Training experiences on methods to design and support changes on livestock farms

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Montpellier SupAgro
Post-graduate education

100 teachers
1,200 students (250 post-graduates / year)
180 PhD
Master of Science of Montpellier SupAgro
Agriculture and Agri-Food Sciences (9 tracks)

Track « Livestock Systems Management »
Track « Tropical Agrarian Systems and Development Management »

Supports of European Erasmus Mundus Master
Sustainable Development in Agriculture » (Agris Mundus)

PhD
Doctoral School (with University of Montpellier and AgroParisTech)

Erasmus Mundus joint doctorate program
« Agricultural Transformation by Innovation » (AgTrain)

Consortium of European universities (Agris Mundus and AgTrain) :
Montpellier, Wagenigen, Copenhagen, Corlk, Madrid, Catania
Research and training group

Tropical and mediterranean livestock farming systems

Three main research topics:

- Adaptives capacities of animals and resources
- Alternative management of livestock farms for sustainable development
- Dynamics of livestock farms in local development and value chains

Training experiences on methods to design and support changes on livestock farms

Part 1
Theoretical and methodological choices for researches on design and support of changes on farms

Part 2
Experiences of building training situations to improve students competencies on design and support of changes on farms
Training experiences on methods to design and support changes on livestock farms

Part 1
Theoretical and methodological choices for researches on design and support of changes on farms

Part 2
Experiences of building training situations to improve students' competencies on design and support of changes on farms

Theoretical framework on changes and decisions (1)

Technical or organizational changes = Strategic decision for farmers

- determining the farm operation for the next years (mid-term decision)
- not to be changed each year or each season (≠ tactical adjustments)
The hypothesis of limited rationality

The choices of the farmer are rational. They are linked with his objectives and his perception of opportunities and constraints of his environment.

The farmer don’t know all the possibilities of changes and the impacts of each change on the technical and economic results of his activity.

The farmer could have several aims for his husbandry activity and it is not always possible to define only one objective-function to be maximized in order to choose the optimum change.

Theoretical framework on changes and decisions (2)

Theoretical framework on changes and decisions (3)

Decision making is a cyclic process

- Tools for diagnosis (problem finding)
- Tools for designing solutions (problem solving)
- Tools for choosing the best solution, according to the situation of the farmer and the available information
Methodological choices (1)

Use of simulation model

- to explore new scenarios integrating changes and
- to discuss outputs of the simulations with farmers and advisors of extension services

Farm depiction
Building Initial Scenario
Diagnosis of the current situation

Simulating, assessing and discussing
Alternative Scenario

Conclusion of the support session

(adapted from Le Gal et al., 2013)

Methodological choices (2)

Two situations of supporting farmers thinking using simulation models

Individual advisory

Milk production development for smallholders, specialized in dairy cattle production or within mixed farming systems (Morocco, Brazil, Peru, Madagascar)

Collective approach, with groups of farmers and advisors of extension services

Adaptation of feed system for pastoral sheep farms facing climate change (South of France)

Integration of one milking per day (instead of twice) for dairy ewe farms to solve work problems (South of France)

Collective approach : based on exchanges of knowledge between farmers to enhance creativity
Choice of models for building simulation tool (1)

A livestock farming system viewed as two linked sub-systems

Choice of models for building simulation tool (2)

Dynamic whole-farm decisional model

- Biophysical environment (climate, soils, ...)
- Socio-economic environment (prices, policies, ...)
- Quantity of goods and services purchased
- Objectives of the farmer
- Rules for decision making

Input data

Model

Output data

Dairy cattle farm (Vayssières et al., 2009)
Beef cattle farm (Martin et al., 2010)
Dairy goat farm (Puillet et al., 2010)
Dairy cattle, pig and crop farm (Chardon et al. 2012)
**Choice of models for building simulation tool (3)**

**Limits of whole-farm decisional model**

- High number of input data needed
- Representation of decision making = difficulty for the elicitation of the rules / lack of generocity
- Interpretation of outputs not easy to understand (intermediate outputs needed)

**Model for researchs**

Difficulties to implement simulation tools from those models for use with farmers

**Choice of models for building simulation tool (4)**

**Dynamic decisional model** → **Static biotechnical model**

- Biophysical environment
- Socio-economic environment
- Practices

Practices are decided by the user of the model (and not by the model, according to the objectives and the rules put in and the evolution of the environment)
Choice of models for building simulation tool (5)

- Simple static model
- Implemented with spreadsheet
- Determinist
- Representing seasonal operations for a year production cycle
- Dedicated to one purpose

CLIFS simulation model to support strategic thinking of dairy cattle farmers
(Le Gal and al., 2012 and 2013)

Management of hay and silage stocks for mountain dairy cattle farms facing climate hazards
(Lurette and al., 2013)

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Part 1
Theoretical and methodological choices for researches on design and support of changes on farms

Part 2
Experiences of building training situations to improve students competencies on design and support of changes on farms
Competencies needed to develop support process with farmers

Modeling
• To design a conceptual model according to the questions negotiated with stakeholders
• To implement the model in a computerized simulation tool

Supporting
• To collect data by surveys and literature review to build initial scenarios
• To imagine changes to build alternative scenarios (review, surveys)
• To use the simulation tool to simulate scenarios
• To interpret the outputs of simulated scenarios (based on biotechnical knowledge and modeling assumptions)
• To assess the scenarios from the outputs for various dimensions
• To present scenarios and assessment results
• To organize a work session with a farmer (or a group) in order to discuss the scenarios and achieve assessment from the farmers' points of view

Training situation to develop competencies

Student works for several months or years
   Master Thesis : 6 months
   PhD : 3 years

Courses in academic training at master level
   (2 to 4 weeks)
### PhD and Master Thesis situation

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- **Design of conceptual model and implementation of a first version of a simulation tool**
  - *(Master thesis)*

- **Adaptation of the simulation tool and test of the support process with 3 to 10 farmers (CLIFS) or 3 groups (Pastoral rummy)**
  - *(PhD and Master thesis)*

### Master courses situations

**Constraints**
- Short time for one course: from 2 weeks, 50 hours to maximum of 4 weeks, 100 h
- Number of students (from 15 to 30 students)
- Organization of partnerships and work on field for a group of students

**Choice of the competencies to be developed**

**Two possibilities**
- Field work with farmers and advisors
- Case studies in class room
Developing modeling competencies and use of simulation to explore scenario *(class room activity)*

12 hours / 10 students

*Development of a demographic simulation tool to explore off-take strategies for dams in sheep flocks in Senegal*

Lecture on modeling principles (3h)

Session 1 (3h)
- Presentation of the situation and questions
- Design of a conceptual model (personal work and collective debriefing)

Session 2 (3h + personal work)
- Implementation with a spreadsheet

Session 3 (3h + personal work)
- Use of the tool to address two questions
- Presentation of results (written report)

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Developing modeling competencies to explore scenario *(class room activity)*

**Modeling**

- To design a conceptual model
- To implement the model in a computerized simulation tool

**Supporting**

- To collect data to build initial scenarios
- To imagine changes to build alternative scenarios
- To use the tool to simulate scenarios
- To interpret the outputs of simulated scenarios (based on biotechnical knowledge and modeling assumptions)
- To assess the scenarios from the outputs for various dimensions
- To present scenarios and assessment results
- To organize a work session with a group to discuss the scenarios
### Developing supporting competencies using an existing simulation tool (*field work and class room activities*)

30 hours / 35 students

**Field work integrated in a on-going research program**

*Assessment of the impact of a one milking per day practise in dairy ewes farms and linked adaptations (milking period length, grazing, number of ewes, cropping patterns)*

1. Presentation of context and objectives (2h)
2. Surveys on two farms participating to a farm monitoring network (advisory services and Livestock Institute) (8 h)
3. Sessions for simulation (initial scenario and alternative scenarios) and preparation of presentation of the results (12h)
4. Meeting with the two farmers and advisors (8 h)

### Developing supporting competencies using an existing simulation tool (*field work and class room activities*)

**Modeling**

- To design a conceptual model
- To implement the model in a computerized simulation tool

**Supporting**

- To collect data to build initial scenarios
- To imagine changes to build alternative scenarios
- To use the tool to simulate scenarios (DIFFICULTY)
- To interpret the outputs of simulated scenarios (based on biotechnical knowledge and modeling assumptions)
- To assess the scenarios from the outputs for various dimensions
- To present scenarios and assessment results
- To organize a work session with a group to discuss the scenarios
Using an existing simulation tool to develop exploration of scenarios of changes *(class room activities)*

9 hours / 10 students

**Use of a tool developed for a past research program**

*Exploring management strategies for forage stocks to improve robustness of dairy cattle farms coping with climatic hazard at the limit between temperate and mediterranean climate*

1. Design of conceptual model and presentation of simulation tool (3h)
2. Exploring alternative scenarios based on an initial scenario already implemented (3 h + extra-work)
3. Oral presentation and discussion of the alternatives between students, teachers and researchers (3h)

Using an existing simulation tool to develop exploration of scenarios of changes *(class room activities)*

**Modeling**

- To design a conceptual model
- To implement the model in a computerized simulation tool

**Supporting**

- To collect data to build initial scenarios
- To imagine changes to build alternative scenarios
- To use the tool to simulate scenarios
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- To assess the scenarios from the outputs for various dimensions
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- To organize a work session with a group to discuss the scenarios
Conclusion (1)

Think the competencies portofolio of students along the track, with progression along mandatory courses

*Livestok System Management for tropical and mediterranean areas.*

- Course 1 : Methods for Livestock Farming Systems and Animal Product value chain diagnosis (2 weeks) *(classroom activities, with lectures and cases studies)*

- Course 2 : regional analysis of the livestock sector (2 weeks) *(field activities, with surveys and organization of a final meeting)*

- Course 5 : Modeling livestock farming system (1 week) *(class room activities)*

Conclusion (2)

To develop students competences : they have to act during the training activities, coping with the reality of the field, by :

- Direct confrontation with farmers and advisors (field activities)
- Work on well-documented case studies, in class room

Implications for the teacher

- To maintain partnerships with farmers and advisors in order to build field training activity with reciproc interests
- To develop case studies from field research work
- To participate to modeling activities and have good knowledge of the simulation tool used for training situations