

Review Klemedtsson and Smith, 2011 Biogeosciences discussion

Over all this paper points to the importance of improving the ability to predict N₂O emission, it focuses on grain crop use for bioenergy. It examines limitation of first generation biofuel to offset GHG emission.

Comments:

The observation that nitrous oxide emission occurs in the winter especially during thawing is consistent with results in the northern USA and other countries.

p. 6750 line 15-24: Excellent point, when observed in the short-term, N₂O flux does seem to increase with N-additions. However, N₂O emission continues as long as there is labile N, which likely would be true in native systems, with a substantial pool of organic matter.

P. 6756 Line 16 – relationship to soil carbon consistent with work published by Liebig et al., 2006 Soil response to long-term grazing in the northern Great Plains of North America. Agric. Ecosys. Environ. 115:270-276. Their work noted the relationship of N₂O to labile N and C.

A few items to consider:

This discussion is focused exclusively on first-generation fossil fuels. It may be worthwhile to make this obvious even in the title. Also on p. 6747 line 11 – add ‘grain’ after crop yield. Although, the focus is N₂O consider a brief discussion that addresses if/how other GHG may be impacted by using grain for ethanol.

p. 6750 – line 12; when you state ‘at least one-year’ are you implying that emission were measured all months of the year. It would be helpful if this was clarified. In the supplemental data A, add frequency and interval of sampling, also add if measurement were made during thawing.

P. 6754 line 25-26: What are the regression coefficients? Add r^2 and P values for fig. 2. It will make the relationship or lack thereof more apparent. Also consider adding a line showing the median.

p. 6756 line 11 – ethanol refinery? Clarify.

P. figure 3 when was the fertilizer applied.

If first-generation biofuel have limited ability to meet the EU standards for GHG mitigation, then what are strategies to enhance GHG mitigation?

Perhaps a future project may be to estimate the potential of second-generation biofuels to mitigate GHG emission.