

Interactive comment on “Impact of agricultural emission reductions on fine particulate matter and public health” by Andrea Pozzer et al.

Anonymous Referee #1

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An interesting and important topic discussed so far mostly at a regional level. Presenting the global perspective is interesting but I personally doubt that such work has any implications on regional policy as it entirely misses discussion of regionally specific aspects of mitigation opportunities analyzing rather unrealistic scenarios of agricultural emissions; additionally referring to 2010 levels while emissions from livestock and arable land production (fertilizer use) are likely to increase further in several regions, especially in Asia. The above does not disqualify the paper and the authors do not claim that this analysis could guide regional policy but I believe that more discussion, or at least a clear statement, of this aspect is needed. Another aspect of this work that needs more clarity is the issue of temporal distribution of agricultural emissions used in the simulations. The authors make comments about the potential issue with temporal

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pattern of emissions but do not explain that any further and do not provide the actually used profile which makes it difficult to comment on that further. Another issue is the spatial resolution of the modelled PM_{2.5} concentrations and its use for calculation of population exposure. While the dose-response functions are referred to, it is not clear how the 10x10km (or 0.1x0.1 degree) mortality map (Fig 7) is produced when the output of the model is 1.1x1.1 degree which would lead to underestimation of exposure in urban areas. A clear explanation and discussion of consequences for the results and conclusions would be important.

More specific comments: ABSTRACT: I am not sure if the last sentence about the impact of 100% reduction is of any significance; such reductions are not even theoretically possible. INTRODUCTION: Page 1, Line 23: One could add there a reference to the EU policy which includes now targets for NH₃ emissions within the revised air quality legislation. The authors include a reference to that later in the paper. Page 2, Line 4: not clear what is meant by ‘manure processing’, suggest replacing with ‘manure storage and on field application’ Page 2, line 4: suggest add ‘N’ or ‘nitrogen’ before “fertilizer” Page 2, line 12: maybe ‘leads’ should be replaced with ‘would lead’ or ‘could lead’ as this is a modelling study rather than impact observed anywhere. Page 2, line 18: ‘by agriculture’ should be replaced with ‘from agriculture’ and ‘resulted’ can be possibly modified to ‘would or could result’ Page 2, last paragraph: As before, suggest adding a reference to the recent European air quality policy and possibly underlying analysis. METHODOLOGY Page 3, from line 21: The emissions are for the year 2010 but the references are for data sets until 2005. Few words of explanation? Page 4, Figure 2: A bit small, hard to read the axis Page 5, last paragraph: I believe it would be beneficial to put these assumptions in perspective of what has been discussed as feasible since the reductions given here, even the lowest level, are in most regions perceived as either infeasible or close to maximum reduction potential unless dietary changes are considered reducing meat demand. Beyond that, the realistic potential varies strongly between the regions which could be at least mentioned. It would be also advisable to add a clear statement

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which agricultural sources are included, eg., livestock manure, N mineral fertilizers, open burning of agricultural residues. . . Page 6; first paragraph: Presumably the first sentence refers to agricultural burning and so it could be moved to the end of this paragraph where combustion emissions are mentioned. In general this paragraph should be clear as to which sources are meant next to specific pollutants. Page 6; line 17: The 20-90% reduction refers to single measures and not to the overall mitigation potential and so nowhere 90% can be achieved for the whole agriculture. The potential is typically between 20-45% with some exceptions where structure is different, i.e., China with large share of emissions from urea and ammonium bicarbonate. Discussion of mitigation potential is available for a some countries, e.g., the Netherlands, Denmark, UK but also European studies discuss this; for example: https://link.springer.com/chapter/10.1007%2F978-94-017-9722-1_9 and specific discussion of feasibility, experience, and obstacles in reducing emissions in the UNECE: <http://www.unece.org/env/documents/2007/eb/wg5/WGSR40/ece.eb.air.wg.5.2007.13.e.pdf>

RESULTS Page 8, para from line 15: Total emissions in winter are not higher than in summer! NH₃ emissions are increasing with temperature and also organic fertilizers are applied in Spring, Summer, Autumn, just as the mineral fertilizers. I have mentioned the issue of temporal distribution of emissions earlier; I think if the distribution is indeed wrong then the consequences of that for the simulation results need to be discussed more thoroughly. Figure 7; here the resolution for the mortality attributable to PM_{2.5} is indicated as 10x10km. An explanation what data are used to develop that is needed. In general some discussion related to how coarse resolution concentration fields are used in health impact assessment would be useful, see eg. <http://www.sciencedirect.com/science/article/pii/S1364815215000808?via%3Dihub>

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