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Interactive comment on "N_2O release from agro-biofuel production negates global warming reduction by replacing fossil fuels" *by* P. J. Crutzen et al.

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The comment by Rauh and Berenz (2007) provides an opportunity to again emphasize some of the key issues of the manuscript by Crutzen et al. (2007). This will make it possible to clarify the misunderstandings raised and explain apparent discrepancies.

*) The transfer losses between feedstock and biofuels (cv) are described in terms of mass of carbon, not in terms of energy. Using data in the reference quoted by Rauh and Berentz (Schindler and Weindorf, 2006), a yield of 8t wheat (at 16% water content) per ha, and 2.3t ethanol produced from that, together with our calculations as outlined in Appendix A will provide a cv of 0.4, very close to the 0.37 which we use.

*) In our paper the factor we called "e", with a value of 0.4, is exactly the same as the

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"RE_N" of Balasubramanian et al. (2004). These authors, in an authoritative review, have values of RE_N for different arable crops under *current farming practice*, ranging from $<$20% to 50% ($<$0.2 to 0.5, in our terms), with the value for irrigated maize given as 37% (or 0.37). Our use of 0.4 is thus well towards the upper end of the range, deliberately to make our estimates of N_2O more conservative. In the same SCOPE volume, Krupnik et al (2004) estimate RE_N to be 0.35-0.38 for all crops and regions. The value of RE_N ("e") does not include the N in the crop derived from the mineralisation of soil organic matter, which typically is of the order of half the N actually taken up from the soil - hence the difference between the factor of 0.7 cited by Rauh and Berenz and our value. A large proportion of the added fertiliser N goes into the soil organic matter, thus replacing that which has been mineralised and which has contributed to the crop uptake. This process maintains the OM level, without which one would be "mining" the soil of nutrient and steadily reducing the soil fertility - which is precisely what happened when virgin lands were first ploughed and cropped in, e.g., the American Prairies.

*) We do not argue at all that the measurements of emissions directly from agricultural fields are incorrect. We do, however, argue that those emissions are only part (one third to one fifth) of the total N_2O emitted to the atmosphere annually due to new input of reactive nitrogen into global terrestrial systems. As we state in the manuscript, much of the N input into biofuel crop production, as well as other crops, is released to the global atmosphere, and to aquatic and terrestrial systems distinct from agricultural fields, where immobilization/mineralization/nitrification/denitrification occurs to produce N_2O. This N_2O is virtually unquantifiable, except through a global mass balance approach, such as that we present in this paper.

As only part of the N_2O emissions over the lifetime of Nr is accounted for in the 1% N_2O yield on the plot scale, it is regrettable that this number is still being referred to in life cycle assessments.

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