Sustainable Agriculture

Organized by

Mediterranean Agronomic Institute of Chania

MAI coordinator: Dr. Ioannis LIVIERATOS

Aims: Increasing concern over environmental, biodiversity and food safety issues in the Mediterranean area, have formed the basis for a Masters of Science (M.Sc.) degree. Sustainable Agriculture promotes the principles of a viable agro-ecosystem with natural living systems that operate compatibly through responsible management of abiotic and biotic resources and it is particularly sensitive to environmental pollution and waste. The postgraduate program enables the graduates to understand the theoretical background of sustainable agriculture and familiarize with integrated crop management and organic farming applications, capabilities and limitations. M.Sc. graduates constitute suitable employees in farmer advice/extension, teaching, research institutions, government and international agencies, management companies, aid programs, local authorities and as consultants in the private sector. Other graduates carry on pursuing further research for a PhD degree.

Objectives:

- To conjugate environmentally friendly scientific advances, trends and applications in agriculture with critical thinking and research hypothesis formulation ability;
- To provide the tools to measure the impact as well as manage the biotic and abiotic production inputs to farming systems;
- To introduce the frame of the legal requirements and the methodological approach to certification systems of environmentally friendly, sustainable and safe agrofood production;
- To analytically present modern and environmentally friendly crop protection approaches in both integrated pest management and organic farming systems;
- To provide a thorough insight into modern and environmentally sound recycled hydroponics greenhouse production methods.

Part 1
Post graduate specialization programme

Weeks	TITLE	WEIGHT	DATES
	SEMESTER I		
	SAG520.11512.0 Introduction to Sustainability - 15 ECTS		
1	SAG524.1410.1 AGRO-ECOSYSTEMS AND POPULATION DYNAMICS	4	01-05/10/2012
2	**EXAMS**		08-12/10/2012
3	SAG522.2412.3 AGRO-ENVIRONMENTAL IMPACT ASSESSMENT & FARM MANAGEMENT	4	15-19/10/2012
4	**EXAMS**		22-26/10/2012
5	SAG525.14012.1 ECOTOXICOLOGY	4	29/10-2/11/2012
6	**EXAMS**		5-9/11/2012
7	SAG523.1304.1 QUALITY ASSURANCE & GOOD AGRICULTURE PRACTICES	3	12-16/11/2012
8	**EXAMS**		19-23/11/2012
9	**EXAMS**		26-30/11/2012
	SAG530.1712.0 Natural Resources Management - 7 ECTS		
10	SAG531.2412.13 SOIL PROPERTIES & QUALITY ASSESSMENT (60%) AND COMPOSTING TECHNOLOGY (40%)	4	3-7/12/2012
11	**EXAMS**		10-14/12/2012
12	SAG532.1304.1 NUTRIENT MANAGEMENT AND SOIL FERTILITY IMPROVEMENT	3	17-21/12/2012
13	***EXAM PREPARATION***		*24-28/12/2012*
14	***EXAM PREPARATION***		*31/12-4/1/2013*
15	**EXAMS**		7-11/1/2013
	SAG540.1810.0 Assessment of Genetic Resources - 8 ECTS		
16	SAG541.2410.23 SEED PRODUCTION AND QUALITY MANAGEMENT (60%) / PLANT BREEDING (40%)	4	14-18/1/2013
17	**EXAMS**		21-25/1/2013
18	SAG543.1410.3 AGRO-BIODIVERSITY ASSESSMENT AND MANAGEMENT	4	28/1-1/2/2013
19	**EXAMS**		4-8/2/2013
	SEMESTER II		
	SAG550.11510.0 Crop Protection - 15 ECTS		
20	SAG552.2412.23 IPM/ FUNGAL & BACTERIAL DISEASE MANAGEMENT	4	11-15/2/2013
21	**EXAMS**		18-22/2/2013
22	SAG553.2410.12 DETECTION AND EPIDEMIOLOGY OF PLANT VIRUS DISEASES	4	25/2-1/3/2013
23	**EXAMS**		4-8/3/2013
24	SAG554.1410.23 INSECT MANAGEMENT	4	11-15/3/2013
25	**EXAMS**		18-22/3/2013
26	SAG555,2312.2 WEED MANAGEMENT	3	25-29/3/2013
27	**EXAMS**		1-5/4/2013
	SAG560.1812.0 Greenhouse Management - 8 ECTS		
28	SAG562.1410.1 GREENHOUSE TECHNOLOGIES AND CLIMATE CONTROL	4	8-12/4/2013
29	***EXAMS***		15-19/4/2013
30	SAG563.1410.1 SOILLESS CULTIVATION	4	22-26/4/2013
31	***EXAM PREPARATION***		29/4-3/5/2013
32	***EXAM PREPARATION***		6-10/5/2013
33	**RETAKE EXAMS**		13-17/5/2013
	SAG510.1410.0 Biometrics - 4 ECTS		
34	SAG511.1410.1 CROP EXPERIMENTATION	4	20-24/5/2013
35	**EXAMS**		27-31/5/2013
36	SAG572.1312.1 INNOVATION AND COMMUNICATION IN SUSTAINABLE FARMING	3	3-7/6/2013
37	**EXAMS**		10-14/6/2013

EDUCATIONAL SEQUENCE

The programme is organized in 7 Units (60 ECTS)

SEMESTER I

SAG520.11512.0
01 October to
30 November '12

INTRODUCTION TO SUSTAINABILITY (15 ECTS)

Content:

Agroecosystems and Population Dynamics.
Agro-Environmental Impact Assessment and Farm Management.
Ecotoxicology.
Quality Assurance & Good Agriculture Practices.

Learning outcomes:

a) to be able to differentiate the distinct components of an agroecosystem, b) to reason on the need for sustainable agriculture nowadays, c) to develop the tools for the assessment of the environmental impact of external inputs in agriculture, d) to familiarize with good agricultural practices, the pertinent legislation and the particular topics on quality assurance.

SAG530.1712.0
03 December '12 to
11 January '13

NATURAL RESOURCES MANAGEMENT (7 ECTS)

Content:

Soil Properties and Quality Assessment and Composting Technology.
Nutrient Management and Soil Fertility Improvement.

***Learning outcomes*:**

a) comprehension of soil properties and characteristics of soil quality, b) understanding of soil degradation and ability to manage nutrient flows on farm level, c) an introduction on processing methodologies of agricultural and agro-industrial urban wastes, d) to develop a primary ability of design a composting site.

SAG540.1810.0
14 January to
08 February '13

ASSESSMENT OF GENETIC RESOURCES (8 ECTS)

Content:

Seed Production and Quality Management / Plant Breeding.
Agro-Biodiversity Assessment and Management.

***Learning outcomes*:**

a) assessing and understanding agro-biodiversity, its components and complexity, b) ability to place agro-biodiversity in its multidisciplinary role within the framework of sustainable agriculture, c) to familiarize with the improvement of seed quality by priming and sorting (ways on how to address seed quality), d) varieties identification by conventional and novel DNA techniques, e) comprehension of the development of usable genetic variation (breeding) by classical and biotechnological approaches.

SEMESTER II

SAG550.11510.0
11 February to
05 April '13

CROP PROTECTION (15 ECTS)

Content:
IPM / Fungal and Bacterial Disease Management.
Detection and Epidemiology of Plant Virus Diseases.
Insect Management.
Weed Management.
***Learning outcomes*:**
a) understanding of various basic concepts such as bio-interactions of various pests and hosts, disease development, economic threshold, prediction modelling, disease resistance, b) crop protection using ways alternative to chemical control, c) to familiarize with modern pathogen detection techniques, d) the main approaches to develop resistance, e) to understand and critically comment on potential direct and indirect impacts of transgenic crops on the environment and risk assessment tools.

SAG560.1812.0
08 April to
17 May '13

GREENHOUSE MANAGEMENT (12 ECTS)

Content:
Greenhouse Technologies & Climate Control.
Soilless Cultivation.
Learning outcomes:
a) greenhouse structures and climate control, energy saving technologies for sustainable agriculture, b) a thorough theoretical and practical exposure to hydroponics, c) ability to manage water efficiently.

SAG510.1410.0
20 May to
31 May '13

BIOMETRICS (4 ECTS)

Content:
Crop experimentation.
Learning outcomes:
a) to understand the role of biometry in advanced agronomic level, b) to gain basic statistics concepts (randomness, probability, sampling distribution, statistical inferences in the form of confidence interval and hypothesis testing), c) to understand of the inference in simple linear regression, d) be able to design field experiments and investigate genotype environment interactions for primary economic plant attributes (yield and quality).

SAG572.1312.1
03 June to
14 June '13

INNOVATION AND COMMUNICATION IN SUSTAINABLE FARMING (3 ECTS)

Learning Outcomes

a) Understanding the innovation adoption/diffusion processes, b) Understanding the communication processes involved in innovation diffusion, c) Familiarity with several problems occurring in the field of innovation and communication, d) Familiarity with communication methods and techniques, e) Familiarity with participatory methods and tools and new extension roles (facilitation and brokerage), f) Competency in drafting an extension programme related to the introduction of sustainable/organic farming in a farming/rural area and in evaluating an extension programme.

(EXAMINATIONS

Participants are obliged to take an examination in order to obtain **an individual grade** in the following arrangement: For every one or two week(s) of course delivery the given examination period is one week.

All units are subject to examination.

Examinations may take the form of written exams (problems, set of questions, exercises, multiple choice questions), individual or team work project, computer assisted exams or any combination of the above forms.

Retake examination is allowed for a maximum of three weeks course delivery of any unit except for the final unit.

Language of instruction: ENGLISH

Detailed additional information (ECTS guide) and in particular an analytical syllabus is available at www.maich.gr/sust/

Part 2
The Master of science program

Project (9 months duration, 60 ECTS)

Independently of the thesis thematic area, students acquire standard common competencies such as literature reviewing, hypothesis formulation and experimental design, sampling and collection of data, statistical analysis of acquired measurements (where necessary), scientific writing and critical interpretation of results. Linked to the thematic area of their research work, students gain specific competencies that might fall in different groups:

a) soil and leaves lab analytical methods (e.g. spectrophotometer, Khendal, ICP, etc.);
b) sugars and antioxidants measurements in fruits, chlorophyll and carotenoids analysis in leaves (e.g. HPLC etc.);
c) operation of fully automated hydroponics fertilization and irrigation system;
d) evaluation of photosynthetic and evapotranspiration status of plants (LI-COR 6400 system);
e) molecular biology techniques (RT-PCR, agroinfiltration, nucleic acids and proteins hybridizations, fluorescence microscopy etc.).

Research activities: topics generally available for Master of Science theses

- Compost evaluation as a substrate in hydroponic systems with simultaneous application of additional variables such as CO_2, salinity etc;
- Study of Mediterranean insect pests activity and their bio-ecological characteristics;
- Host-virus interactions essential for virus replication or plant resistance;
- Nutrient and energy budget analysis for integrated crop management and organic farming systems;
- Selected research topics on organic farming, integrated crop management.

INDICATIVE MASTER THESES REALIZED WITHIN THE AREA

1. **Title:** Glyphosate resistance of Conyza spp. plants
   Author: Nevena Nol, Serbia
   Place of Realization: Mediterranean Agronomic Institute of Chania, Crete, Greece
   Thesis director: C.N Giannopolitis, I. Livieratos

2. **Title:** Bacterial expression and purification of three plant viral proteins for antiserum production
   Author: Magdalena Shegani, FYROM
   Place of Realization: Mediterranean Agronomic Institute of Chania, Crete, Greece
   Thesis director: Dr. Ioannis Livieratos

3. **Title:** Towards a molecular characterization of glyphosate resistance in Conyza canadensis (Horseweed)
   Author: Mohamed Abdel Salam Mohamed Eid, Egypt
   Place of Realization: Mediterranean Agronomic Institute of Chania, Crete, Greece
   Thesis director: Dr. Ioannis Livieratos

4. **Title:** Olive fly activity in an organic table olive orchard in southern Crete
   Author: Adamantia Kokkinaki, Greece
   Place of Realization: Mediterranean Agronomic Institute of Chania, Crete, Greece
   Thesis director: Dr. Emmanouil Kabourakis

ACADEMIC STAFF TEACHING WITHIN THE M.SC. PROGRAM

The academic visiting faculty of the “Title of the MSc programme” is compounded by highly qualified professors from internationally renowned universities who are considered leaders in their fields. The scientific faculty of MAICh selects and invites them on the basis of specialisation to the subject matter, their international reputation and experience in teaching and research, as recognised by the academic community. MAICh is committed to the constant reviewing of the visiting faculty by the students on a yearly basis, in order to ensure the high quality of the teaching program and a dynamic adaptation to new scientific developments. Additionally, the academic visiting faculty collaborates in the formulation of research and development projects, exchange of ideas and expertise for recent advances in science and encouragement for active participation in student’s MSc thesis research projects through consultation and/ or assignment of official supervising duties. Outstanding MSc MAICh graduates are subsequently recruited into their reputable PhD programs on a full scholarship basis. A considerable number of former MAICh graduates are now active and successful members of the international academic community.