Assessing the feasibility of GHG mitigation through water saving techniques (AWD) in irrigated rice fields in the Philippines

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Project Site

Central Luzon, Philippines

- Contributes 20% of the national rice production

- Two distinct season
  - Dry and Wet
Water Management

1. Continuous Flooding (CF)
2. Safe AWD
3. Site Specific AWD (AWDS)
   - Mid-season drainage
   - AWD at -25 cm

Crop Management

- Similar in all 6 cropping seasons
- In 2016 DS and WS:
  1. AWD was implemented 10 DAT
  2. Rice stubble incorporated during dry fallow tillage
Seasonal variations in daily rainfall, mean surface water level, CH$_4$ and N$_2$O flux during **Dry season**
Seasonal variations in daily rainfall, mean surface water level, CH₄ and N₂O flux during Wet season
### Results

<table>
<thead>
<tr>
<th>Treatment</th>
<th>CH$_4$ (kg CH$_4$ ha$^{-1}$)</th>
<th>N$_2$O (kg N$_2$O ha$^{-1}$)</th>
<th>GWP (kg CO$_2$ eq ha$^{-1}$)</th>
<th>Grain yield (Mg ha$^{-1}$)</th>
<th>Water use (m$^{-3}$ ha$^{-1}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF</td>
<td>69.9 DS 328.9 DS</td>
<td>1.6 DS 0.509 DS</td>
<td>2853 DS 11333 DS</td>
<td>6.9 DS 5.41 DS</td>
<td>10336 DS 10944 DS</td>
</tr>
<tr>
<td>AWD</td>
<td>42.2 DS 350.1 DS</td>
<td>3.5 DS 0.633 DS</td>
<td>2476 DS 12093 DS</td>
<td>6.88 DS 5.83 DS</td>
<td>5913 DS 9215 DS</td>
</tr>
<tr>
<td>AWDS</td>
<td>52.8 DS 374.0 DS</td>
<td>2.63 DS 0.528 DS</td>
<td>2578 DS 12874 DS</td>
<td>6.90 DS 5.42 DS</td>
<td>5012 DS 8949 DS</td>
</tr>
<tr>
<td>Season mean</td>
<td>54.9 DS 351.5 DS</td>
<td>2.58 DS 0.556 DS</td>
<td>2636 DS 12100 DS</td>
<td>6.89 DS 5.55 DS</td>
<td>7087 DS 9702 DS</td>
</tr>
</tbody>
</table>

**Treatment Means**

- **CH$_4$**
  - CF: 199.4 A
  - AWD: 196.1 B
  - AWDS: 213.4 A

- **N$_2$O**
  - CF: 1.05 B
  - AWD: 2.07 A
  - AWDS: 1.58 B

- **GWP**
  - CF: 7093 A
  - AWD: 7284 A
  - AWDS: 7725 A

- **Grain yield**
  - CF: 6.16 A
  - AWD: 6.35 A
  - AWDS: 6.16 A

- **Water use**
  - CF: 10640 A
  - AWD: 7564 B
  - AWDS: 6980 B

- **1.7% reduction**

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*Note: DS = Dry Season, WS = Wet Season.*
Conclusions

• Implementation of AWD is feasible in DS in Central Luzon

• The AWD with the current settings significantly reduced the seasonal total CH$_4$ emission, but the reduction rate against CF was very limited (1.7%)

• N$_2$O emission was enhanced by the AWD, and the resultant GWP of CH$_4$ and N$_2$O did not significantly differ among water management.
Feasible options that enhance the ability of AWD in reducing GHG emissions in Central Luzon, Philippines:

(1) An earlier rice residue incorporation under dry soil conditions

(2) An earlier implementation of AWD;

(3) A proper maintenance of flooded soil condition during/after N fertilizer topdressing.
Thank you