

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

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Dear Reviewer,

We would like to thank you for interesting questions and useful comments. We have tried to address all the issues raised by you. The original comment is given first followed by our response.

1. I would like to see some detail in the introduction about the cultivation of RCG. For example, how are crops established, managed and harvested?

We have now added a line in introduction that RCG can be established from seeds and

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added a reference for detailed management practices.

2. Why is bare soil the control? Why not use the vegetation that would grow naturally following rewetting?

We agree that for evaluation of GHG effects of rewetting under in situ conditions an appropriate reference would be a naturally vegetated (grass) soil. During the present experiment, however, comparison of RCG and bare soil mesocosms (rather than, e.g., grass vegetation) was done in order to tentatively isolate the contribution of RCG in the measured GHG fluxes. In doing this, the GHG emission from the bare soil mesocosm was subtracted from the emission from the vegetated mesocosms. Inclusion of grass-vegetated mesocosms would have been a third experimental treatment, which was not feasible in the present study. We intended to reflect our approach already in the title of the manuscript, but as both reviewers stresses this point; we obviously failed to justify it properly in the manuscript itself. We have now added such information in the discussion.

3. P13313 L24 Why is there not a control with no fertiliser? How were the application rates decided?

Our previous study on effect of fertilization on RCG biomass yield already showed higher biomass yield of RCG with fertilization than without fertilization (Kandel et al. 2013). Similar fertilization rate was applied as applied in reed canary grass field from where the mesocosms were collected. However, higher nitrogen fertilization was given considering the lower mineralization rate at higher GWL. We have now added this information in the methodology section. The optimum amount and timing of fertilization required for optimum growth of RCG could be another experiment and we have now acknowledge this in the discussion section.

4. What is RVI? If this is a new method it should be addressed in the introduction.

RVI has now been defined in detail. We have now added a reference where it has been

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previously used for modelling CO₂ and CH₄ fluxes.

5. P13326 L14 Given that biomass yields were similar what is the implication for fertilizer application? Is it necessary?

As mentioned above, RCG showed higher biomass yield with fertilization than without fertilization (Kandel et al. 2013). Nevertheless, in the discussion, we recommend further studies to assess the effect of fertilization on RCG growth L.441 to L.444.

6. P13326 L16 Is this uptake of 6.2 kg CO₂/m² an actual CO₂ sink? Will part of this not be removed when the crop is harvested? What proportion of this might be belowground sequestration or how could it be estimated?

We completely agree with the reviewer that the part of CO₂ taken by plants will be removed when the plants are harvested. But we didn't go into further discussion about it as the uptake of CO₂ was not measured for whole measurement period. Rather we simply made the distinction between ecosystems being C sinks (from a soil C perspective) or CO₂ sinks from an atmospheric perspective. With the data we provide we believe that we can reasonably state that RCG cultivation makes the systems CO₂ sinks from an atmospheric perspective. Even taking into account the amount of C loss in harvested biomass the total emissions from RCG at 0 cm of GWL was 6.4 kg CO₂ eq. m⁻² year⁻¹ which is almost similar to the growing season GPP. In annual basis the GPP will even be higher. Furthermore, the RCG biomass will additionally reduce the CO₂ emissions by fossil fuel displacement.

Minor comments P13312 L21-22 Change to '...60-70 cm early in the 20th century and since then has been used for agricultural purposes.' P13313 L1 Insert 'the' before 'mesocosm'

Done

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