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Biogeosciences Discussions

Interactive comment on "Nitrogen food-print: N use and N cascade from livestock systems in relation to pork, beef and milk supply to Paris" *by* P. Chatzimpiros and S. Barles

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We thank referee # 3 for his comments, remarks and technical corrections to our paper. We address the comments below.

"The paper does require some reorganization and additional information (specific suggestions can be found in the "Specific comments" section, below). For example, the flow of the article would be clearer if the discussion of the uncertainties precedes the authors' discussion of conclusions. The authors should also more clearly report their major scientific findings from the analysis. More definitions and explanations are necessary, especially in the case of some of the assumptions, as modeling of this scale

requires complex assumptions that can have a substantial impact on the results. The paper overall presents important, original findings, but some revision is necessary before a final publication."

Answer: The introduction and discussion/conclusion sections have been reorganised. In the introduction section, we have highlighted the main objectives of the paper. In the discussion/conclusion section, the discussion of the uncertainties now precedes the discussion of the results and final conclusions. The major findings from the analysis have been also highlighted and necessary definitions and explanations on assumptions are provided.

Specific comments:

1. "The title is a little confusing with its use of the term "N cascade," as the results presented describe the losses to the N cascade rather than an actual analysis of the N cascade. Instead, I would suggest the following title: "Nitrogen food-print: N use in and N losses from the production of the pork, beef, and milk supply to Paris."

Answer: According to referee's remark, we modified the title to: "Nitrogen food-print: N use and N losses from livestock systems in consequence of pig, beef, and milk supply to Paris."

2. "The abstract focuses too much on the methods; it does not provide enough information on why the study was done and what the major conclusions are".

Answer: The abstract will be changed to include background information and the major findings of the work.

3. "The term "farm-gate" (1974/14) should be defined."

Answer: The term "farm-gate" was initially used to signify the calculation perimeter of the N budgets. We consider, however, that the term was not properly used and that the sentence is clear without it. The term is thus removed.

BGD

9, C1781–C1791, 2012

4. “More background information on nitrogen should be provided. For example, the difference between unreactive N (N2) and reactive N (all other forms) should be explained. I assume that when referring to nitrogen in this paper, the authors actually mean reactive nitrogen. This is fine, but should just be stated early on to avoid confusion. Some attention should also be given to the consequences of releasing reactive nitrogen to the environment to explain the importance and implications of this study.”

Answer: The new version of the introduction provides additional background information on nitrogen. A clear distinction is now made between reactive and nonreactive forms of nitrogen. By the end of the introduction it is now stated that reactive nitrogen (Nr) is simply referred to as nitrogen (N) in the paper. The following short paragraph is added in the introduction as background information on the implications of releasing Nr in the environment: “The N cascade is now recognized as a major crosscutting theme over all environmental problems and global-change issues such as climate change, biodiversity losses, groundwater pollution, eutrophication, tropospheric ozone generation and stratospheric ozone depletion with severe effects on ecosystems and human health (Sutton et al., 2011).”

5. “The term “food-print” should be defined in both the abstract and the introduction.”

Answer: A short discussion on the concepts of footprint and food-print has been added in the introduction. We will also provide a definition in the abstract

6. “The term “urban food-print” is also used. Is this different than a normal “food-print? A definition would be helpful.”

Answer: The term “urban” before “food-print” is used to mean the food-print of an urbanite and/or a city. An explanation is given in the introduction in the paragraph about the food-print concept.

7. “The term “N cascade” should be defined in the abstract, and it should be more completely defined in the introduction, especially if it remains in the title”

BGD

9, C1781–C1791, 2012

Answer: The term “N cascade” was removed from the title. We nonetheless added the following paragraph in the introduction. “The N cascade is now recognized as a major crosscutting theme over all environmental problems and global-change issues such as climate change, biodiversity losses, groundwater pollution, eutrophication, tropospheric ozone generation and stratospheric ozone depletion with severe effects on ecosystems and human health (Sutton et al., 2011).” The term will also be mentioned in the abstract.

8. “It would be useful to put the study in context for France, Europe, and perhaps the world. The analysis is very useful for the Paris region, but could the food production system results be extended to the rest of France? How different is the production from the rest of Europe?”

Answer: The results can be extended to the rest of France as the systems that supply Paris also supply food to other cities. Compared to northern Europe, the French cattle systems are moderately intensive but swine systems are of comparable intensity. A comparison with US systems is provided in the discussion/conclusion section.

9. “An explanation of why the selected food products were the only ones considered would be useful. For example, why were chickens not considered while the two other major livestock types were? Are there plans to continue the analysis for other types of protein?”

Answer: The aim of this study was to analyse production systems with respect to N for individual products. Beef, milk and pig were chosen because of their traditional high shares in Parisian diets. This is now stated in the methods and data section. The analysis can of course be extended to other products. This is also stated in the introduction and discussion/conclusion sections.

10. “It appears that beef, milk, and pig supply to Paris were considered in their raw form, e.g. carcasses and fresh milk. Statement is made that “transformations” are not accounted for (1974/20); does this mean processing? I think it would be helpful to

BGD
9, C1781–C1791, 2012

state this a little more clearly. Additionally, it would be useful to mention that raw food products require processing, which lead to additional nitrogen losses."

Answer: The word "transformations" was mistakenly used instead of "processing". We rectified that. We also added the following sentence in the end of the introduction section to explain that transportation and processing typically causes additional N losses: "Note that emissions of Nr in consequence of feed, milk and carcass transportation and processing are not accounted for. Transportation causes additional Nr emissions that are independent of the Nr content of products due to fuel combustion while processing of raw milk and carcasses as well as cooking lead to additional Nr losses which are evidently fractions of the initial Nr content of products."

11. "Was food waste considered? Substantial amounts of food waste (often over 30"

Answer: Consumption in Paris is calculated from data on apparent consumption (production, plus imports, minus exports), they thus include food waste (other than slaughter waste which are subtracted in the calculations).

12. "The wording on lines 1975/8-10 would be more clear with the following: ": : :factors that underlie the environmental change caused by animal agriculture: : :""

Answer: Thank you!

13. "Instead of the words "transportation database" (1975/21-22), "international trade database" may be clearer."

Answer: We changed the words 'transportation database" to "trade database".

14. "It would be helpful to more fully define the "perfect mixing principle" (1975/25)."

Answer: We provided a more explicit definition: "...which assumes that the distribution by origin of internal consumption is the same as that of imports plus internal production...".

15. "Adding the word "feed" to "energy system" (1976/17) would help explain what is

BGD

9, C1781–C1791, 2012

being described".

Answer : The word feed is added.

16. It is stated that 25

Answer: Sorry but something important seems to be missing from your comment.

17. "The flow of the "Discussion and conclusions" section could be improved. To leave the reader with the authors' conclusions, it would be preferable to discuss the uncertainties before the final conclusions are presented."

Answer: Several changes have been made in the discussion and conclusion section. The discussion of the uncertainties now comes earlier the section.

18. "Both the abstract and conclusions would benefit from a more clear explanation of the authors' major findings. This work has implications for personal food choices, for example that consuming one type of food would ultimately release less nitrogen to the environment than another type of food. The authors also spent some time discussing potential mitigation strategies, which could be better highlighted in the discussion as opportunities to reduce nitrogen losses".

Answer: We added clearer explanations of the main objectives of the paper in the introduction section and of the major findings in the discussion section. The abstract will be also restructured to inlcude background information and the major findings of the work.

19. "The use of the term "a priori" (1984/14) is a little confusing; I think the term "inherently" would be better suited Âż

Answer: The term "a priori" has been changed to "inherently".

20. It is stated (1985/13-14) that "Farm dependency on imported protein is most generalized in pig production." Does this mean it is most apparent or prevalent in pig production?

BGD

9, C1781–C1791, 2012

Answer: It meant prevalent. The sentence has now been changed to "...swine farms are in overall quite dependent on feed imports from external crop farms. In total, less than 10 % of French domestic pig production comes from swine farms that are self-sufficient in cereals."

21. "The following paper undertakes a similar analysis of N losses to the environment per unit of N consumption for different food categories: Leach, AM, JN Galloway, A Bleeker, JW Erisman, R Kohn, J Kitzes. 2012. A nitrogen footprint model to help consumers understand their role in nitrogen losses to the environment. Environmental Development, 1: 40-66. The loss factors calculated in the Leach et al. paper could be compared to those shown in Table 4 as "N losses per unit of N in animal products." Note that the Leach et al. paper looks at average U.S. production."

Answer: A paragraph is added in the discussion section where we compare and explain differences on N losses factors between the two studies.

22. "Table 4 – What does "environmental efficiency" mean? Does it mean efficiency in terms of N use?"

Answer: Yes. The term environmental efficiency has been changed to efficiency in terms of N use.

23. "Fig. 4 – Why is the term "urban food-print" used here?"

Answer: Sorry for that. The term is now removed.

Technical corrections

Âń 1972/16 – Change to "livestock are" Âż OK

"1972/14-15 – The units for N supply and N losses should have units kg N/cap/yr" OK

1972/21 – Change "destined to" to "used for" OK

1972/23 – Change "for the majority" to "mostly" OK

BGD

9, C1781–C1791, 2012

1972/23-24 – Change ": : :environment and contributes to the N cascade which is: : :" to ": : :environment where it contributes to the N cascade, which is: : :" OK

"1973/2-3 – Change "food demand drives at distance: : :" to "food demand drives most impacts relating to the alteration of the global N cycle from a distance"" OK, sentence changed

Âń 1973/15 – change "systems" to "system"" OK

Âń 1973/29 – a case study Âż Sentence changed

Âń 1974/15 – livestock system Âż OK

"1974/18 – Change "losses : : : consequence" to "losses could enter the N cascade in consequence" Âż OK

1974/18 – France, The sentence has been slightly changed

1974/22 – Change "Those: : :which" to "However, those data report the location of the last loading of products, which" OK

1975/24 – grounds OK

1976/1 – In those cases, OK

1976/6 – Does "per capita" need to be in quotations? Answer: No. Quotations deleted.

1976/11 – consists of OK

1976/12 – systems, and OK

1976/26 – respectively, OK

1977/23 – Replace "fabrication" with "production" OK

1977/28 – roughages, OK

1978/2 – Does "on-farm" need to be in quotations? Also at 1978/17 Answer: No,

BGD

9, C1781–C1791, 2012

quotations deleted in both cases.

1979/5 – Soybeans are OK

1979/5 – : : :in the form of meals, and they generally originate from Brazil: : : OK

1978/9 – processing; for instance, OK

1978/15 – Remove “in addition” OK

1978/22 – Remove “In” from “In overall.” This should also be done for 1980/1 OK

1978/24 – an identical OK

1979/1 – a percentage OK

1979/6 – the pig, OK

1979/15 – The nitrogen use efficiency acronym was already explained in line 1979/10 and does not need to be explained again OK, nitrogen use efficiency deleted before the acronym.

1979/23 – rotations; OK

1979/24 – a uniform rate OK

1979/25 – 170 kg N/ha, OK

1979/27-28 – Replace “but: : :simplification” with “but without precise data we were obliged to adopt this simplification.” OK

1980/2 – and summed up OK

1980/5 – leaching, OK

1980/11 – in the form of manures is calculated OK

1980/13 – as an “exchange ratio” OK

BGD

9, C1781–C1791, 2012

1980/26 – assumed to be returning to surrounding Answer: Sentence changed to "Gaseous N compounds, emitted during housing and storage of manures, are assumed to be re-deposited on surrounding cropland."

1981/2 – Replace "fragment" with "part" OK

1981/8 – Does "Gross" need to be capitalized? Answer: No, the capital letter is changed.

1981/11 – after secondary OK, "behind" change to "after"

1983/20 – Replace "sustains" with "requires" Answer: "Sustains" is used here to stress the fact that the manure excreted as by-product of meat production can fertilize crop production in the context of mixed (crop + livestock) agrarian systems. This precision is added in the text. In this sense, we keep "sustains".

1984/10 – potential direct contribution OK

1984/26 – Replace "much" with "greatly" OK

1985/1 – It is confusing which livestock types the numbers refer to, since it is suggested that swine losses are 3x those of beef, but the corresponding number for swine is 3x smaller than that for beef. Answer: Sorry for that: The figures were inversed. They are now in the right order.

1986/6 – Replace "pertain" with "remain" OK

1986/6 – Replace "relating to" with "of" OK

1986/28 – with a different OK

1987/2 – Replace "agrosystems of" with "agrosystems with a" OK

1987/11 – Replace "taste" with "choices" OK

1988/28 – Replace "be always" with "always be" OK

BGD

9, C1781–C1791, 2012

Table 1 – The units should all be in /cap/yr. OK

Table 2 – The (in front of and should be removed OK

Table 4 – The way the units are displayed is a little unclear; perhaps it could be stated in the title that all units unless otherwise stated are kg N/cap/yr OK, we stated so in the title

Fig. 1, 2, and 5 – The test in the embedded legends is too small. OK, text modified.

"Fig 6-9 – Are arrows in terms of relative magnitude? If so, it would be helpful to state that. However, if they are currently in terms of relative magnitude, it appears that some of the scaling should be modified. For example in Fig. 6, the bar on the bottom right with 0.27 is larger than the bar in the top right with 0.38."

Answer: Arrows in these figures are not in terms of relative magnitude. We nonetheless modified the bars you mention.

Fig 6-9 – It should also be clarified that the units are /cap/yr here as well. OK

Interactive comment on Biogeosciences Discuss., 9, 1971, 2012.