CCAFS – MOT: A decision support tool for geographic optimisation of agricultural mitigation options
(ongoing work)

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Low emissions agriculture: Supporting agricultural development that GHG emissions or sequesters carbon.
What it does

- Estimate GHG emissions for different land use systems according to management types;
- Rank the most effective mitigation options;
- Estimate the mitigation potential of different options.

What it does not do

- Estimate life cycle assessment of GHG emissions;
- Scale emissions up to total area, total livestock;
- Estimate GHG emissions in different microclimates;
- ....
Main objective of CCAFS-MOT

- User friendly
- Little time required
- It widely used
- Quick user vs expert user
- General overview of key emission sources
- Tool to help providing advice for policy makers
- Accommodates regional differences
GHG emissions: main input variables are flexible

- Region, climate, soil characteristics
- **Ecosystem:** upland (34 crops + other), rice, grassland
- **Current management practices:** user can choose which practices they are using (e.g. fertiliser application rate, tillage practices).
Mitigation options and potential

- No tillage
- Reduced tillage
- Cover crop
- Balance N
- Organic manure addition
- Balance N, Best fertilizer production technology
- Timing of N application (Synchronizing N application)
- Baseline N, Best fertilizer production technology
- Polymer-coated fertilizers
- Nitrification inhibitor
- Compost application
- Straw addition / Residue return (50%)
## Empirical models to estimate GHG emissions

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<th>Land use</th>
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<th>Empirical models</th>
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<td>Rice</td>
<td>Mineral fertiliser application</td>
<td>Yan et al. (2005)</td>
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<td>Water regime</td>
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<td>Mineral fertiliser application</td>
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<td>Smith et al. (1997)</td>
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<td>Mineral fertiliser production</td>
<td>China - Zhang et al. (2013)</td>
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<td>Livestock systems</td>
<td>Enteric fermentation</td>
<td>Herrera et al. 2013</td>
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Mitigation practices

- Mitigation practices: 12 practices + agroforestry (3 systems included).
- Balanced mineral nitrogen (N) application
- Nitrification inhibitor/Polymer-coated fertiliser
- Timing of mineral nitrogen application
- Best fertiliser production technology (Europe)
- Reduced tillage/No tillage
- Straw addition/Residue incorporation
- Cover crops
- Manure addition
- Compost application
- Agroforestry
Brentrup & Palliere (2010)

<table>
<thead>
<tr>
<th>N application rate (kg N/ha)</th>
<th>N removal (kg N/ha)</th>
<th>NUE (%)</th>
<th>Interpretation</th>
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<td>Risk of high N losses 4</td>
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<td>240</td>
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(1) Soil mining = N removal exceeds N input -> declining soil fertility and yield = unsustainable
(2) Risk of soil mining = additional N requirement for roots and straw is not met by N input
(3) Balanced in- and outputs = N fertilizer input meets total crop demand (grain, straw, roots)
(4) Risk of high N losses = N fertilizer input exceeds total crop demand -> increased risk of leaching

• Nitrogen Use Efficiency (NUE)=
Kg N removed with harvest / Kg of mineral fertilizer N applied * 100.
How does it look like?
Questions/feedback

• Are you familiar with the mitigation options suggested?
• Would you like to see more information than what is currently presented? What is missing?
• What is the difference from other tools?
• Other suggestions...
Acknowledgements

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