Effect of ground water level on greenhouse gas emissions from rewetted peatland cultivated with reed canary grass

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Rewetting of peatland

\[ \text{CO}_2 \quad \rightarrow \quad \text{CH}_4 \]

\[ \text{N}_2\text{O} \]
Materials and Methodology
• 5 different water table - 0, 10, 20, 30 and 40 cm below the soil surface
• 5 replicates
Measurements

- Ecosystem respiration, methane and nitrous oxide emission
  - Gas Sampling: 4 times in 15 minutes interval
  - HMR method: flux calculation

- Biomass Measurement- Ratio vegetation index

- Soil temperature at 5 cm and soil moisture
Results
$r^2 = 58-67\%$
Modelling of CO$_2$ fluxes

$$R_E = (R_{\text{base}} + R_{fb}) = R_0 e^{bT} + (\beta \times \text{RVI}) e^{bT}$$

Kandel et al. 2012 GCB Bioenergy
Biomass Yield
# Cumulative greenhouse gas emission in CO₂ equivalent

<table>
<thead>
<tr>
<th>Water table below the soil surface (cm)</th>
<th>Cumulative Greenhouse gas flux over 183 days in CO₂ eq. (kg/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R eco</td>
</tr>
<tr>
<td>0</td>
<td>2.3</td>
</tr>
<tr>
<td>10</td>
<td>2.3</td>
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<tr>
<td>20</td>
<td>2.9</td>
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<tr>
<td>30</td>
<td>2.7</td>
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<tr>
<td>40</td>
<td>3.3</td>
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</tbody>
</table>
Conclusion

› CO₂ - major gas - emission is lowest at high water table but no difference at 0 and 10 cm of water table.

› CH₄ emission is highest at high water table – contributes very less in terms of GWP.

› N₂O emission is low- negligible contribution to GWP

› Overall rewetting and growing of reed canary grass reduces the overall greenhouse gas emission from peatland
Thank You