Earth Syst. Sci. Data Discuss.,
doi:10.5194/essd-2016-35-RC1, 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

Anonymous Referee #1

Received and published: 7 September 2016

This is an interesting paper that describes a dataset of nitrogen and phosphorus fertilizer use over a period of several decades. This brings me immediately to my first concern about the work, that is the sentence starting on line 59 saying that there is a lack of long-term long term spatially explicit datasets for fertilizer use. There have been several publications with data starting in 1970, for example in the framework of the GLOBAL-NEWS project published in special issues of GBC in 2005 and 2009-2011, and later comparisons have been made of a number of such datasets. It is peculiar that the authors have not even referenced these studies and also a more recent one covering the full 20th century published in PNAS in 2013.

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I also have some concerns regarding the methods used. N fertilizer use is assumed to linearly increase from zero in 1910 to the first data year in FAOSTAT (1961). This is incorrect, because the N fertilizer use in industrialized countries started to explode just after the second World War, particularly in the late 1940s and early 1950s. P fertilizer use was already important in the early 20th century. So I do not think these assumptions are realistic. Early data can be found in the first production yearbooks from FAO, I think published in 1949 when FAO was still based in Washington, DC. This data includes estimates for the 1930s.

The IFA data on fertilizer use by crop are frequently published for a limited number of countries. IFA, FAO and IFDC have published fertilizer use by crop for a much larger number of countries, I think the latest of such publications was in 2003. Although the limited number of countries represent 94% of global fertilizer use, it is useful to have data for smaller countries as well. In addition, the data now do not cover grassland and meadows, while the older datasets have all this information. So in that way grassland could have been covered in a better way than it is now (if at all). In addition, by using the whole series of IFA data, a much longer time period could have been based on real estimates for a larger number of countries instead of extrapolations.

A further concern is that harvested are is used to distribute fertilizer, but perhaps a better way could have been crop yields, which combines area and biomass production.

My major concern is that the authors have only made an inventory of synthetic fertilizers. For biogeochemical studies, or studies on emissions of greenhouse gases or the carbon cycle, also the inputs of animal manure are needed, and biological N fixation, deposition, etc. So just fertilizer use is incomplete, and to assist researcher in need of nutrient data at the global scale, such datasets would be extremely helpful. Just fertilizers is only a part of the nutrient use in agriculture.

So the authors have not reviewed the literature and did not start with the knowledge already available, both approaches and statistical information, which is a pity, because

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most of this data is open access and freely available. In addition, the data as published in this discussions paper in itself is not really useful, since it lacks other sources of nutrients that in many countries are more important than synthetic fertilizers.

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