Advanced Course:

GREENHOUSE GAS ASSESMENT AND MITIGATION IN AGRICULTURE: CONCEPTS, METHODS AND SIMULATION TOOLS

Zaragoza (Spain), 16-20 October 2023

PROGRAMME

0. Opening (1 hour)

1. Context (2 hours) FAO - (M. Bernoux)
- 1.1. The role of agriculture in climate change
- 1.2. Main processes underlying emissions of CO_2, N_2O, CH_4
- 1.3. The importance of the National GHG Inventories

2. Measuring agricultural GHG emissions and soil carbon changes (2 hours) K. Klumpp
- 2.1. Methodological challenges: spatial/temporal variability, sampling issues, etc.
- 2.2. Overview of field and laboratory methods: limitations and opportunities
- 2.3. Low cost procedures and new developments

3. GHG mitigation options for cropping systems (4 hours)
- 3.1. Direct and indirect GHG emissions: general concepts (3.1 and 3.5, 1 hour) **A. Sanz-Cobeña**
- 3.2. Options for reducing direct N_2O and CH_4 emissions (3.2 and 3.3, 2 hours) **A. Sanz-Cobeña**
- 3.3. Options for reducing indirect GHG emissions: N leaching and atmospheric reactive N **A. Sanz-Cobeña**
- 3.4. Options for enhancing CO_2 removal (1 hour) **J. Álvaro-Fuentes**
- 3.5. Barriers and opportunities for GHG mitigation in agriculture **A. Sanz-Cobeña**

4. National GHG inventories (4 hours + 3 hours practical work)
- 4.1. IPCC-based methods (4.1-4.3, 4 hours) **L. Cárdenas**
- 4.2. Overcoming drawbacks, limitations and uncertainties in different national conditions
- 4.3. Improving national inventories: national case studies
  - 4.3.1. UK: **L. Cárdenas**
  - 4.3.2. Chile (1 hour) **(to be decided)**
- *4.4. Practical work on GHG NI based on a case study (3 hours)* ***L. Cárdenas, J. Álvaro-Fuentes, A. del Prado***

5. GHG estimation tools (6 hours + 7 hours practical work)
- 5.1. Process-based models (4 hours)
  - 5.1.1. Overview, data requirements, limitations and opportunities, applications (1 hour) **J. Álvaro-Fuentes, A. del Prado**
  - 5.1.2. Field-scale models for GHG estimation (1 hour) **J. Álvaro-Fuentes, A. del Prado**
  - 5.1.3. Regional and global models (1 hour) **K. Paustian**
  - 5.1.4. Challenges of scaling up (or down) (1 hour) **K. Paustian**
- 5.2. Life cycle analysis (LCA) (2 hours) **R. Teixeira**
- *5.3. Practical work*
  - 5.3.1. Field-scale process-based models (3 hours) **J. Álvaro-Fuentes, A. del Prado**
  - 5.3.2. LCA (4 hours) **R. Teixeira, A. Del Prado**

6. Decision-making oriented tools (3 hours) E. Milne
- 6.1. Decision support systems
- 6.2. User-friendly tools
- 6.3. Open-access databases

7. Carbon farming challenges and opportunities (3.5 hours)
- 7.1. Is carbon farming a realistic solution to climate change? (40 min + questions) **E. Milne**
- 7.2. Carbon market opportunities in agriculture (40 min + questions) **M.J. Sanz**
- 7.3. Debate: **E. Milne, M.J. Sanz.** Moderator: **B. Sánchez** (1.5 hours)

8. Clossing session (0.5 hours)