

## AGENT-BASED MODELLING IN AGRICULTURAL AND RESOURCE ECONOMICS

### Instructors

**Prof. Dr. Alfons Balmann**, Department for Structural Development of Farms and Rural Areas, Institute of Agricultural Development in Central and Eastern Europe (IAMO)  
Theodor-Lieser Str.2, D-06120 Halle (Saale),  
Tel.: +49 345 2928 300; Fax: +49 345 2928 399  
Email: [balmann@iamo.de](mailto:balmann@iamo.de)

**Dr. Zhanli Sun**, Department for Structural Development of Farms and Rural Areas, Institute of Agricultural Development in Central and Eastern Europe (IAMO)  
Theodor-Lieser Str.2, D-06120 Halle (Saale),  
Tel.: +49 345 2928 331; Fax: +49 345 2928 399  
Email: [sun@iamo.de](mailto:sun@iamo.de)

**Mrs. Franziska Schönau**, Department for Structural Development of Farms and Rural Areas, Institute of Agricultural Development in Central and Eastern Europe (IAMO)  
Theodor-Lieser Str.2, D-06120 Halle (Saale),  
Tel.: +49 345 2928 117; Fax: +49 345 2928 399  
Email: [schoenau@iamo.de](mailto:schoenau@iamo.de)

**Dr. Marten Graubner**, Department for Structural Development of Farms and Rural Areas, Institute of Agricultural Development in Central and Eastern Europe (IAMO)  
Theodor-Lieser Str.2, D-06120 Halle (Saale),  
Tel.: +49 345 2928 320; Fax: +49 345 2928 399  
Email: [graubner@iamo.de](mailto:graubner@iamo.de)

**Dr. Amanda Sahrbacher**, Department for Structural Development of Farms and Rural Areas, Institute of Agricultural Development in Central and Eastern Europe (IAMO)  
Theodor-Lieser Str.2, D-06120 Halle (Saale),  
Tel.: +49 345 2928 135; Fax: +49 345 2928 399  
Email: [a.sahrbacher@iamo.de](mailto:a.sahrbacher@iamo.de)

**Dr. Christoph Sahrbacher**, Department for Structural Development of Farms and Rural Areas, Institute of Agricultural Development in Central and Eastern Europe (IAMO)  
Theodor-Lieser Str.2, D-06120 Halle (Saale),  
Tel.: +49 345 2928 235; Fax: +49 345 2928 399  
Email: [sahrbacher@iamo.de](mailto:sahrbacher@iamo.de)

### Course Description

The objective of the course is to present the Agent-Based paradigm for modelling (Agent Based Modelling or ABM) and simulation of complex systems especially in the field of agricultural and resource economics. The course is a five-day learning module, divided into theory and practical sessions; on the theoretical sections, the course will enable participants to understand what ABMs are and when and why they are used; the main concepts of Agent-Based modeling and how it works will be explained; and the decisions required for the formulation of an ABM will be presented. On the practical sessions, participants will learn how to implement and analyze an

ABM using the NetLogo framework by developing a simple model step by step. Participants shall subsequently extend the simple model to address a research question of their own. The course provides a foundation for the student additional self-instruction in Agent Based Modelling, using the references provided throughout the course.

## **Course Outline – Topics**

- I. Introduction to Complex Adaptive Systems
  - a. Background
  - b. Models of Complex Systems
  - c. Simulation of Complex Systems
  - d. Overview of Dynamic Models
- II. Complex Systems and Agent Based Modelling
  - a. The Bottom up Perspective
  - b. Micro-level Emergent Structures
  - c. Complex Systems as Systems of Individuals
  - d. Approaches to Model Complex Systems
  - e. Advantages and Disadvantages of Agent-Based Modelling
- III. Detailed Description of Agent Based Modelling
  - a. Definitions of Agent Based Model
  - b. Elements of an Agent Based Model
  - c. Modelling and Simulation Process for ABM
  - d. Description of a Conceptual Agent Based Model
  - e. Verification and Validation of ABM
  - f. Critical Aspects of Agent Based Models
  - g. Agents Decision Making Mechanisms
- IV. Implementing Agent Based Models
  - a. Overview of Agent Based-Modelling Frameworks.
  - b. Advantages and Drawbacks of Selected Frameworks.
  - c. Computer Programming and ABM Implementation.
  - d. The NetLogo Modelling and Simulation Framework
  - e. Developing an ABM: Walkthrough
  - f. Modelling for an Hypothesis
  - g. Running Simulations and Interpretation of Results
- V. Agent-Based Model application in Agricultural and Resource Economics
  - a. Theoretical Applications
  - b. Applied Examples
  - c. Scientific Relevance
  - d. Research Perspectives

## **Credit points**

3

## **Requirements**

Basic working knowledge in computer, such as MS Office;  
Microeconomic and programming experience will be helpful, but not required.

## **Software**

NetLogo, MS Office

**Necessary course materials**

Participants will be provided with a survey of references and a collection of material to be read before the course, and handouts during the course.