GHG emissions from Agriculture Soils in India

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WGIA8, 13-16 July 2010, Vientiane, Lao PDR
India’s Initial National Communication for the Base Year 1994: Emissions from Agriculture Sector (Gg)

<table>
<thead>
<tr>
<th>GHG source and sink categories (Gg per year)</th>
<th>CO₂ emissions</th>
<th>CO₂ removals</th>
<th>CH₄</th>
<th>N₂O</th>
<th>CO₂ eq. emissions*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total (Net) National Emission</strong></td>
<td>817023</td>
<td>23533</td>
<td>18083</td>
<td>178</td>
<td>1228540</td>
</tr>
<tr>
<td><strong>3. Agriculture</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enteric Fermentation</td>
<td>14175</td>
<td></td>
<td></td>
<td>151</td>
<td>344485</td>
</tr>
<tr>
<td>Manure Management</td>
<td>8972</td>
<td></td>
<td>946</td>
<td>1</td>
<td>188412</td>
</tr>
<tr>
<td>Rice Cultivation</td>
<td>4090</td>
<td></td>
<td>167</td>
<td>4</td>
<td>85890</td>
</tr>
<tr>
<td>Agricultural crop residue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4747</td>
</tr>
<tr>
<td>Emission from Soils</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>146</td>
</tr>
</tbody>
</table>

Source: India’s Initial National Communication to UNFCCC

WGIA8, 13-16 July 2010, Vientiane, Lao PDR
GHG Emissions from Agriculture Sector in India in 2007 (Gg)

<table>
<thead>
<tr>
<th>Source</th>
<th>CH₄</th>
<th>N₂O</th>
<th>CO₂ eq.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enteric fermentation</td>
<td>13767.80</td>
<td>146.07</td>
<td>334405.50</td>
</tr>
<tr>
<td>Manure management</td>
<td>10099.80</td>
<td></td>
<td>212095.80</td>
</tr>
<tr>
<td>Rice cultivation</td>
<td>115.00</td>
<td>0.07</td>
<td>2436.70</td>
</tr>
<tr>
<td>Soils</td>
<td>3327.00</td>
<td></td>
<td>69867.00</td>
</tr>
<tr>
<td>Crop residue</td>
<td>226.00</td>
<td>6.00</td>
<td>6606.00</td>
</tr>
</tbody>
</table>


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Emission Factors

• 1994 Estimation – 0.93 kg/ha N$_2$O-N

• 2007 Estimation – Country specific emission factors
  – rice-wheat system
    • 0.76 kg ha$^{-1}$ N$_2$O-N for rice
    • 0.66 kg ha$^{-1}$ N$_2$O-N for wheat

» for urea application without inhibitors
Emission of $\text{N}_2\text{O}-\text{N}$ from different sources in agricultural soils *(Total emission 0.14 Mt)*

- Soil mineralization: 7%
- Crop residue: 10%
- Green manure: 6%
- Animal manure: 7%
- Fertilizer: 70%

Data source: Majumdar et al. (2000), Pathak et al. (2002; 2004), Bhatia et al. (2005), Malla et al. (2005), Jain et al. (2009)
Nitrous oxide emission from agricultural soils during 1995-2007

Source: Pathak et al. 2010
Nitrous oxide emissions from agricultural soils in different states of India in 2007

Source: Pathak et. al. 2010
Methodology Used in 2007 Estimation

- IPCC 2006 methodology followed
- Activity data for 1995 to 2007 compiled
- Emission coefficients developed and updated for different crops, crop residues and soils
- Uncertainty estimated (3-40%)

Source: Pathak et. al. 2010
Ongoing Work..

- Efforts to reduce uncertainties by developing country specific emission factors
  - For different agro-ecosystems
  - Covering fallow periods
Thanks