Ecole Nationale Supérieure Agronomique (ENSA-Ex INA)

Laboratoire d'Amélioration Intégrative des Productions végétales (AIPV)

International research project ARIMNET2-SEMIARID (ENSA-Algiers): Sustainable and **E**fficient **M**editerranean farming systems: Improving **A**griculture **R**esilience through **I**rrigation and **D**iversification

An International training course for PhD students and young researchers: Integrated impact assessment and designing of Mediterranean agricultural systems in Dry Regions

Centre de Recherche en Economie Appliquée pour le Développement

CREAD-ALGIERS, ALGERIA

27-29 OCTOBER, 2019

Scientific Committee

Honorary President: Pr. Belarbi Yacine (CREAD director)

Days President and Chair person: Pr. Belhouchette Hatem (UMR SYSTEM, CIHEAM-IAMM, Montpellier)

President of scientific committee: Dr. Latati Mourad (National coordinator of SEMIARID project: ENSA-Algiers)

Pr. Wery, Jacques (DDG-R ICARDA- Egypt)

Pr. Yigezu,AtnafeYigezu (ICARDA, JORDANY)

Dr. Hossard, Laure (UMR Innovation, INRA Montpellier)

Dr. Marrou, Hélène (UMR SYSTEM, Montpellier SupAgro)

Dr. Laouar, Meriem (ENSA-Algiers)

Dr. Chenoune, Roza (CIHEAM-IAMM, Montpellier)

Dr. Bouzid Amel (CREAD-Algiers)

Dr. Boudedja Karima (CREAD-Algiers)

Dr. Benmihoub Ahmed (CREAD-Algiers)

Organization committee

Dr. Boudedja Karima (CREAD-Algiers)

Dr. Latati Mourad (ENSA-Algiers)

Dr. Tellah Sihem (ENSA-Algiers)

Mme. Amirouche Safia (ENSA-Algiers)

Dr. Benslimane Hamida (ENSA-Algiers)

Dr. Bouras Fatima zohra (ENSA-Algiers)

Dr. Haddad Benalia (ENSA-Algiers)

An International training course for PhD students and young researchers: Integrated impact assessment and designing of Mediterranean agricultural systems in Dry Regions.

CREAD- Algiers, Algeria

27-29 October, 2019.

Context: This nternational training course follows several doctoral programs organised within SemiArid (ERANET ArimNet, 2017-2020) project, SEAMLESS project (FP6, 2005-2010), the global FSD network (Farming System Design), and then more recently as part of the SemiArid project[1], which have trained more than a hundred international doctoral students.

These courses aimed to prepare young scientists for the analysis and assessment, based on several case studies, of the sustainability of farming systems thanks to integrated approaches. In its applications it will emphasize the role of diversities (intra-field, intra-farm and across-farms) in the efficiency and sustainability/resilience of agricultural systems. It therefore falls within several national and international priorities programme of most dryland countries: « Feeding » and « Protecting ».

Participants: This training course aims for the participation of <u>**25-30 doctoral or post-doctoral students and young researchers**</u> of different nationalities, mostly from northern and southern Mediterranean countries, whose research studies deal with Ag. Sys. assessment and modelling, within a context characterised by harsh and uncertain climatic conditions and limited resource access (water, land, labour, etc.).

This course will be conjointly organized by the: ENSA-Algiers (represented by the Laboratory of Integrative Improvement of Plant Production: AIPV), CREAD-Algiers, CIHEAM-IAMM, INRA-France, and **an international research centre of the CGIAR** (ICARDA), which contributes through staff-time and direct support to trainees.

Objectives and innovation: The training course seeks to prepare for methodologies of systemic analysis that make it possible to integrate different levels (plot, farm, region) into the design and multi-criteria assessment of sustainable/resilient farming systems taking into account diversities at multiple scales.

This course specifically aims to:

1-   Simulate and discuss the production and performance of different ecosystem services (e.g., food production, land management, water resources…), and their trade-offs, with the help of biophysical modelling, using diversified cropping systems in terms of crops grown, rotations, crop combinations (including different annual and perennial crops and their spatial layout), in relation to resource management (water, nitrogen…). The CropSyst model will be

---

[1] SemiArid project (Sustainable and Efficient Mediterranean farming systems: Improving Agriculture Resilience through Irrigation and Diversification) it's an ERA-Net project with the participation of CIHREAM-IAMM as project coordinator, INRA-France, IAV-Hassan II Morocco, ENSA-Algiers, INRA-Morocco, and Montpellier SupAgro-France.

used during the course, with an emphasis on simple models compatible with the data that participants may easily access.

2- Simulate and discuss the integration and adoption of cropping systems that encourage diversity, using bioeconomic modelling (e.g. See ModelEco platform: https://www.supagro.fr/wordpress/modeleco/) and typologies for up and down-scaling (Hammouda et al., 2018), taking into account the expectations of the different stakeholders of the areas and sectors concerned.

Organization: The training course will include two phases:

1. An initial period of distance learning (equivalent to 10 hours) for the core modules, using the teaching materials developed within the FSD, EMSACS and ModelEco projects (2015-2018, funded by the Labex Agro).

2. The second stage will take place on-site (over a period of 3 days) at CREAD-Algiers **in Algeria**. It will offer in-depth lectures and practical exercises, which will encourage the use of conceptual and digital modelling. Moreover, it will give the opportunity for participants to discuss different options targeting the promotion of options for enhancing Ag. Sys systems sustainability and resilience to face climate change and market uncertainty.

Important dates:

1. October 2, 2019: course announcement for receiving cv and motivation letter
2. October 15, 2019: closing candidature.
3. October 20, 2019 for the initial e-learning stage
4. October27-29, 2019 for the on-site training stage in Algeria

Accommodation and fees:

- Registration fees are for free.
- The participants should take in charge their trip and accommodation.
- Lunches and coffee breaks for the 3 days of the training course will be offered for participants by the organisation.

Registration procedure:

- Send your CV and motivation letter before October 15, 2019
- Contact for registration and information: Hatem Belhouchette, Belhouchette@iamm.fr and Mourad Latati: m.latati@yahoo.com

Training course programme

Day 1: Conceptual and scenario-based analysis of the role of diversities in the resilience of agricultural systems.

Trainers: L. Hossard, J. Wery, M. Laouar

This session will be organized in three parts;

1. Conceptualization of an issue into an agricultural system.

As a follow up of the pre-course on-line work the methodology of conceptual modelling of agricultural systems will be presented and discussed, to be further implemented in part 3.

2. Scenario-based analysis of innovation into an agricultural system.After a rapid overview of the various concepts of scenario analysis in agriculture a method adapted to the design and assessment of innovative cropping systems in a changing environment will be presented, illustrated with examples and discussed. Its use in a participatory manner with stakeholder will be discussed from previous projects.

3. Where and how diversities can bring efficiency and resilience into the system.This part will be addressed in group work applying the methods learnt in part 1 and 2 to a specific case study on diversification of Mediterranean cropping systems. Diversification at field level refers to the type of cultivar, crop, rotation, combination, or crop management to promote. At farm level, it refers to the access to resources (water, land, market) but also to the allocation of resources according to the production goal and to resource availability. Legumes (food and feed) in wheat-based systems will be used as an example. Each group will go through the following steps: i) represent the system to be analyzed, ii) identify the actors concerned and for what role, iii) identify the indicators of resilience/sustainability in relation to the objective of the study, iv) use the framework to assess the performance of these systems qualitatively, v) provide the actors involved some answers based on the results obtained (in the form of advice for strategic choices for example). Groups will report in a final plenary session the methodological implications for further implementation of the scenarios in numerical modelling and in a participatory approach.

Day 2: Modelling and analysis of the resilience of cropping systems; contribution of diversities.

Trainers : H. Marrou (for online course), M. Latati and H. Belhouchette (for onsite course)

This session will be conducted in two stages:

1. A correspondence course starting on September 5th using the EMSACS on line Course (E-modules 1.1 and 1.4). This course mainly deals with four modules: the use of crop models in agriculture, an introduction to agrosystem modelling, and how to use data and statistics to parameterize, assess and use a model.
2. The classroom-based course will be composed of two parts :

2.1 How complex should my model be? A lecture will cover the complexity involved in choosing a model according to the structure of the system to be modelled, of the objective of the simulation and of data availability. The lecture will be followed by a practical class reviewing different modeling approaches and exploring the relationship between model complexity, model equation, and model processes, and model error.

2.2 Modelling diversified cropping systems: each work group (duos) will have to use the CropSyst model to simulate various wheat based cropping systems (with or without legumes, several climatic years, with or with little irrigation water, etc.). The challenge here is to answer important questions (to be identified and presented beforehand) concerning production, and the resilience of the different ecosystem services (e.g. food production, reduction of N leaching, and water use efficiency.) in a semi-arid context.

Day 3- Morning: Analysis of the resilience of farms in arid areas: methodological issues and examples of application.

Trainers: Y. Yegezu, R. Chenoune, M. Latati, H. Belhouchette

This course will consist of two parts:

1. **A correspondence course starting on September 5th using ModelEco course** (https://www.supagro.fr/wordpress/modeleco/). This course concerns two modules: the self-study of mathematical programming and the use of bio-economic modelling in order to analyze the resilience of Mediterranean production systems. Several concrete examples of modelling and formulation will be presented on this course.

2. **The classroom-based course on the assessment of the Mediterranean production systems resilience:** A Sétif case study (France, Morocco, and Algeria) will be presented and discussed. The discussion will focus on the i) structure of the current production systems and the expectations of local stakeholders regarding standard ecosystem services: food production, preservation of water resources, reducing production risks, ii) modelling approaches used: selection of typical farms, development of various databases, selection of farm household model, selection of indicators, selection of agricultural activity, and iii) simulation results to see how extend it make it possible to meet the expectations of stakeholders.

Day 3- After-noon: Course evaluation

Trainers: all.

This evaluation includes participant feedbacks on the potential use/misuse, advantages and limits of models (crop models, bio-economic models) and participatory scenarios for agricultural development, including e.g., recommendations for farmers, decision support for farmers/advisers/policy makers, etc.   .

List of trainers.

Name	Staff category, discipline	Affiliation
Wery, Jacques	Professor, Agronomy	DDG-R ICARDA- Egypt.
Yigezu,AtnafeYigezu	Senior Agricultural Economist	ICARDA-Jordan.
Hossard, Laure	Researcher, Agronomy	UMR Innovation, INRA France

Marrou, Hélène	Assistant professor, Agronomy	UMR SYSTEM, Montpellier SupAgro
Latati, Mourad	Assistant professor, Agronomy	ENSA-Alger
Laouar, Meriem	Assistant professor, Agronomy	ENSA-Alger
Chenoune, Roza	Post-doc, Agronomy	CIHEAM-IAMM
Belhouchette, Hatem	Sc. Administrator, Agronomy	UMR SYSTEM, CIHEAM-IAMM, France