Farming Systems Analysis and Design

The example of Wageningen University & Research

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Plant production systems, Wageningen University
Systems analysis is in the DNA of WUR

‘To explore the potential of nature to improve the quality of life’
WACASA: Wageningen Centre for Agroecology and Systems Analysis

- Collaboration between three chair groups:

- *Using concepts of systems analysis, we analyse and design sustainable production systems for crops, livestock and their interactions, with focus on resource use efficiency and equitable management of natural resources.*
Undergraduate teaching

**BSc Plant Science, Animal Science**

**MSc Plant Science, Animal Science, Organic Agriculture**

1. Systems analysis and modelling
   - Basic concepts (rate and state variables) and techniques (relational diagrams; integration)
   - Dynamic simulation modelling (e.g. WOFOST, FARMSIM)
   - Optimization modelling (e.g. FarmDESIGN)
   - Agent-based modelling
   - Programming skills

2. Disciplinary building blocks for farming systems analysis
   e.g.: Advanced Agronomy, Systems approaches in Animal Science

3. Interdisciplinary approaches for current farming system challenges
   e.g.: Global Food Security, Climate-Smart Agriculture, Analyzing Sustainability of Farming Systems, Functional Agricultural Resource Management, Analysis and Design of Organic Farming Systems
Postgraduate teaching

Six graduate schools
T-shaped skills

Broad range of courses, e.g.

- Art of Modelling
- Climate-Smart Agriculture
- Resilience of living systems
- Farming Systems and Rural Livelihoods (field course)
Postgraduate teaching

- Farming Systems and Rural Livelihoods (field course)

**DEED cycle as organizing principle and approach for co-learning and co-design**
- Resource flow mapping, village transects and maps, focus group discussions
- Farm descriptions, household questionnaires
- Typologies of fields and farms
- Descriptive and multivariate statistics
- Simple simulation models at field and farm scale
- Network analysis, nutrient flows and balances
- Multi-criteria analysis, trade-off analysis
Graduate school research theme on Re-design of (agro-)ecological systems

- Resource use efficiency
- Scaling across hierarchical levels
- Emergent properties
- Resilience

Van Zanten et al., 2019
Dalgaard et al., 2003
Corral, 2011
www.surefarmproject.eu
Postgraduate teaching

- New engineering doctorate

Design for Agrifood and Ecological Systems

Wageningen University’s new Engineering Doctorate degree
MOOCs

**MOOC Sustainable Food Security: Crop Production**

**Starts on:**
Self-paced

**Duration:**
6 weeks, 6-8 hours

**Language of instruction:**
English

How to feed the world without depleting our planet’s reserves? As part of the XSeries Sustainable Food Security learn about the availability pillar of production.

**MOOC Sustainable Food Security: The value of systems thinking**

**Starts on:**
Self-paced

**Duration:**
6 weeks, 8-10 hours per week

**Language of instruction:**
English

As part of the XSeries Sustainable Food Security, learn how to apply systems thinking to improve the environmental sustainability of food production systems.
Education for professionals

- Agriculture, Horticulture and Animals
- Biotechnology and Chemistry
- Food Systems and Sustainable Business
- Data Science, AI and Robotics
- Environment and Climate
- Food, Nutrition and Health
Thank you for your attention

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