

Interactive comment on “Analysis of virtual water flows associated with the trade of maize in the SADC region: importance of scale” by J. M. Dabrowski et al.

Anonymous Referee #2

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Although I have enjoyed reading the manuscript, this work is eligible for some criticisms. The concept of virtual water is not new and in this case it is used to encourage a country to view agricultural crops in terms of the amount of water required to produce those crops, with a view to implementing trading policies that promote the saving of scarce water resources. The conclusions from this analysis can lead to some incorrect assumptions due to the inappropriate generalization carried in the study.

In this study, the amount of water used to produce a crop does not take into account the inappropriate agronomic management that leads to very low yield (1 mt wide rows,

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low plant population etc). You can produce much higher yield with the same amount of water. That is the case of this work where the yield are very low but the water applied is higher than necessary. Also technological advancements are not taken into account, new cultivars, row spacing, fertilization etc. For this reasons, these results could suggest solution that may not be correct due to the inefficient way of managing water resources. My main point is that South Africa (SA) has low yield because of poor management. Other places with similar environmental conditions have an average yield of 15 ton ha⁻¹ compared to the 2.7 of SA, with the same amount of water. The record yield of maize is 24 ton ha⁻¹ and it is not irrigated, admitting that is due also to lower temperature regimes, the issue is that agronomic management and climate variability changes the analysis completely. Your conclusion would have different if the yield very higher, as they can be.

The scale of analysis also plays a crucial role, as correctly indicated by the authors when they discuss about their results on a national level vs the smaller scale analysis.

Another limitation is that the study is limited to a single year (I assume, since it is not specified in the text). As you know the yields are variable both over space and time and this variability should be taken into account before any conclusion can be drawn. If the analysis is carried out using the value of yield and precipitation of the last 30 years, the analysis changes with time and only by giving the probability that a certain outcome will occur, could give lead to a more stable and less risky conclusion. Analysis based on short term, do not account for temporal variability and conclusion can be biased depending on which year is used in the analysis.

There is another issue to consider. This analysis does not taken into account that people in SA will not change their crop due to the eating habits and economic values associated with growing maize that will not be available if the farmers changes crops. I know that is not the objective of the study, but indirectly the analysis of virtual water could suggests trading policy without considering socioeconomic aspects.

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The paper concentrates on maize, but there is a section on other crops that should be removed. The paper is too long and could be reduced.

Also if 91% of SA maize is produced on rainfed environment, thus the analysis of virtual water is not crucial for SA, but a better agronomic management will help improve the WUE of maize grown there and the analysis will provide different results and conclusions.

The paper should take in the consideration these issues before it can be published. Unfortunately, these suggestions are crucial to give some realistic values to the analysis and are difficult to implement in the current version.

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