

Interactive comment on “Changing global cropping patterns to minimize blue water scarcity in the world’s hotspots” by Hatem Chouchane et al.

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Three reviewers have submitted comments that mainly converge on three main points of critique:

- The global study presented in the paper uses as its smallest unit of analysis entire countries without accounting for local variations in climate, soil conditions, or water availability. Especially in very large countries (India, China, U.S.A.), and smaller if they span different climate zones (e.g., sub-Saharan Western African countries) this poses a problem. The first reviewer even warns that the results of the study therefore may be misleading.

C1

- The discussion of the results should be refocused (the reviews offer several suggestions) and be made more concise.
- Various unclear passages in the text and/or figures.

The responses by the authors indicated that they see realistic possibilities to improve the discussion and improve the text and the figures to address the second and third of these points. The reviewers offered specific, constructive suggestions. These were not lost on the authors, as their response indicates. They also make some suggestions for modifying the optimization in order to address intra-country variations in water availability. This requires some effort, so at this time it is not clear to what degree the limitation of the nation-based analysis can be remedied. I agree with the reviewers that this is a serious point of concern and I sincerely hope that the authors can improve that aspect of the study. Especially the second comment of reviewer 1 is pertinent. In their response, the authors propose to study the effect of not allowing irrigated areas per country to increase, and the effect of capping the total blue water consumption in each country at current levels. I am not sure if that will be sufficient to mitigating the effect of treating the vast land masses of large countries as uniform entities. In paragraph 3 of the response to reviewer 3, the authors state their intention to expand the analysis to the water availability in irrigated areas of individual countries, if I understand their reply correctly. That would be a useful refinement of the optimization procedure.

My reservation regarding the validity of the country-based analysis notwithstanding, I understand that much of the underlying data are only available on a country-by-country basis. However, Reviewer 1 mentions grid-based data on blue water availability and irrigation areas though, so that could offer some relief of this restriction.

Overall, I believe the paper has potential and will probably benefit from a revision according to the lines suggested in the replies by the authors. I hope they will be able to address, to a certain degree, the concerns raised about larger countries. I therefore invite the authors to revise the paper. Because this will involve additional calculations,

C2

I will classify this as a major revision. I am, of course, aware that the author team will have to carry on without the input of Prof. Hoekstra, who unfortunately passed away, and whose input will undoubtedly be sorely missed. I therefore ask the authors to inform me if more time is needed, so I can arrange an extension of the deadline if so desired.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2019-461>, 2019.

C3