Olive Growing and Oil Technology

Organized by

Mediterranean Agronomic Institute of Zaragoza

Olive Growing and Oil Technology

Jointly organized by: **University of Córdoba (UCO), CIHEAM-IAMZ, Junta de Andalucía, International Olive Council (IOC), Spanish Higher Council for Scientific Research (CSIC)** and **Spanish National Institute for Agro-food Research and Technology (INIA)**

Scientific coordinator: **Prof. Dr. Ricardo Fernández Escobar**

The programme is held every two years. Next edition starts at the end of September 2009.
This Master is also an official Master of the Spanish University system.

Aims: More than 98% of olive production is to be found in the Mediterranean Basin, where this agricultural system has been developing for thousands of years, characterised by its adaptation to the environment and its empiricism. Several factors have modified the olive production and processing systems in the last decades. The crisis of traditional agriculture and the valorisation of olive oil, due to its organoleptic attributes and its beneficial influence on health, are probably the two most important features. As a consequence, great advances have been made in olive growing and olive oil technology that make it necessary to train professionals and scientists so that from both the public and private sectors they can accommodate these changes and develop sustainable production systems and high quality products.

Learning outcomes:

- To have in-depth knowledge of olive production, industrial processes for olive oil and table olive elaboration, sector economy and product marketing strategies, and to be able to apply the most relevant and innovative techniques and methods that, in a framework of sustainability, may answer specific demands of the sector and secure safety and high-quality products.
- To be able to integrate knowledge about the olive sector and to know how to plan and develop strategies according to productive, ecological and socio-economic determining factors in particular situations, to lead to optimization of production, progressive intensification of orchards, culture adaptation to different environmental conditions, quality of product control and improvement and competitiveness increase in national and international markets.
- To assume the responsibility of planning and carrying out, under the supervision of a tutor, but in a manner that must be largely autonomous, a work of initiation to research in olive growing or olive oil technology, whose results may be potentially publishable.
- To prove knowledge of the scientific and technical information underpinning the research conducted, command of the techniques and methodologies relevant to such research, and capacity to objectively evaluate the significance of its results and conclusions.
- To know how to communicate the reasoning and conclusions of tutored works carried out in a group or autonomously, to develop skills in the preparation of informative and synthetic documents, and to acquire experience in the preparation and presentation of oral communications delivered and defended before an audience.

Part 1
Postgraduate specialization programme

The programme is organized in 6 Units (60 ECTS)

Unit 1
11-25 Jan. '10

THE PLANT (8 ECTS)

Content:

Development, growth and physiology of the olive tree
Flower and fruit set. Structures and processes
Plant material and breeding
Propagation

Learning outcomes:

- To have in-depth knowledge of the olive tree, its biology and the physiological processes affecting growth and development of the plant and its reproductive structures, as well as the anatomical and physiological basis of olive propagation.
- To gain practical experience about olive vegetative and reproductive structures, the photosynthetic process and flower phenology and quality.
- To develop practical skills in the use of different olive propagation methods, from traditional methods to micropropagation, organogenesis and embryogenesis.
- To gain knowledge in olive varieties, methods for variety characterization and processes and techniques to obtain new varieties.

Unit 2
20-30 Sep. '09,
26 Jan.-12 Mar.
and 6-9 Apr. '10

CULTIVATION TECHNIQUES (17 ECTS)

Content:

Design and establishment of plantations
Pruning
Nutrition and fertilisation
Soil management
Irrigation
Irrigation methods and systems
Harvest
Experimental methods in olive growing

Learning outcomes:

- To be acquainted with the physiological, agronomical and environmental basis of the different growing techniques, from orchard design and establishment to fruit harvest.
- To develop criteria to assess the different methods and techniques used in each culture stage, their comparative advantages and their sustainability.
- To gain practical experience on the different growing techniques, like soil preparation, planting and training processes, pruning, and fertilization and irrigation yearly planning.
- To gain experience in practical aspects related to different orchard management techniques and in the reality of commercial orchards, by means of technical visits to experimental fields and traditional and new orchards to appreciate their structures and different management methods.

- To understand the statistical basis needed to carry out experimental designs in olive growing and experimental data treatment and analysis, and to gain practical experience in the use of computer software and in experimental field data sampling and measurements.
- To be familiar with the use of diverse information systems to characterize the olive oil sector and to aid decision making.

Unit 3 **CROP PROTECTION (4 ECTS)**
15 Mar.-2 Apr. '10

Content:
Main pests affecting crop production and quality
Pest control methods
Different types of diseases and causal agents. Abiotic agents
Etiology, epidemiology and control of main biotic diseases

Learning outcomes:
- To recognise the main pests, diseases and abiotic agents affecting olive culture and to assess their economic and ecological importance.
- To analyse the different aspects concerning pest and disease control with special emphasis on those environmentally-friendly production systems, such as integrated and organic productions.

Unit 4 **PROCESSING OF TABLE OLIVES (6 ECTS)**
01-14 Oct. '09

Content:
Implications of harvesting types and transport methods on product quality and conservation
Elaboration of green olives. Traditional systems and modifications
Elaboration of natural and oxidized black olives
Legislation rules and management of environmental problems concerning the industrial process
Quality and food safety control

Learning outcomes:
- To be acquainted with the different phases in the diverse elaboration procedures of green and black table olives, the control of transformations and the quality and safety parameters.
- To gain practical experience in the control of both chemical and microbiological fermentation, packaging and preservation.
- To take one's first steps in the different processes by means of technical visits to industrial facilities to learn their application at a large scale and in commercial settings.

Unit 5 **OIL PROCESSING AND QUALITY (19 ECTS)**
15 Oct.-
18 Dec. '09

Content:
Preliminary operations. Separation systems
Control of the process. Storage
Quality. Bottling of virgin olive oil. Quality in management
Practicals: Placements in industries. Tasting course
Industrial projects
Olive oil and human health

Learning outcomes:

- To know the physical and chemical basis of olive oil extraction and production and to gain further insight into the different phases of the olive oil elaboration process, its control and the product quality parameters.
- To gain practical experience in the diverse virgin olive oil elaboration systems and in their quality control, as well as in oil tasting.
- To gain experience in a real professional environment of an industrial olive-oil mill, knowing the problems of these industries and favouring the exchange of ideas with sector professionals directly involved in development activities.
- To be qualified in the elaboration of synthesis reports on the characteristics of olive-oil mills, their strategies and activities, assessing aspects relative to the learning and personal value of the work carried out during the internship.
- To gain practical experience in the development of an olive-oil mill project, considering all stages, from the design and dimensioning to the foresight of by-product disposal or reuse.
- To be aware of the importance of olive oil in the Mediterranean diet and of its beneficial effects on human health, and to be able to transfer this information to stakeholders and general audiences.

Unit 6
12 Apr.-
14 May '10

ECONOMICS (6 ECTS)

Content:

Production systems, demand and consumption
Commercialisation and marketing
International trade, industrial group strategies, cooperatives
Information systems for characterising the olive oil sector

Learning outcomes:

- To know how to analyse the characteristics and peculiarities of the olive sector, its structure and organization, as well as its implications concerning the approach and design of marketing strategies and plans, with special reference to international strategies.
- To master the theoretical elements of marketing and the most modern tools and methodologies used in this discipline, analysing the strategies applied by the different sectors' agents and placing particular emphasis on the strategies for differentiation to gain competitive advantages.

EXAMINATIONS

Participants take 1 written examination at the end of each Unit, except in the case of Unit 5, where they take 3 written examinations. Written exams consist of a set of questions that require a concise answer. Some of the questions are multiple choice. Lengthy questions are avoided.

Participants may retake failed exams once.

For the evaluation of Unit 2 participants also present written personal practical exercises on experimental methods. For the evaluation of Unit 5 participants also present a written report for the assessment of their stays in industries.

LANGUAGE OF INSTRUCTION

The working language is Spanish, therefore participants should prove knowledge of Spanish at the start of the course. From the beginning of July to the end of September the University of Córdoba organizes an intensive course of Spanish for those who require it. In the selection of candidates, knowledge of English and French is nevertheless valued, as part of the documentation distributed may be written in either of these languages.

ACADEMIC STAFF

More than 100 lecturers participate in each edition of the M.Sc. programme. Many of them belong to the organizing institutions and others are guest lecturers from different institutions in Spain. 48% come from Research Centres, 28% from Higher Education Institutions, 20% from Administrations and 4% from Private Companies.

Part 2
The Master of Science thesis

Project (60 ECTS)

This part is organized in 2 Units

INTRODUCTION TO RESEARCH (30 ECTS)

The aim of this unit is to provide the prior knowledge, skills and attitudes necessary to carry out a research project in a particular topic in the speciality of olive growing or olive oil technology.

Learning outcomes:

- To improve skills in the search for information, as well as in its selective treatment.
- To develop criteria for defining the objectives of a particular research study.
- To know how to plan the research work in order to best achieve the objectives set and to optimise time.
- To develop skills in the use of techniques and methodologies relevant to the execution of a research project and to discern the advantages and disadvantages of each one for each particular project.
- To know how to integrate knowledge and to learn how to analyse and contrast results.
- To value the guidance received to plan and develop a research work, fostering dialogue, criticism and capacity to work as a member of a team.
- To develop skills for self-directed learning and autonomous work.
- To improve the capacity of response to unforeseen situations and the ability to reorient a research if need be.

MASTER THESIS (30 ECTS)

The aim of this unit is to apply previous education received throughout the Master programme to carry out original research in the topic chosen in the previous unit, that concludes with the elaboration of a written thesis.

Learning outcomes:

- To be able to apply previously acquainted knowledge, methods and techniques in a discerning manner.
- To develop skills in the analysis of problems and in the definition of objectives.
-To know how to design the diverse experiments included in the research project correctly.
- To be competent in data collection and analysis according to a pre-established research protocol.
- To gain experience in the analysis of results and the elaboration of conclusions that may contribute to clarify and find a possible solution to problems.
- To develop skills in the synthesis and presentation of contents and in the preparation of scientific texts.0
- To gain practice in the preparation and presentation of oral communications and in their public defence.
- To acquire attitudes to favour exchange and collaboration with other researchers and professionals.

Research work is carried out in well-recognized institutions (universities, research centres or firms), generally throughout Spain or in the participant's country of origin, under the scientific supervision of a thesis director that must be a doctor of renowned prestige. Participants choose the topic according to their interest of training, which is approved by a Committee. If the participant so requires, the organizing institutions advise on the choice of the most appropriate thesis director and institution to carry out the desired project, and likewise propose topics related to their research activities or other topics of interest previously accorded with other institutions.

The assessment of acquired competences for both units is made by an examining board composed of representatives of the organizing institutions and external members selected in each case for their expertise and prestige in the field of the research work. For the first unit, this assessment is based on: (i) an oral examination by the examining board; (ii) the evaluation done by the thesis director on the performance of the candidate; and (iii) the evaluation based on the reports presented periodically by the participant, with the support of the thesis director, on the development and progress of the research work. For the second unit, assessment is based on quality of the thesis and on its public presentation and defence.

Research activities: most common topics for Master of Science theses

- Study of morphological or genetic traits of different cultivars, sometimes relating them with agronomical or oil quality characteristics
- Growing techniques (fertilisation systems, propagation techniques, plant forcing, etc.) and their effect on performance and on other parameters of agricultural or industrial interest
- Olive pest/diseases characterization, host-pathogen interrelations and control
- Economics and marketing of olive and oil products
- Different olive oil extraction, separation and processing procedures and their implications in final oil quality

INDICATIVE MASTER THESES REALIZED WITHIN THE AREA

1. **Title**: Use of microsatellite markers (SSRs) in the analysis of molecular variability and identification of olive varieties in Boughrara" germplasm bank (Sfax, Tunisia) (2008)
   Author: Radia Tekkouk, Agronomist, Algerian
   Place of realization: Departamento de Bioquímica, Biología Celular y Molecular de Plantas, Estación Experimental del Zaidín, Consejo Superior de Investigaciones Científicas, Granada, Spain
   Thesis directors: Juan de Dios Alche and M. Isabel Trujillo
2. **Title**: Entomopathogen fungi isolation in olive orchard soils in Andalusia and their potential in the control of the olive fly *Bactrocera oleae* (Gmelin) (Diptera: Tephritidae) (2007)
   Author: Ibrahim Eldesouki Arafat, Agronomist, Egyptian
   Place of realization: Departamento de Producción Vegetal, Universidad de Córdoba, Spain
   Thesis director: Enrique Quesada
3. **Title**: Analysis of the possibilities of increasing olive oil demand in emerging markets. The cases of Australia, Japan, China and Thailand (2006)
   Author: Francisco Jesús Vaca Montes, Agronomist, Spanish
   Place of realization: Departamento de Administración de Empresas, Contabilidad y Sociología, Universidad de Jaén, Spain
   Thesis director: Manuel Parras Rosa
4. **Title**: Estimation of biophysics variables in olive orchards using remote sensing methods based on satellite and airborne sensors for their integration in precision agriculture (2005)
   Author: Joao da Gama Minas, Forest engineer, Portuguese
   Place of realization: Instituto de Agricultura Sostenible, Consejo Superior de Investigaciones Científicas, Córdoba, Spain
   Thesis director: Pablo J. Zarco
5. **Title**: Influence of the extraction system on virgin olive oil quality (2001)
   Author: Daniela Capogna, Agronomist, Italian
   Place of realization: Instituto de la Grasa, Consejo Superior de Investigaciones Científicas, Sevilla, Spain
   Thesis director: José Alba

Detailed additional information is available at
http://www.iamz.ciheam.org/en/pages/paginas/pag_formacion8.htm