

Sustainable Agriculture

Organized by

Mediterranean Agronomic Institute of Chania

Sustainable Agriculture

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

The programme is organized in 7 Units (60 ECTS)

SAG510.1410.0
03-14 Oct.'11

BIOMETRICS (4 ECTS)

Contents:

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).

SAG520.11010.0
17 Oct. to 25
Nov.' 11

INTRODUCTION TO SUSTAINABILITY (10 ECTS)

Contents:

Agroecosystems and Population Dynamics.

Ecotoxicology.

Agro-Environmental Impact Assessment and Farm Management.

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.

SAG530.1810.0
28 Nov.'11 to 06
January'12

NATURAL RESOURCES MANAGEMENT (8 ECTS)

Contents:

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
09 Jan.' to 03
Feb.'12

ASSESSMENT OF GENETIC RESOURCES (8 ECTS)

Contents:

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.

SAG550.11510.0
06 Feb. to 30
March'12

CROP PROTECTION (15 ECTS)

Contents:

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.

SAG560.11210.0
02 April to 25
May'12

GREENHOUSE MANAGEMENT (12 ECTS)

Contents:

Crop Modelling & Bioclimatology.
Greenhouse Technologies & Climate Control.
Soilless Cultivation.

Learning outcomes:

- a) to be acquaint with energy balance notions and responses of plants to environmental factors,
- b) to initiate crop modelling and its uses (i.e. early warning),
- c) greenhouse structures and climate control, energy saving technologies for sustainable agriculture,
- d) a thorough theoretical and practical exposure to hydroponics,
- e) ability to manage water efficiently.

SAG580.1310.0
02 April to 25
May'12

QUALITY ASSURANCE AND GOOD AGRICULTURAL PRODUCTS (3 ECTS)

Contents:

Quality Assurance and Good Agriculture Practices

Learning outcomes:

- a) to familiarize with good agricultural practices, the pertinent legislation and the particular topics on quality assurance.
- b) being able to research and understand international and EU legislation concerning agricultural products.
- c) being familiar with basic legal, statutory and commercial requirements for agricultural products.

- d) understanding basic concepts regarding food safety.
- e) understanding of the certification and accreditation scheme for agricultural products.
- f) ability to interpret and evaluate results of water and agricultural product chemical and microbiological analyses.

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 (**9 ECTS**) of any unit except for the final unit.

Language of instruction: ENGLISH

ACADEMIC STAFF

The academic visiting faculty of the Sustainable Agriculture 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.

Weeks	TITLE	WEIGHT	DATES
	SAG510.1410.0 Biometrics - 4 ECTS		03/10-14/10/2011
1	SAG511.1410.1 CROP EXPERIMENTATION	4	03-07/10/2011
2	EXAMS		10-14/10/2011
	SAG520.11010.0 Introduction to Sustainability - 10 ECTS		17/10-25/11/2011
3	SAG524.1410.1 AGRO-ECOSYSTEMS AND POPULATION DYNAMICS	4	17-21/10/2011
4	EXAMS		24-28/10/2011
5	SAG525.1305.1 ECOTOXICOLOGY	3	31/10-04/11/2011
6	EXAMS		07-11/11/2011
7	SAG522.2306.3 AGRO-ENVIRONMENTAL IMPACT ASSESSMENT & FARM MANAGEMENT	3	14-18/11/2011
8	EXAMS		21-25/11/2011
	SAG530.1810.0 Natural Resources Management - 8 ECTS		28/11/2011-06/01/2012
9	SAG531.2510.13 SOIL PROPERTIES & QUALITY ASSESSMENT (60%) AND COMPOSTING TECHNOLOGY (40%)	5	28/11-02/12/2011
10	EXAMS		05/09/12/2011
11	SAG532.1304.1 NUTRIENT MANAGEMENT AND SOIL FERTILITY IMPROVEMENT	3	12-16/12/2011
12	EXAM PREPARATION		19-23/12/2011
13	EXAM PREPARATION		26-30/12/2011
14	EXAMS		02-06/01/2012
	SAG540.1810.0 Assessment of Genetic Resources - 8 ECTS		09/01-03/02/2012
15	SAG541.2410.23 SEED PRODUCTION AND QUALITY MANAGEMENT (60%) / PLANT BREEDING (40%)	4	09-13/01/2012
16	EXAMS		16-20/01/2012
17	SAG543.1410.3 AGRO-BIODIVERSITY ASSESSMENT AND MANAGEMENT	4	23-27/01/2012
18	EXAMS		30/01-03/02/2012
	SAG550.11510.0 Crop Protection - 15 ECTS		06/02-30/03/2012
19	SAG552.2310.23 IPM/ FUNGAL & BACTERIAL DISEASE MANAGEMENT	3	06-10/02/2012
20	EXAMS		13-17/02/2012
21	SAG553.2410.12 DETECTION AND EPIDEMIOLOGY OF PLANT VIRUS DISEASES	4	20-24/02/2012
22	EXAMS		27/02-02/03/2012
23	SAG554.1410.23 INSECT MANAGEMENT	4	05-09/03/2012
24	EXAMS		12-16/03/2012
25	SAG555.2410.2 WEED MANAGEMENT	4	19-23/03/2012
26	EXAMS		26-30/03/2012
	SAG560.11210.0 Greenhouse Management - 12 ECTS		02/04-25/05/2012
27	SAG561.1410.1 CROP MODELLING & BIOCLIMATOLOGY	4	02-06/04/2012
28	EXAM PREPARATION		09-13/04/2012
29	EXAM PREPARATION		16-20/04/2012
30	EXAMS		23-27/04/2012
31	SAG562.1410.1 GREENHOUSE TECHNOLOGIES AND CLIMATE CONTROL	4	30/04-04/05/2012
32	EXAMS		07-11/05/2012
33	SAG563.1410.1 SOILLESS CULTIVATION	4	14-18/05/2012
34	EXAMS		21-25/05/2012
	SAG580.1310.0 Quality Assurance & Good Agricultural Products - 3 ECTS		28/05-15/06/2012
35	SAG523.1304.1 B75QUALITY ASSURANCE & GOOD AGRICULTURE PRACTICES	3	28/05-01/06/2012
36	EXAMS		04-08/06/2012
37	RETAKE EXAMS		11-15/06/2012

SUSTAINABLE AGRICULTURE PROGRAM - Academic year 2011-2012

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 CO₂, 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:** Identification of Citrus tristeza virus (CTV) in Crete – Standardization and optimization of diagnostic techniques
Author: Heba Afifi, Egypt
Place of Realization: Mediterranean Agronomic Institute of Chania, Crete, Greece
Thesis director: Ioannis Livieratos
3. **Title:** Anionic resin extractable P as an index of P availability in calcareous soils of Crete, amended and non-amended with pig manure compost
Author: Mohamed Abdelaal Dafea, Egypt
Place of Realization: Mediterranean Agronomic Institute of Chania, Crete, Greece
Thesis director: Vissarion Keramidas
4. **Title:** Looking For A Model of Sustainability: The Opportunity For A Sustainable Localized Food System In Crete With A Focus on Fresh Vegetable and Melon Production and Distribution
Author: Kristy Apostolides, Agronomist, Cypriot (2008)
Place of Realization: Mediterranean Agronomic Institute of Chania, Crete, Greece
Thesis director: Emmanouil Kambourakis

5. Title: Responses of Cucumber To Composted Pig Manure Used As Sole Substrate or In Mixtures With Perlite At Different Ratios: Impact Of The Height Of The Substrate In The Bag

Author: Ola Al Naddaf, Agronomist, Syrian (2009)

Place of Realization: Mediterranean Agronomic Institute of Chania, Crete, Greece

Thesis director: Dimitris Savvas

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