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Interactive comment on "Enhancement and validation of a state-of-the-art global hydrological model H08 (v.bio1) to simulate second-generation herbaceous bioenergy crop yield" *by* Zhipin Ai et al.

Anonymous Referee #2

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Comments on "Enhancement and validation of a state-of-the-art global hydrological model H08 (v.bio1) to simulate second-generation herbaceous bioenergy crop yield" by Ai et al.

The ms shows modeling implementations and results of global simulations of switchgrass and Miscanthus yields, and effects of irrigation in the simulations. I appreciate the courageous work to validate global simulations of energy crops, however, the ms doesn't provide any original scientific insight; it just adopts modeling information from SWAT model. Also, the ms doens't incorporate various insight from researches on en-

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ergy crops, for example, suitable energy crop species in tropics, importance of fertilizer applications on marginal land, etc.

I have several concerns about the ms, and I do not find the ms ready for publication in present form. I must recommend publication in another outlet specific to bioenergy researches (e.g. Biomass and Bioenergy, GCB Bioenergy, . . .) after substantial revision.

Major concerns:

1. This ms considers only two lignocellulosic herbaceous energy crops, switchgrass and Miscanthus. These species are mainly considered as energy crops for temperate and continental climate zone. For the global simulations of second-generation herbaceous energy crops, authors need to address additional species in the modeling like Napier grass, sugarcane/energycane which are suitable for growing in tropics (Surendra et al. 2018). Also, consideration of woody species like Eucalyptus in tropics and SRC in boreal is recommended in the analysis of yield comparison with LPJmL and/or ORCHIDEE-MICT-BIOENERGY models as they already simulate.

2. Many studies show sensitivities on the yields, and requirement, even limited amount, of N and/or P fertilizer for these crops, particularly on switchgrass (e.g. Wullschleger et al. 2010, Hong et al. 2014, Ashworth et al. 2016). SWAT model already contains implementations of the process of fertilizers applications. This is critical point.

3. The simulated yields by the HO8 should be compared with simulation using SWAT model with the same climate forcing to validate the adopted implementations from the model described in the ms.

4. The simulation uses climatology (1997-2016 average) for the input, however, to validate the model results with field observations, I would recommend using annual forcing data in the simulations for the corresponding years. In addition, only WFDEI forcing is used in the simulations. There is no supporting information on the rational of using the forcing date over other data set, like S14FD (Iizumi et al. 2017), CRU JRA.

(Harris et al. 2019). At minimum, a revised manuscript must address the limitations.

5. It is critically needed to compared/validate the simulated yields using irrigation with field observations/experiments if data would be available.

Minor comments:

L16: Bauer et al. 2018 could be a "recent predictions".

L61: Miguez et al. 2012 also considers both species.

L62-64: Is it really few studies available? Nair et al. 2012 reviews and shows many models already available for the simulation.

L154: I found no description on simulation algorithm of parameter ensemble in the supporting materials.

Fig.3: Is it possible to disaggregate the figure with each climate zones?

Table s1, s2: I would recommend adding mean and SD of the observed yields in the tables.

L190: Too small sample size (N = 8).

L192: I don't understand the reason of excluding that yield below 10 Mg ha-1 yr-1.

L199: Does the result of Fig 5g change if the higher yield from Miscanthus or switchgrass calculated by H08 are used in the comparison?

L203: Is the discrepancy related to the modeling assumption of double cropping in the region? In practice, double or triple cropping can be done in the tropics for the herbaceous crops.

L215: I recommend comparing simulated results between SWAT and H08 using same forcing data.

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