

Online Advanced Course  
**GREENHOUSE GAS ASSESSMENT AND MITIGATION IN AGRICULTURE:  
CONCEPTS, METHODS AND SIMULATION TOOLS**  
28 September - 2 October / 5-8 October 2020

**PROGRAMME**

- 1. Context (1 hour)** (A. Ferrara)
  - 1.1. Status of Climate Change and potential role of agriculture to meet Paris Agreement expectations
  - 1.2. Meeting sustainable intensification with Nationally Determined Contribution targets
- 2. Sources and drivers controlling GHG emissions at different scales: from the soil aggregate to the agri-food system (1 hour)** (A. Ferrara)
  - 2.1. Main processes underlying emissions of CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>
  - 2.2. The soil-plant-atmosphere system and its relationship with the C-N cycle components
  - 2.3. Basic concepts for estimating GHG emission and removals from agriculture and from land use
- 3. Mitigation options for cropping systems. Examples (4 hours)**
  - 3.1. Main factors controlling emissions and effect of agricultural management practices (3.1 to 3.4: 3 h) (A. Sanz-Cobeña)
  - 3.2. Options for reducing non-CO<sub>2</sub> GHG emissions (A. Sanz-Cobeña)
  - 3.3. Options for reducing non-biogenic GHG emissions (A. Sanz-Cobeña)
  - 3.4. Options for reducing indirect GHG emissions (NO<sub>3</sub>- leaching, NH<sub>3</sub> and NO<sub>x</sub>) (A. Sanz-Cobeña)
  - 3.5. Enhancing CO<sub>2</sub> removals (1 h) (J. Álvaro-Fuentes)
- 4. Reporting National GHG Inventories (3 hours + 4 hours practicals)**
  - 4.1. The importance of the National Inventories (4.1. to 4.3: 1 h) (A. del Prado)
  - 4.2. IPCC-based methods (A. del Prado)
  - 4.3. New 2019 IPCC inventory guidelines (A. del Prado)
  - 4.4. Overcoming drawbacks, limitations and uncertainties in different national conditions (4.4 and 4.5: 2 h) (L. Cárdenas)
  - 4.5. Improving national inventories – an introduction (L. Cárdenas)
  - 4.6. Practical work based on a case study (3 h sessions + 1 h presentation and debate) (L. Cárdenas, J. Álvaro-Fuentes, A. del Prado)
- 5. Improving GHG estimations and National GHG Inventories (6 hours + 7 hours practicals)**
  - 5.1. Measuring agricultural GHG emissions and SOC changes at field scale (2 h) (K. Butterbach-Bahl)
    - 5.1.1. Methodological challenges: spatial/temporal variability, sampling issues, etc.
    - 5.1.2. Overview of field and laboratory methods: limitations and opportunities
    - 5.1.3. Low cost procedures and new developments
  - 5.2. Process-based modelling approaches: overview, data requirement, limitations and opportunities, applications (4 h + 7 h practical work)
    - 5.2.1. Field-scale models for GHG estimation (1 h) (J. Álvaro-Fuentes, A. del Prado)
    - 5.2.2. Life cycle analysis (LCA) (1 h) (R. Teixeira)
    - 5.2.3. Regional and global models (1 h) (R. Farina)
    - 5.2.4. Challenges of scaling up (or down) in the models (1 h) (R. Farina)
    - 5.2.5. Practical work
      - 5.2.5.1. Field-scale process-based models (3 h) (J. Álvaro-Fuentes, A. del Prado)
      - 5.2.5.2. LCA (4 h) (R. Teixeira, A. del Prado)
- 6. Socio-economic assessment of GHG mitigation (3 hours)** (S. Pellerin)
  - 6.1. The marginal abatement cost curve methodology (MACC)
    - 6.1.1. Key steps of the process
    - 6.1.2. Examples from different countries
  - 6.2. Barriers for mitigation implementation
  - 6.3. Debate on how MACC can help decision making (1 h)
- 7. Decision-making oriented tools (2 hours)** (E. Milne)
  - 7.1. Decision support systems

7.2. User-friendly tools

7.3. Open-access databases

**8. Round table discussion (2 hours)** (E. Milne, R. Teixeira, J. Álvaro-Fuentes, R. Farina, A. del Prado)

8.1. Priorities on GHG research

8.2. How to incentivize the implementation of mitigation measures