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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Trade-offs between crop-related (physical and virtual) water flows and the associated economic benefits and values: a case study of the Yellow River Basin" *by* Pute Wu et al.

Anonymous Referee #3

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The paper presents an approach to account for economic water productivity. However, the concept of the manuscript is not clearly developed, and at it is not entirely clear what the objective of the manuscript is. The novelty is the approach to divide green and blue water productivity, but it seems to use a very simplified approach. As a result, the authors conclude that green water productivity is higher, which is a direct result of the definition of the Net benefit per m3 of blue and green water (eq. 4 and 5). The result would be the same, if water would be free, and if there is irrigation costs, it is fully attributed to blue water. However, the motivation for this model is not presented

in the paper nor sufficiently discussed. If cost of irrigation is only attributed to blue water (although green water productivity increases with irrigation too), then it would seem logical that the costs of green water (i.e. the land use where precipitation is definitely part of the land price) should be allocated to the green water (at least a share) and less to the blue water. In general, the approach seems to be a bit ad-hoc and not investigating procedures from other disciplines on how to allocate production costs and parameters. Calculating shadow prices and other approaches should be compared and discussed.

The modeling of the case study region is missing some details. In general, the model results and input files should be made available to allow reproduction of the results, otherwise the study cannot be properly assessed. One question relates to the definition of blue water: in many occasions I understand form the description that water withdrawals are used. It might be a miscommunication, but it must be clarified. For instance with irrigation, losses in flood irrigation are only to a share consumption, since it partially percolates back to ground water.

Also the role of precipitation as explained below equation 1 should be revisited: Precipitation over the cropping field is set equal to green water, while in general only effective precipitation is available. However, RF is in equation, but it should not only be allocated to BW (which later on seems not to be done).

The crop model is not described in detail and it seems that the yields calculated need to have assumptions on fertilizer and management aspects, which are not described.

Below eq3: Are the data from YRCC water consumption or supply or withdrawal?

Eq 6 is obsolete the Eq.5 results the same

The whole trade analysis is highly simplified. Prices in locations don't reflect what exporters get and thus a net benefit is not necessarily occurring. There is taxes transport costs and more behind trade. Also, how are the water demands in other places calcu-

lated exactly? Are they consistent with the YRB results? Moreover distribution within China and trade among provinces might be based on published MRIO data rather then based on livestock numbers etc..

The work is based on the WFN manual (2011) but only does accounting and not water scarcity assessment (required as part of the guidelines as an operational sustainability assessment). This would the analysis also make in line with the ISO standard on WF and other studies assessing trade and water scarcity.

Finally, clear scientific conclusions based on the work presented are not established. The main conclusion that GW productivity is higher than BW is based on the assumptions (eq. 4 and 5). Also the whole socioeconomic situation behind agricultural production and trade is not discussed in detail. Especially the scenarios are requiring additional discussion of uncertainties of all the input parameters to put the results in context.

The manuscript contains several typos and language should be improved to be more concise and avoid repetition.

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