Earth System
Dynamics
Discussions

EGU
Open Access

Interactive comment on "Projected changes in crop yield mean and variability over West Africa in a world 1.5 K warmer than the pre-industrial" *by* Ben Parkes et al.

Anonymous Referee #3

Received and published: 24 August 2017

This study used four different models to investigate how crop yield (mean and variability) of maize, sorghum and millet will change in West Africa in the future under 1.5K warming. The effectiveness of two adaptation strategies has been tested under the warming. This study has the potential to be published. However, I found the manuscript in the current form needs to be significantly improved to achieve a publishable level. There are several major issues in the manuscript.

1. The methodology is unclear and incomplete. It lacks the necessary details to fully understand the experiment design and the results. For example, there is no explicit information about the statistical model used in the study. We don't know what form this

model is and how it works in the study. Moreover, the interannual variability of yield is analyzed in the future based on projections from climate models. But I am not sure whether climate variability and their impacts on yield can be captured by the model's future projection, given that signals like ENSO may not be well captured.

2. The analysis and results are kind of unbalanced. Three crops are included in the study, but most of the figures and results are about maize while less attention has been given to other crop and their results are placed in SI. The ensemble approach using climate data of 16 combinations should help understand the uncertainty in the results. However, there is little discussion about uncertainty (e.g., from climate input data or model itself). And surprisingly, there is no error bar or confidence level reported in the results. Discussion section needs to include more content to dig into the inconsistencies and discrepancies in the results across the models and across different crop types.

3. The figures in the manuscript are poorly designed, which undermine the readability. Many figures can be combined. Results of three crops can be combined in one figure. The colormap used in the heat map is problematic. Fig 7 is hard to follow. The authors have to think about how to improve the figures to make them more effective in conveying key information and in the meantime easy to read.

4. As for writing, English should be improved. There are frequent grammatical issues and awkward expressions. Also, more references need to be added to support the argument. This is a problem for introduction section. Some content is irrelevant and lack of focus.

Specific comments:

P1 L4-5: Please specify recent historical and near term future.

P1 L6: "The mean yields are not expected to alter significantly". Where does this expectation come from? This contradicts the results of this study.

The abstract needs more work. Please clearly define the science question, explain the methods used and the results.

The first paragraph needs to have more references and to be better organized. Some content such as monsoon is irrelevant to the topic of this study.

P2 L4 heat- and drought-resistant

P2 L19-20: references

P3 L23-25: If 10 out of 16 combinations are based on RCA4. Why is it designed this way? My concern is that the results from the ensemble experiment would largely depend on the performance of RCA4, making the results biased to RCA4.

P3 L30-33: The varying CO_2 levels could affect the mean yield response as well as the variability under warming. This needs to be discussed.

Section 2.2: more information about the four crop models need to be provided. For example, at least to differentiate process-based crop models and the statistical models. Another question is if the results from the statistical model are comparable with that from the process-based models, as the mechanisms drive the change could be different. This needs to be discussed.

Figure 1: (1) Since the red and blue color already represent negative and positive changes, it may not necessary to use symbols (cross and dot) to denote agreement for negative and positive changes separately. (2) Fig 1 and 2 and be combined to include both mean change and IAV. (3) I would suggest trying to include all four crops in the figure using 8 panels.

P4 L24-25: Unless those place names are shown on the map, they make little for people like me who is not familiar with the geography of West Africa. And this might be the case for most readers.

P4 L26: Avoid placing the results in SI unless there is a strong reason to do so. Since

C3

millet is one of the three crop types in the study, the results should appear in the main text.

Fig 3-6: (1) the current blue-to-red contrast type of colormap is problematic. It is not suitable to display a continuous range of yield value (not yield change). It creates unnecessary visual confusions. For example, What is the white color? Does it mean no value or the value around 1700? Please use other colormaps, there are plenty alternatives to choose. (2) Heat map here may not be a good choice to represent quantitative information ... The difference between history and future is very hard to see. The authors should consider redesigning this figure or at least display the exact number in the heat map.

P5 L11: Please specify the results from Knox and Challinor results? Is that a model result, empirical study, field experiment, or meta-analysis? What did they find and how their results are connected here?

P5 L24: Please justify the definition of crop failure using 1 and 1.5 standard deviations of yield. Is the std threshold calculated using observations?

Fig 7. The legend is incomplete. Please add legends for all symbols including cross, circle, etc. I don't understand how to read this figure... What is the variable on x and y axes and their units? Please add more information in the caption.

———————————————————