

Interactive comment on “Estimating global cropland production from 1961 to 2010” by Pengfei Han et al.

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Reviewer 1: This paper presents a study of global cropland production modeling using a process-based model VEGAS. The Green Revolution is addressed here which is very important in global carbon cycle. However, how to represent the Green Revolution in models is a major task. A prior attempt was made in VEGAS. Although large uncertainties and lots of future improvements remain, the results are still reasonable. Therefore, this paper fits the journal scope well and has certain scientific contributions.

Response: Thanks for the understanding of this paper.

There are only some issues to be addressed in the discussion section about the uncertainties. 1, The Green Revolution has not changed synchronously across different

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regions globally. However, the harvest index represented in equation 1 treats it identical over the globe. Please discuss the uncertainties of this issue.

Response: Thanks for the valuable advice. Indeed, the harvest index (HI) represented in equation 1 did not change over different areas. This was mainly constrained by the limited large scale observed values over time. And we mainly modeled the first order of the Green Revolution, which is the decreased HI trend over time. Furthermore, we discussed this uncertainty in Line 323-327.

2, Irrigation in section 2.1.2. As mentioned in the context, the irrigation intensity varies spatially. Please specify the sources of this spatial information? Is the spatial information from the HYDE data or generated by the model?

Response: Thanks for the question. We added the Eq. and description in the revised manuscript in Line 115 and 120. Irrigation data was generated by the VEGAS model using an empirical function related to mean annual temperature (MAT) (Fig 1):

$$\text{Irrigation intensity} = 1 + 0.5 \cdot (1 / (1 + \exp(2 \cdot (\text{MAT} - 15) / 5)))$$

We acknowledge this is a rough assumption due to the lack of global irrigation data set with time series. The irrigation intensity varies spatially from 1 (no irrigation) to 1.5 (high irrigation) with high intensity in temperate areas and low intensity in tropical areas which reflects the regional economic developments.

Figure 1: Irrigation intensity (Wirrigr) changes with mean annual temperature (MAT) as used in the model.

3, section 2.1.5. it says “Crop phenology was not decided beforehand but was determined by the climate condition.” Double cropping over the East Asia is very popular where the climate conditions are sufficient. However, in the USA, single cropping is major under similar climate condition. Please discuss this issue a little bit in the discussion section.

Response: Thanks for the suggestion. Indeed multiple cropping is mainly distributed

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in low latitude areas in Asia, Africa and South America. We added this part in the discussion part Line 327-331.

4, DO double check the context and the references. There are too many small mistakes in the reference list, such as Subscript 2 in CO₂. Mistakes were found in Lines 508 and 518 536: DO keep the references in an identical style.

Response: Thanks for the careful review. We double checked and rectified the context and the references.

Interactive comment on Earth Syst. Dynam. Discuss., <https://doi.org/10.5194/esd-2017-49>, 2017.

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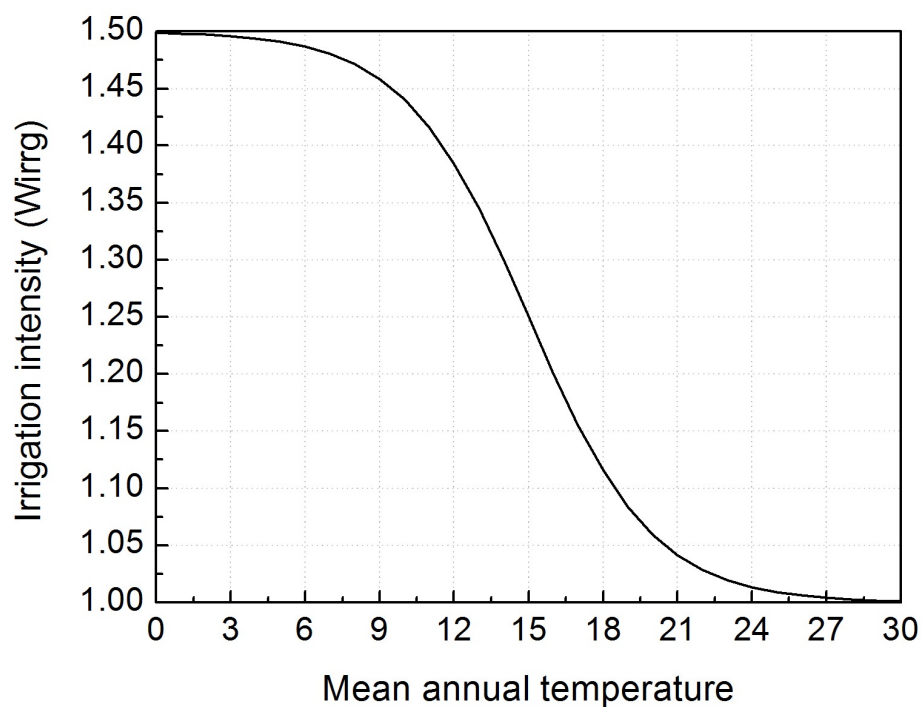


Fig. 1. Irrigation intensity (Wirrig) changes with mean annual temperature (MAT) as used in the model.

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