

Biogeosciences Discuss., referee comment RC1
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Comment on bg-2022-39

Anonymous Referee #1

Referee comment on "Episodic N₂O emissions following tillage of a legume–grass cover crop mixture" by Alison Bressler and Jennifer Blesh, Biogeosciences Discuss., <https://doi.org/10.5194/bg-2022-39-RC1>, 2022

This manuscript explores short-term N₂O emissions after incorporation of cover crops – clover, rye and a clover/rye mix – at two field sites. There are many studies of N₂O emissions after incorporation of plant material (cover crops, crop and tree residues), including those that compare legumes vs non-legumes, and so the novelty of the work you present, and the additional knowledge that this provides, are not apparent.

This is confounded by your study being limited in number of spp – legume, non legume and a mix – and only over a two week period, so that relationships between crop characteristics (eg N content, biomass) or functional traits, can not be rigorously determined, and consequently the discussion provides little insight into trait effects on emissions. I don't consider this limited selection to truly represent 'functional diversity'. You state that little is known about multiple spp, but you are only using one mixture of two spp, and there have been other studies that have measured emissions from these spp, and more rigorously examined effect of spp mixtures. The magnitude of emissions will depend on the chemical composition of the plant material, and this is well established in the literature. The magnitude of emissions from the mixture will depend on the ratio of the component material, and so I find it disappointing that you only applied one ratio of the mix.

In the introduction text why do you just focus on emissions from the US? This is a global issue, and by focusing just on the US you are limiting the reach and reader interest of your work.

Line 53 – 20 years – do you mean 20 days?

Can you please explain why you measured N₂ fixation in the legume, rather than just the total biomass N – above + belowground?

Did you measure changes in soil mineral N after incorporation? I don't see this data, but it will be essential in helping explain the impact on soil processes resulting in emissions, for example net N immobilisation (line 317). It is a major omission not to include this data. Likewise, I don't see any measure of CO₂ emissions, despite residue addition likely to stimulate microbial activity.

I may have missed this, but I don't see data of the chemical characteristics of the clover, rye or weeds?

It would be helpful to have the daily fluxes of N₂O also presented as fluxes per biomass or % C applied basis. I think you give this for cumulative N₂O, but not for the daily fluxes.