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Interactive comment on “Impacts of future climate change on potential yields of major crops in China” by Y. Yin et al.

Anonymous Referee #1

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GENERAL

The paper is well structured and has a clear scope that fits for ESD and the ISI-MIP special issue: the projected impact of climate change (CC) on major agricultural crops in China under a high emission scenario using various GGCMs combined with data from various GCMs.

My major concern is that it is rather a report of findings from readily available and published data and does not provide much added scientific value. Various prior studies have dealt with CC impacts on agriculture in China (which the authors mention in several places) and a global evaluation of the data used here has already been presented in the extensively cited ISI-MIP main publications (e.g. Elliott et al., 2014; Rosenzweig et al., 2014). Despite the paper's scope, about half of the very short results section

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deals only with extents of harvested areas in China and reproduction of historic crop yields by the GGCMs. In my opinion, the paper could profit massively if the authors provided a more extensive evaluation as for example (a) a comparison of yield changes with changes in climate variables in order to derive sensitivity of yields in the region to certain variables. The authors hypothesise in the Discussion that yields increase in high altitudes and cold regions due to warming, but do not provide proof for that. Xiong et al. (2012) found that not temperature or precipitation (which are usually in the focus of CC assessments) but solar radiation can be considered the limiting factor for rice yields in past decades. So it would be interesting to see what climatic factors would drive yield changes in the future within this ensemble of GGCMs and GCMs. Also (b) a combination with socio-economic projections regarding future food security could be interesting or (c) the combination with other outputs from ISI-MIP to derive a more holistic vulnerability assessment for China.

The title may need some adjustment. In the Discussion (P626/L3ff), the authors state that GGCMs show large differences in projected CC impacts and do not reproduce historic yields well. The title should hence include some reference to uncertainties.

The applied methods are straight forward and reproducible.

The language could be polished in various places in order to facilitate understanding.

The abstract summarizes the contents of the paper adequately.

The Conclusions are rather a summary and need more elaboration (see below).

SPECIFIC COMMENTS

P618/L4: “.. a couple of global gridded crop models ...”: why does this not state the number of crop models being used, which is four?

P618/L9: “...show that the potential yields of rice may increase over...” should be “...show that the yields of rice may potentially increase over...” to make clear that not yield potential is meant

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P618/L11: should be “which” instead of “where”

P618/L17: should say “yields” instead of “production”. Production is not necessarily impacted by CC, as it also depends on the harvested area, agronomic inputs, etc.

P621/L2: “harvesting time” should be “number of cropping seasons”

P621/L15: There actually is partial adjustment in some models: GEPIC takes adaption into account in terms of decadal adjustment of planting and harvest dates and the distribution of spring and winter wheat. PEGASUS and LPJ-GUESS adjust the GDD of their cultivars. You may need to check more carefully the descriptions of the models that produced the data.

P622/L7: “moving average”: what kind of average?

P623/L16: “This is likely due to the limitations of rice model in the GCMs”. How do you derive this conclusion? Apparently, also the other crops are not represented too well in the GCMs in terms of reproducing historic reported yields. Besides actual crop growth algorithms, the global crop models also use different input data (e.g. soils, planting dates, growing season lengths) and various management assumptions. I’m not sure whether any conclusions on model performance in terms of bio-physical processes can be drawn from the ISI-MIP crop model outputs.

P626/L11: See comment on adaptation above.

P627/L8: The conclusions should draw new findings or provide an outlook on what further research or policy decisions, etc. may be needed in the future based on what has been presented and discussed in the foregoing sections. This Conclusions chapter however is rather a summary that has already been provided in the abstract.

P628/L10: various names in the references have been misspelled (e.g. Challiore, Izaurade, Lobel). The authors for “Future scenarios of European agricultural land use...” are not correct. The authors should check all references carefully and correct them where necessary.

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References

Xiong, W. et al. (2012) Untangling relative contributions of recent climate and CO2 trends to national cereal production in China. *Environ. Res. Lett.* 7 044014

Interactive comment on Earth Syst. Dynam. Discuss., 5, 617, 2014.

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5, C488–C491, 2014

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