

Advanced Course
PREDICTIVE BREEDING TOOLS FOR INTENSIVE AND SUSTAINABLE PRODUCTION
UNDER CLIMATE CHANGE SCENARIOS

Zaragoza (Spain), 17-21 January 2022

PROGRAMME

- 1. Framework for prediction in plant breeding under climate change scenarios (0.5 hour)** (L. Cattivelli)
- 2. Climate change scenarios (1 hour)** (N. Ferreira)
 - 2.1. Precipitation and temperature changes, extremes, variability, drought indices, Coupled Model Intercomparison Project - Phases 5 and 6
 - 2.2. Basics of climate modelling
 - 2.3. Construction of emissions scenarios
- 3. Traits for sustainability in cereal breeding (3.5 hours)**
 - 3.1. Trait selection (0.5 h) (L. Cattivelli)
 - 3.2. Phenotyping for high temperature adaptation (1 h) (G. Slafer)
 - 3.3. Phenotyping for WUE and drought resilience (1 h) (A. Schulman)
 - 3.4. Phenotyping for Nitrogen Use Efficiency (1 h) (S. Rasmussen)
- 4. Genomic selection (3 hours)**
 - 4.1. General concepts (2 h) (A. Fricano)
 - 4.2. Practical applications in breeding programmes (1 h) (F. Bassi)
- 5. Crop modelling (7 hours)**
 - 5.1. Basics of crop growth simulation modelling (1 h) (R. Rötter)
 - 5.2. Crop modelling demonstration: modelling platforms WOFOST and APSIM (1 h) (N. Ferreira, G. Bracho-Mujica)
 - 5.3. How crop models are used by growers for agricultural planning and management (1 h) (M. Acutis)
 - 5.4. Model evaluation/linking modelling with experimentation: calibration using input/experimental data of different quality level (2 h) (G. Bracho-Mujica, R. Rötter)
 - 5.5. Practical work (2 h) (A. Acutis, P. Perego)
- 6. Linking genomic prediction (GP) with crop simulation models (CSM) (15 hours)**
 - 6.1. Conventional GWAS-GP vs linkage GP with CSM. Practical example on flowering time (2 h) (L. Paleari, R. Confalonieri)
 - 6.2. Model improvement and ideotyping
 - 6.2.1. Limits, pros and cons of models to capture different crop responses to abiotic stresses and impact of multiple stresses (1 h) (R. Rötter/G. Bracho-Mujica/R. Confalonieri)
 - 6.2.2. Examples of recent or planned model improvements (1 h) (M. Acutis)
 - 6.2.3. Designing future wheat (1 h) (M.A. Semenov)
 - 6.2.4. Methods of model-based ideotype design (2 h) (P. Martre)
 - 6.2.5. Results from different model-based ideotyping studies
 - 6.2.5.1. Developing efficient high temperature stress phenotyping methods for sorghum breeding (1 h) (E. van Oosterom)
 - 6.2.5.2. *In silico* crop design – simulate to innovate (1 h) (G. Hammer)
 - 6.2.5.3. The example of wheat (1 h) (M. Bogard)
 - 6.2.5.4. The example of lodging in barley (1 h) (L. Paleari, R. Confalonieri)
 - 6.3. WOFOST model Demonstration and exercises (R. Rötter, G. Bracho-Mujica)
 - 6.4. Final discussion (4 h) (R. Rötter, G. Bracho-Mujica, L. Paleari, R. Confalonieri, M. Acutis, M.A. Semenov, P. Martre)