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Interactive comment on "Effect of reed canary grass cultivation on greenhouse gas emission from peat soil at controlled rewetting" *by* S. Karki et al.

Anonymous Referee #1

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This paper addresses an interesting question related to different management options (planting versus no planting) for rewetted peatlands. Rewetting of peatlands is occurring in Europe and North America, so this paper has relatively broad geographic interest/application. The authors examine whether planting Reed Canary Grass (RCG) changes the greenhouse gas emissions from rewetted peat soils in comparison to bare soil.

The paper will make a nice contribution to the literature, but can be improved in the following ways:

1) In setting up the treatments, the authors compare reed canary grass to bare soil. Is

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this what would be happening in the field? Bare soil? Given the authors had to remove organic matter and grass from the cores they used that were bare, it seems bare soil is not likely to be what would be occurring in the field perhaps. Therefore, the authors need to justify why the compared to bare soil and perhaps include in the discussion a brief discussion about how these results might have varied if they had not compared to bare soil but instead to whatever native vegetation would have recruited naturally to a rewetted site.

2) I think in the Introduction it would be worthwhile to mention that reed canary grass is an invasive species in some parts of the world (including the U.S.) and that it may not be prudent to use reed canary grass as a biofuel crop in places where there is concern about this invasive species spreading. Thus there are additional factors that must be taken into account besides the greenhouse gas balance before deciding to plant RCG and this should perhaps be discussed in the conclusion or discussion.

3) RVI is defined but not explained and this was not an acronym I was familiar with. Please explain this briefly when it is first introduced so the reader knows why it is a useful index.

4) In the statistical method section, I think it would be useful to describe more fully what the CorAR1 structure versus compound symmetry represent since these were applied to the CH4, N2O or CO2 fluxes.

5) I would really like to see a diagram/schematic showing GHG flux in and GHG fluxes out of each treatment and at each water level and then also the net balance (a la W. Schlesinger figures). This would visually help me understand the overall net fluxes and would support nicely the authors' premise that RCG can have overall the effect of making a rewetted peatland a sink for CO2.

6) I would have liked a bit more discussion of the potential policy implications of this study. For example, the findings that increases in CH4 emissions under RCG were offset by decreased N2O emissions except when the water levels were at 0 would

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suggest that it is important if possible when reflooding peatlands to control the degree of wetting. Also, the peaks of N2O emissions in the RCG treatments that occurred after fertilization suggest that it is critical to only fertilize when absolutely necessary and to keep that fertilization to a minimum. Perhaps some standards need to be set to ensure that fertilization application does not offset the potential benefits of replanting in rewetted peats.

Technical Comments 1) Add lines in Table 1 to separate SO4 from NH4 from NO3 more easily for the reader.

2) Figure 7: Is this in comparison to the bare treatments? That would explain why there are negative bars for N2O. But this needs to be clarified in the figure text.

3) I don't understand the sentence on page 13314 lines 13-14. "...as non-linear increase in gas concentration over time was often observed with non-steady state chambers for used gas measurement." What does "used gas measurement" mean?

4) Page 13323, Line 1. "was" should be "WERE"

5) Page 13324. Line 2. Remove "the" in "...which could suppress CH4 emissionS."

6) Need to include the scientific name of Reed Canary Grass in the Introduction.

Interactive comment on Biogeosciences Discuss., 11, 13309, 2014.