

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 6 Units (60 ECTS)

Unit I BIOMETRICS (6 ECTS)

04 – 22 October 2010

Content:

Statistics.
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).

Unit II INTRODUCTION TO SUSTAINABILITY (12 ECTS)

25 October –
03 December 2010

Content:

Agroecosystems and Population Dynamics.
Ecotoxicology.
Agro-Environmental Impact Assessment and Farm Management.
Quality Assurance and Good Agricultural Practice.

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.

Unit III NATURAL RESOURCES MANAGEMENT (6 ECTS)

06 December 2010 –
07 January 2011

Content:

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

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.

Unit IV

ASSESSMENT OF GENETIC RESOURCES (6 ECTS)

10 January –
04 February 2011

Content:

Agrobiodiversity Assessment and Management.
Seed Production and Quality Management.
Plant Breeding.
Biotechnological approaches to Plant Propagation.

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.

Unit V

CROP PROTECTION (18 ECTS)

07 February –
08 April 2011

Content:

Plant/Pest Interactions.
Integrated Pest Management.
Fungal and Bacterial Disease Management.
Detection and Epidemiology of Plant Virus Diseases.
Insect Management.
Weed Management.
Biotechnological Approaches to Crop Protection.

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.

Unit VI

GREENHOUSE MANAGEMENT (12 ECTS)

11 April – 27 May
2011

Content:

Crop Modelling and Bioclimatology.
Greenhouse Technologies and Climate Control.
Soilless Cultivation.
Water Management.

Learning outcomes:

- a) to be acquainted 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.

UNIT CASE STUDIES

CASE STUDIES IN ORGANIC AND INTEGRATED PRODUCTION

30 May – 04 June 2011

Content:

Case Studies in Organic and Integrated Production. Case Studies and excursions in Olive Tree, Vegetable, Citrus and Vine Cultivation (lectures, field work).

Learning outcomes:

Farm visits to ICM and organic farming systems. Connection with theoretical background offered during the academic year.

06-10 June 2011

RETAKE EXAMS

13-17 June 2011

ORAL EXAMS

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. For every three weeks of course delivery the given examination period is two weeks.

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 the last four weeks** of course delivery (**12 ECTS**) of the final unit.

At the end of the 60 ECTS first year programme participants are obliged to take an oral comprehensive examination **weighting 15%** of the overall graduation grade.

Language of instruction: ENGLISH

ACADEMIC STAFF

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.

The following academic quality indicators have been achieved, during the period 1985-2005.

Research Indicators

- **39%** of the total number of research Master theses have been published in peer review journals (256 publications);
- **43%** have been presented and published in international conferences and proceedings.

Academic Mobility Indicators

- **28%** of graduates have been accepted with full scholarships in PhD programmes by highly ranked universities;
- **30** graduates and PhD holders serve as University Professors in their home country or abroad.

PROGRAM SUSTAINABLE AGRICULTURE					
Academic Year 2010-2011					
Weeks	TITLE	INSTRUCTORS	WEIGHT	%	DATES
	Unit I: SAG 510 Biometrics - 6 ECTS				04/10-22/10/2010
1	SAG 510.1 STATISTICS	A. Mavroustakos	3	50	04-08/10/2010
2	SAG 510.2 CROP EXPERIMENTATION	G. Markakis	3	50	11-15/10/2010
3	EXAMS				18-22/10/2010
	Unit II: SAG 520 Introduction to Sustainability - 12 ECTS				25/10-08/12/2010
4	SAG 520.1 AGRO-ECOSYSTEMS AND POPULATION DYNAMICS	E. Karbourakis	3	25	25-29/10/2010
5	SAG 520.2 ECOTOXICOLOGY	L. Belzunces	3	25	01-05/11/2010
6	EXAMS				08-12/11/2010
7	SAG 520.3 AGRO-ENVIRONMENTAL IMPACT ASSESSMENT & FARM MANAGEMENT	G. Haas	3	25	15-19/11/2010
8	SAG 520.4 QUALITY ASSURANCE & GOOD AGRICULTURAL PRACTICE	I. Mahoyannis	3	25	22-26/11/2010
9	EXAMS				29/11-03/12/2010
	Unit III: SAG 530 Natural Resources Management - 6 ECTS				06/12/2010-07/01/2011
10	SAG 530.1 SOIL PROPERTIES & QUALITY ASSESSMENT SAG 530.2 COMPOSTING TECHNOLOGY	V. Keranidas / G. Zervakis	3	50	06-10/12/2010
11	SAG 530.3 SOIL FERTILITY AND NUTRIENT MANAGEMENT	U. Koepke	3	50	13-17/12/2010
12	EXAM PREPARATION				20-24/12/2010
13	EXAM PREPARATION				27/12/10 - 02/01/2011
14	EXAMS				03-07/01/2011
	Unit IV: SAG 540 Assessment of Genetic Resources - 6 ECTS				10/01-04/02/2011
15	SAG 540.1 AGRO-BIODIVERSITY ASSESSMENT AND MANAGEMENT	P. Barberi	3	50	10-14/01/2011
16	SAG 540.2 SEED PRODUCTION AND QUALITY MANAGEMENT / PLANT BREEDING	W. Ligterink / G. Skarakis	3	50	17-21/01/2011
17	EXAMS				24-28/01/2011
18	EXAMS				31/01-04/02/2011
	Unit V: SAG 550 Crop Protection - 18 ECTS				07/02-08/04/2011
19	SAG 550.1 INTEGRATED PEST MANAGEMENT / PLANT-PEST INTERACTIONS	E. Paplomatas / J. Tsitsipis	3	16	07-11/02/2011
20	SAG 550.2 FUNGAL & BACTERIAL DISEASE MANAGEMENT	E. Tjamos	3	16	14-18/02/2011
21	EXAMS				21-25/02/2011
22	SAG 550.3 DETECTION AND EPIDEMIOLOGY OF PLANT VIRUS DISEASES	N. Katis	3	17	28/02-04/03/2011
23	SAG 550.4 INSECT MANAGEMENT	D. Prophetou	3	17	07-11/03/2011
24	EXAMS				14/03-18/03/2011
25	SAG 550.5 WEED MANAGEMENT	C. Giamopolitis	3	17	21-25/03/2011
26	SAG 550.6 BIOTECHNOLOGICAL APPROACHES TO CROP PROTECTION	I. Livieratos	3	17	28/03-01/04/2011
27	EXAMS				04-08/04/2011
	Unit VI: SAG 560 Greenhouse Management - 12 ECTS				11/04 - 27/05/2011
28	SAG 560.1 CROP MODELLING & BIOCLIMATOLOGY	A. Tchamitchian	3	25	11-15/04/2011
29	EXAM PREPARATION				18-22/04/2011
30	EXAM PREPARATION				25-29/04/2011
31	SAG 560.2 GREENHOUSE TECHNOLOGIES AND CLIMATE CONTROL	K. Kittas	3	25	02-06/05/2011
32	SAG 560.3 SOILLESS CULTIVATION	D. Sawas	3	25	02-06/05/2011
33	SAG 560.4 WATER MANAGEMENT	S. Manfreda	3	25	09-13/05/2011
34	EXAMS				16 -20/05/2011
35	EXAMS				23-27/05/2011
	Unit Case Studies				30/05-04/06/2011
36	CASE STUDIES IN ORGANIC & INTEGRATED PRODUCTION (OLIVE, VEGETABLES)	E. Karbourakis / H. Passam			30/05-03/06/2011
37	RETAKE EXAMS				06-10/06/2011
38	ORALS				13-17/06/2011

Part 2

The Master of science programme

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:** Old And Endangered Organically Cultivated Greenhouse Tomatoes. Effect of The Harvest Time On The Flavour Ingredients And Consumer Acceptance
Author: Vasilis Gkissakis, Agronomist, Greek (2006)
Place of Realization: IOL, University of Bonn, Germany
Thesis director: Ulrich Kopke
2. **Title:** A Yeast Two-Hybrid System Approach to Identify Tomato Proteins Interacting with *Pepino Mosaic Virus* (PepMV) Proteins
Author: Rita Veiga, Agronomist, Portugese (2007)
Place of Realization: Mediterranean Agronomic Institute of Chania, Crete, Greece
Thesis director: Ioannis Livieratos
3. **Title:** Nutrient Budgeting as an Environmental Indicator For Conventional And Organic Olive Cultivation Systems In Crete
Author: Ali Abokila, Agronomist, Egyptian (2008)
Place of Realization: Mediterranean Agronomic Institute of Chania, Crete, Greece
Thesis director: Guido Haas and Emmanouil Kambourakis
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/