Short course on modelling for sustainable management of crop health

Volterra, Italy

Monday January 13 8:30 – Friday January 17 14:00

PROGRAM

This short course is an initiative of the INRA Metaprogram "Sustainable Management of Crop Health", in collaboration with the European Research Group ENDURE (DURable Exploitation of Crop Protection Strategies), the European project PURE (Pesticide Use-and-Risk Reduction in European farming systems with Integrated Pest Management), the INRA/CIRAD Integrated Pest Management network, and the INRA/ACTA Mixed Technological Network on Modelling.

Monday January 13

Introduction (8:30-12:30)

General introduction to the course. Presentation of teachers and students. J-N Aubertot (30 min)

Review of the varied objectives of modelling for plant protection. J-N Aubertot (30 min)

The major types of models. Descriptions, properties, examples

- Dynamic system models (detailed example of aphid-ladybug). D. Wallach (30 min)
- Agent based models. IBM based on the example of banana stem weevil. M. Gosme (30 min)

Break (30 min)

- Statistical models. D. Makowski (30 min)
- Network models. M. Pautasso (30 min)

Change of pace lecture. Practical applications of plant disease modeling in IPM. T. Caffi (30 min)

Lunch (12:30-13:30)

The R programming language: lectures and hands-on work (13:30-18:00)

Part I. F. Brun (1 h 30 min)

Change of pace lecture. Climate change impacts on plant health. M Pautasso (30 min)

Break (30 min)

Part II. F. Brun (2 h)

Tuesday January 14

The R programming language: lectures and hands-on work (8:30-12:30)

Part III. F. Brun (1 h 30 min)

Change of pace lecture. Analysis of agricultural risks in Europe. D. Makowski (30 min)

Break (30 min)

Part IV. F. Brun (1 h 30 min)

Lunch (12:30-13:30)

Risk model examples and demonstrations with interactions (13:30-15:30)

Evaluation of risk of invasive species. Strategic decisions. W van der Werf (1 h)

The Magarey model for disease risk assessment. D. Makowski. (1 h)

Break (30 min)

PROJECT: SEIR model of brown rust on wheat (16:00-18:30)

Explanation of project. D Wallach (10 min)

Description of brown rust. T. Caffi (20 min)

A simple SEIR model, based on Zadok. F. Brun (30 min)

Group discussion on possible objectives of a study using this model. J-N Aubertot (30 min)

Exercise – programming the model in R. F. Brun (1 h)

Wednesday January 15

Various modeling approaches. Part I (8:30-13:00)

A comparison of different approaches: simple rules, empirical models, mechanistic models. Tito Caffi. (1 h)

The use of networks as models in plant epidemiology. Marco Pautasso (1 h)

Break (30 min)

Qualitative modelling. J-N Aubertot (1 h)

Modelling pathogen competition and displacement. J Yuen (1 h)

Lunch (13:00-14:00)

Trip to Volterra (14:00-18:00)

Thursday January 16

Various modeling approaches. Part II (8:30-10:30)

Policy. Linking risk and economics. W. van der Werf (1 h)

A framework for spatially explicit modeling of multiple bio-agressors. M Gosme (1 h)

Break (30 min)

Generic modeling methods (11:00-13:00)

Dimensional analysis. J-N Aubertot (30 min)

Model calibration. D Wallach (30 min)

Model uncertainty. Model evaluation for prediction D. Wallach (30 min)

Model evaluation for discrimination. ROC. J Yuen (30 min)

Lunch (13:00-14:00)

The project. Part I (14:00-18:00)

Group breakouts, work on applying the model

Friday January 17

The project Part II (8:30-10:00)

Finish project, prepare restitution

Break (30 min)

Restitution of projects by group (10h30-12h00)

Course wrap-up (12:00-12:30)

Lunch (12:30-13:30)

14:00. Departure to airports (Firenze or Pisa)