Earth Syst. Sci. Data Discuss.,
doi:10.5194/essd-2016-35-AC3, 2016

Open Access Earth System Science Data Discussions

Interactive comment on "Global nitrogen and phosphorus fertilizer use for agriculture production in the past half century: Shifted hot spots and nutrient imbalance" *by* Chaoqun Lu and Hanqin Tian

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Received and published: 9 November 2016

Thanks a lot for your positive comments. We have revised the manuscript according to your advice. Please find the detailed revision as below:

1. There is no mention of which country boundary polygon layers were used in this study.

Response: we added the data source (GADM database of Global Administrative Areas) and its citation in manuscript.

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2. In section "Crop-specific N and P fertilizer use rate", it's unclear whether the spatial resolution of "grid cell g" is 0.5-degree or same as the resolution of Monfreda data (i.e. 5-arc min).

Response: it's 0.5-degree. We have clarified it in text.

3. In section "Crop-specific N and P fertilizer use rate", there is no mention of how the situation of a grid cell sitting on the boundary of multiple adjacent countries was handled.

Response: We converted shapefile of country boundary to half-degree grid file, and then used it to calculate harvested areas of 13 crop groups in each country based on M3-crop map aggregated to the same resolution. There is no grid cell "sitting on the boundary of multiple adjacent country".

4. In section "Harmonizing national total and crop-specific fertilizer use rate", it's unclear the spatial resolution of "grid cell g" is 0.5-degree or same as the resolution of HYDE data (i.e. 5-arc min)

Response: It is 0.5 degree. We have clarified this in the text.

5. Figure 1 only contains data elements. It can be improved by: 1) Including process elements to form a full workflow diagram. Data and process elements can be represented in different shapes, for example, data in oval and process in rectangle; 2) Adding metadata information (e.g. spatial resolution and time period) into data elements to better describe the characteristics of each data element

Response: Thanks for your constructive suggestions. We re-drew figure 1 by including process elements and adding more metadata information for specific data sources. Details can be found the new figure.

6. Using "Crop-specific N and P fertilizer use rate" to calculate fertilizer use rate for all other years suppose to be based on assumptions: 1) Relative fertilizer use rates across 13 crop groups in each country was assumed to be unchanged within the whole

time frame of this study 2) Crop groups mixing ratio in each grid was assumed to be unchanged within the whole time frame of this study Both those two assumptions could introduce uncertainties into the final data set. But in the "Uncertainty and future needs" section, only bullet 1) was mentioned, while not bullet 2).

Response: Thank you for pointing this out. We extended the text to address the possible uncertainty introduced by the second assumption, and potential data improvement given the future availability of time-series crop distribution maps.

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