

Interactive comment on “N₂O release from agro-biofuel production negates global warming reduction by replacing fossil fuels” by P. J. Crutzen et al.

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The authors provide convincing evidence that so-called 'bio-fuels' can produce more CO₂ equivalents than may be 'saved' from replaced fossil fuel. This astonishing insight is derived from the consideration that all N in the harvested fuel has to be replaced in some form by the same amount of reactive N, of which 3-5 % will eventually be emitted as N₂O. Growing oilseed rape for 'bio-diesel' or corn for ethanol production is only possible with regular additions of reactive N. Whether this occurs in form of mineral fertiliser or through biological N fixation, say by a crop of soy-beans, makes no difference in terms of subsequent N₂O emissions. Nevertheless, the line of thought

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laid out in this paper also points to conditions under which 'bio-fuel' may indeed be a 'climate-friendly' option to fossil fuel. This is, where 'energy-crops' are grown solely on reactive N that has leaked from other processes (agriculture, industry, households, traffic) into areas otherwise un-productive in an agricultural sense. A good example would be elephant grass growing on set-aside land receiving substantial rates of atmospheric N deposition. Rates of 25 kg N/ha/year, not un-common in many parts of the world, are capable of supporting the growth of 1.4 tons of dry mass each year without further additions of N (assuming an N uptake efficiency of 0.4 and a mass ratio of 7.3 g N/kg dry matter, the calculation is: $25 \text{ kg N} \times 0.4 \times 1000 \text{ g dry matter} / 7.3 \text{ g N}$). As an additional benefit, such a crop would regularly remove reactive N from the environment, where otherwise 3-5 % of it would be turned into N₂O. Whether such a way of 'bio-fuel' production makes economic sense, depends very much on those who shape the market. Currently, subsidies and regulations keep the 'bio-diesel' markets growing (Gubler, R.: Industrial Biotechnology, 3, 22-24, 2007). It is to be hoped that those taking decisions on subsidies and regulations will in future take N₂O emissions into account and promote some forms of 'bio-fuel' production while quickly abandoning others.

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