Hydrol. Earth Syst. Sci. Discuss.,
doi:10.5194/hess-2016-86-AC1, 2016

Hydrology and Earth System Sciences
Discussions
Open Access
EGU

Interactive comment on "Assessment of impacts of agricultural and climate change scenarios on watershed water quantity and quality, and crop production" *by* A. D. Teshager et al.

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Received and published: 6 April 2016

Q1. Why were simulated total suspended solids different for different agricultural scenarios? I think the mechanisms about the TSS simulations in the model should be introduced briefly in section 3.1.

Answer 1. The same could be said for flow, total nitrogen and total phosphorous yields. The theoretical manual for the model used in this study (SWAT) clearly describes processes affecting and equations used in determining water, sediment, nitrogen and phosphorous yields, in addition to other parameters. Therefore, in the manuscript we invited the reader to refer to the manual and additional literature (P6, L11) for description of each components of the model. The focus of this study is using the model for

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long term impact analysis, not evaluating certain components of it.

Q2. I think the major contribution of this study is that the authors analyzed of the combined effects of agricultural land use change and climate change. However, I found that the scientific questions are lacking. Can the agricultural scenarios be completely independent with the climate scenarios? Is it necessary to consider the adaption of agriculture to climate change?

Answer 2. We appreciate the reviewer for these insights. As described in P9, L2-23, land use change (agricultural or others) is one component embedded in climate models to determine the possible GHG concentration pathways or RCPs. While we describe what each RCP represents in P9, L2-14, the interdependence between RCPs and agricultural scenarios was briefly described in P9, L15-23. In the results section, P12, L19-25, we offer a way to look at the results considering this interdependence between climate and agricultural scenarios. We will expand this section in our revision.

Q3. Moreover, the basin is too small. Are the conclusion representative for the whole U.S. Corn Belt Region?

Answer 3. The Raccoon River watershed (RRW) is a typical Corn Belt Region (CBR) watershed with its intensively tiled fields dominated by annual crop farms. That is why CBR is used throughout the manuscript. The value of the paper is partly in the high spatial resolution of the analysis, which could help guide conservation policy in the future. To provide some context, in the US, conservation planning is generally done at a HUC 12 level, and there are 108 HUC 12 subwatersheds in the RRW, so in that sense the watershed is quite large. Larger scale studies use coarser data, and therefore are generally not suitable for immediate use in fine-grained conservation use. To provide further context, there are not many watersheds in the CBR with water quality data as good as the RRW. The water quality data provide a really sound basis for calibration and validation of the model, which is not always possible in watersheds where, for example, only flow data is collected. Thus, the results in this study can be used as

a reference or starting point for future studies in similar watersheds, especially in the CBR. However, we do not claim our study for the RRW to represent the entire CBR. There need to be similar studies for other watersheds in the region, and larger scale studies for the entirety of the region to derive reliable conclusions and recommendation for the whole region and its impacts on downstream water quality.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-86, 2016.

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