a proof that it is more resilient and less vulnerable than wheat, so I do not see why the conjunction of subordination although? The sentence was rephrased**.**

Comment 3

In introduction, « This has implications for modelling and Monitoring ». You mean implications in the modelling and monitoring of agricultural drought. If so, the sentence should be completed.

Comment 4

Overall, the introduction is well written and argued. However, the application of artificial intelligence models in modelling drought impacts, risk, and vulnerability has been limited. It is worth adding a paragraph on the advantages and limitations of intelligence models in modelling the impacts of drought given that in your methodology you have used the extreme gradient boosting algorithm (XGBoost).

Comment 5

*Line 250 «*To retain as much information about the hazard distributions, we computed the relative affected area (non-)exceeding specified thresholds (in regular intervals of 0.5 for SPEI, 0.25 for LST/NDVI-anom., 0.05 for SMI, 5 for SMI-Total, and using the LBG class limits for AZL). A total of 68 features were created this way on county level».

On what criterion were these thresholds considered? This deserves to be clarified. The different classification thresholds for these indices and their meanings should be provided in a table in the methodology section.

Comment 6

The principle of the calculation of the LST/NDVI anomaly has not been sufficiently described. There should be a separate section to better describe and justify the choice of this anomaly to represent the impacts of drought when there are various other anomalies or indices that can better reflect the impacts of drought on agricultural systems. In this sense, the normalization indicated in Table 1 concerns only the LST values and/or the LST/NDVI values. If so, considering the max and min values or mean and standard deviation (SD)?

Comment 7

Ligne 255-260 « In 2013 and 2014 the SMI-Total is close to 0, observed vegetation health is at its maximum (i.e. negative LST/NDVI-anom.), essentially no impact-related statements…..» Similarly, to better assess the consistency of these statements, the formula and principle of the calculation of the IMS and IMS-Total must be clearly described in the methodological section with the different classification thresholds.

Comment 8

In Table 1, you mentioned that the monthly SPEI used has a resolution of 10 km and the source is the reference Zhang et al. (2024). However, in this reference, the SPEI used has a 1 km resolution. It is a bit ambiguous. Has the SPEI been calculated? or was the same database from the Zhang et al. (2024) study used? If this is the case, the spatial resolution of 10 km should be rectified because in the source reference mentioned it is rather 1 km that is mentioned.

Comment 9

The algorithm used to calculate the Landsat LST was not explained in the methodology.