

CORSO DI DOTTORATO IN SCIENZE AGRARIE – Ph.D COURSE OF AGRICULTURAL SCIENCES

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Area disciplinare: Scienza Agrarie e Veterinarie Dipartimenti interessati: Agraria

Breve descrizione: Il Corso ha l'obiettivo di formare dottori di ricerca altamente qualificati e in grado di rispondere alla domanda di ricerca e sviluppo e di alta qualificazione professionale nei campi dell'agrometeorologia e ecofisiologia vegetale; della produttività delle colture agrarie; della gestione e protezione dei sistemi produttivi agrari e forestali; della conservazione, tutela e valorizzazione delle risorse naturali; delle biotecnologie microbiche e delle tecnologie alimentari mirate alle esigenze produttive di ambito regionale, nazionale e internazionale; delle tecniche di allevamento e di riproduzione, nutrizione e alimentazione, genetica applicata e selezione degli animali zootecnici anche con l'uso di tecniche di biologia molecolare; della qualità e sicurezza dei prodotti alimentari di origine animale e vegetale; delle problematiche legate alla desertificazione e al degrado dei suoli.

Nei tre anni i dottorandi acquisiscono il metodo scientifico e le competenze necessarie per la predisposizione di progetti sperimentali, la conduzione di piani sperimentali e di attività di laboratorio, l'elaborazione dei dati e la valutazione delle inferenze statistico- sperimentali, la divulgazione dei risultati della ricerca secondo standard internazionali.

Il Corso persegue l'internazionalizzazione attraverso la predisposizione di convenzioni con università straniere e promuove l'acquisizione di titoli riconosciuti a livello europeo e internazionale.

Disciplinary area: Agricultural and Veterinary Sciences; Departments involved: Agricultural Sciences

Brief description: The course aims to train highly qualified PhD able to respond to the demand for research and development and high professional qualifications in the following fields: agrometeorology and plant ecophysiology; productivity of agricultural crops; plant health; management and protection of agricultural and forest production systems; conservation, protection and enhancement of natural resources; microbial biotechnologies and food technologies aimed at regional, national and international production needs; techniques of breeding and reproduction, nutrition and nutrition, applied genetics and selection of livestock animals, also with the use of molecular biology techniques, quality and safety of food products of animal and plant origin, desertification and soil degradation. During the three years of the course, the PhD students will acquire the scientific method and the skills necessary for the experimental plane definition and laboratory activities, the processing of data and the evaluation of statistical- experimental inferences, the dissemination of the scientific results of the research according to international standards. The course pursues internationalization through the establishment of agreements with foreign universities and promotes the acquisition of titles recognized at European and international level.

KEY INFORMATION

- Disciplinary area: Agricultural and Veterinary Sciences
- Department: Agricultural Sciences
- Coordinator: Prof. Severino Zara

- Venue: Department of Agricultural Sciences
- Type of lessons: frontal and practical lessons
- Language: Italian - English
- ECTS: 180
- Deadline for applicants: See UNISS website
- Fees: See UNISS website

OVERVIEW

Brief description: The PhD program develops research training activities in a field that is extended to many scientific sectors of agricultural sciences.

The course is divided into 6 Curricula, which operate within a common teaching plan to organize and promote study and research activities.

- 1) **Curriculum Agrometeorology and ecophysiology of agricultural and forest ecosystems**
(Referents: Prof. Maurizio Mulas and Roberto Furesi).

The lines of research mostly concern:

Analysis of the impact of the climate on agriculture and forest and natural ecosystems, with particular attention to the dynamics and adaptation and mitigation techniques.

Study of micrometeorological processes in agrarian, forest and natural systems and of the dynamics that regulate carbon balance.

Analysis of ecophysiological processes in Mediterranean environments with reference to water stress conditions.

Analysis of the territorial vocation, with reference to the identification of bioclimatic indexes, to the studies of agricultural and forest vocationality, to the management of the green areas.

Modeling and simulation of crop water requirements and estimation of irrigation efficiency, in consideration of climate change in progress.

Analysis of the interactions between climate change and forest fire risk.

Development and validation of modeling for the study of the functionality and productivity of forest and agricultural systems.

Management and use of biodiversity and agro-biodiversity for the sustainability of crop systems.

Economic impacts of climate change on agricultural systems

Economics and Policy of Fire Management Activities and Programmes

2) Curriculum Agricultural and food microbial biotechnology
(Referents: Prof. Costantino Fadda and Giacomo Zara).

Physiological and genetic characterization of bacteria, yeasts, and fungi also according to their use in the biotechnological and food industry.

Characterization of the microbiota in agricultural, forestry, agri-food, animal, and water ecosystems.

Selection of starter strains for agri-food related processes

Chemical-physical and sensory characterization of food products and impact of transformation / conservation operations on the evolution of the main biochemical parameters.

Impact of transformation / conservation operations on the content and activity of biological components present in food.

Determinants of plant pathogenicity and mycotoxigenic ability in filamentous fungi and development of alternative containment strategies.

Metabolomics as a new approach to nutritional research and its utility in the study of food and gut microbiota.

3) Curriculum Monitoring and control of forest ecosystems in Mediterranean environments (Referents: Prof. Paola Castaldi and Filippo Gambella).

The lines of research mostly concern:

Biodiversity study of the Mediterranean forest.

Climate-soil-biocenosis relations and influence of anthropic factors on the forest ecosystem.

Indicator species for monitoring the degradation status of forest ecosystems.

Identification of qualitative models for the different forest and mountain ecosystems through the monitoring of the main biological, geochemical and environmental indicators.

Definition of sustainable strategies aimed at the recovery and rehabilitation of degraded areas, as well as the improvement of the physical-chemical characteristics of soil and crop production.

Development of sustainable agroforestry systems and re-naturalization models of areas subject to reforestation with exotic species.

Evaluation of the state of natural equilibrium with the study of the composition of the biocenoses and identification of the taxonomic groups most sensitive to environmental pollution factors and their use as indicators of the same.

Studies on the bio-ecology of the main pathogens and phytophages in forest populations, and on the relative means of struggle.

Genetic biotechnologies applied to taxonomic phylogeny and environmental diagnostics.

Territorial information systems for monitoring and multi-dimensional representation of the elements studied, useful for the definition of models functional to the management of forest ecosystems.

4) Curriculum Productivity of cultivated plants

(Referents: Prof. Francesco Giunta and Monica Rodriguez).

Study of biological and agronomic factors that influence the production, growth and development of crop vegetable and floricultural species in protected cultivation and open field.

Evaluation of new sources of bioproducts with bioactivator and fertilizer function (struvite, biostimulants, lombricompost) for plant production and vegetable food quality improvement.

Integrative multi-omics approaches to identify the genetic basis of adaptation to changing environment in plants, to identify genes with key agronomic and economic relevance, and to facilitate crop improvement for climate resilience and superior nutritive value.

Population genetics to inform breeding strategies and to increase genetic gain.

Molecular profiling and barcoding of individual plants or populations of plant species of agricultural interest.

Crop physiology of cereal and grain legumes species adapted to the Mediterranean environment with particular emphasis on phenology, resource-use-efficiency, cropping systems for marginal areas, old cultivars and species, cereal grain quality.

Agricultural strategies to revert Mediterranean marginal/abandoned areas into newly productive agricultural systems

Eco-compatible strategies for weed management in the agro-ecosystems

Physiology of yield production of tree species adapted to the Mediterranean environment, with particular emphasis on the physiological effects of winter and green pruning on yield and quality of wine grapevines, and on water use efficiency in water-limited condition.

5) Curriculum Livestock sciences and technologies (Referents: Prof. Corrado Dimauro and Anna Nudda).

The lines of research mostly concern:

The study of the nutrition of animals of zootechnical interest, feeding techniques and methods of evaluation of livestock food.

Mathematical-statistical modeling applied to biological processes of zootechnical interest, to production systems, to the environmental impact of farms.

Studies on the relationship between feeding of the main species of zootechnical interest, quality and safety of food products of animal origin.

Studies on genetic improvement and enhancement of biodiversity in species of zootechnical interest with quantitative and biotechnological genetic tools.

Studies on breeding techniques of both terrestrial and aquatic species of zootechnical interest.

Studies on the optimization of zootechnical systems, on the efficiency of machines and plants of livestock farms, on the relationship between animal management techniques and their well-being.

Sustainable and competitive livestock management economics and policy

6) Desertification and land degradation

(Referents Prof. Giovanna Seddaiu and Giovanni Garau)

The research topics of this curriculum are dedicated on all the forms of land degradation, intended as the loss of actual or potential land productivity or utility as a result of natural or anthropic factors which affect food production and safety, livelihoods, and the production and provision of other ecosystem goods and services. In this context, desertification is a form of land degradation occurring in arid, semi-arid and dry sub-humid areas worldwide.

The specific research lines of the curriculum are:

- Factors and forces leading to land degradation and desertification
- Impacts of climate change on land degradation and desertification
- Monitoring and assessment methodologies at different scales (from field to landscape)
- Mitigation and adaptation strategies to cope with land degradation and desertification
- Socio-economic and policy dimensions of land degradation and desertification

The common objective is that the training of the PhD student is not limited to the deepening his/her research field, but aims at a common interdisciplinary competences of the Agricultural Sciences, acquired in specific laboratories and in the open field (experimental companies) as well as in collaboration with affiliated agencies and research agencies, under the supervision of an academic mentor.

The PhD program in Agricultural Sciences also promotes internationalization through research periods abroad, the preparation of co-tutoring agreements with foreign researchers, the stipulation of agreements with foreign universities and research institutions and the presence in the board of professors and researchers from universities and research institutions located outside the national territory.

Teaching goals

The course aims to train experts in research and high professional qualifications in the following fields (albeit not exclusively): agrometeorology and plant ecophysiology; cropping systems; plant health; management and protection of agricultural and forest production systems; conservation, protection and enhancement of natural resources; sustainable water management; biotechnologies aimed at regional, national and international production needs; breeding techniques, livestock feeding, selection and selection of livestock animals also with the use of molecular biology techniques, quality and safety of food and feed products; desertification and soil degradation, economics of land degradation.

In the three years the PhD students acquire the scientific method and the skills for the preparation of experimental projects, the conduct of experimental plans and laboratory activities, the processing of data and the evaluation of statistical-experimental inferences, the disclosure of the facts of the research according to international standards. The course pursues internationalization through the establishment of agreements with foreign universities and promotes the acquisition of titles at European and international level.

Expected employment and professional opportunities

PhDs have specific training for conducting scientific and technological research activities in public and private research institutions. Through specific paths, in connection with industries and companies, PhDs can acquire high professional skills, develop, and apply research results as well as startup business activities and technology transfer.

Expected professional outlets concerns the research career in universities and public bodies or in private research facilities, in the areas of land use planning, environmental monitoring of resources, innovative technologies and processes related to the activities of the agro-food industry, where skills are required specifications, as well as agro-meteorological services and environmental agencies. The establishment of research spin-offs for technology transfer to companies. The scientific qualification of the professional activities of the degrees of access to the school (agronomist and forestry, veterinary, engineer, architect, biologist, naturalist, chemist, etc.). They can practice freelance with specialization in the field of studies and research or enhance their skills as entrepreneurs in the agricultural, agroforestry and livestock, food processing and territorial governance, scientific dissemination, and technology transfer of innovation. Furthermore, the uses in the primary production and food processing industries and in consultancy and services in the fields of interest are to be considered.

Language

A good command of English is required for admission to the course. This includes 3 compulsory common courses taught entirely in English to improve communication and oral comprehension and use of scientific English in terms of: i) reading and understanding of scientific texts; ii) writing of scientific texts; iii) oral communication in scientific forums. All courses are taught with bilingual material - Italian / English - and teachers use both languages during lessons. PhD students can attend the University Linguistic Center for a linguistic study.

Laboratories, facilities, libraries, and databases

The Department of Agricultural Sciences is fully applied in line with the strategies defined by the University Doctorate School - it has laboratories for measuring in the open field and in a controlled environment and handling of environmental conditions. Laboratories are available for the implementation of biotechnological processes, chemical, biological and microbiological analyzes and for all support analyzes. Furthermore, IT laboratories are present.

The books and databanks available to the PhD students ensure complete coverage of the course topics and consist of 52,700 monographs; 80 magazine subscriptions; 19,307 years; 535 CD-DVD; The PhD students also have free access to the University Library System <http://sba.uniss.it/>, with 40,500 electronic journals in subscription; 10,000 free on the Web; 52 databases and other electronic publications on subscription; 600 free on the Web; 14,500 e-books; 10,500 publications including PhD theses among the digital products of the University's scientific research available in the UnissResearch institutional archive.

REQUIREMENTS

Education: Master's degree

Selection process: Public call with evaluation of qualifications, research project and interview

Language: All applicants will have to demonstrate competence in the English language

TEACHING

Teaching schedule

The training of the Course is divided into three years and aims to train figures able to contribute to innovation and to the scientific and technological development of society. Every year for the new Doctoral Cycle activated, the Teaching Plan is formulated for the three years.

The preparation of the PhD students is aimed at research oriented both towards university teaching and for inclusion in public and private research institutions, both in the industrial and service world. The total teaching commitment is 180 Research Training Credits (CFR). For admission to the second year, 42 CFR are required and admission to the third 102 CFR. All CFR must be achieved within the third year of the course.

For courses which are common to the addresses and specific to the **1CFR address = 8 hours of teaching** and 25 hours of the doctoral candidate's total commitment. Attendance is mandatory. A maximum of 25% is allowed on the total time of the scheduled lessons, with attendance of at least 75% for each course.

For PhD students without scholarship, the compulsory attendance is at least 30% of each course. To encourage stays abroad and internships, doctoral students who do not attend scheduled classes as they are engaged in research activities elsewhere are admitted and must still take the final exams. In addition, the PhD student who has attended courses like those of the Course, arranged by the host institution, can request the evaluation of the accrued CFR. The decision on the evaluation will be taken by the Board of the Course. They can be evaluated among the CFRs at the choice of the PhD student courses used outside the Course. Courses that require access to the master's degree and which include a final exam are eligible. The recognition of the number of CFR is delegated to the Board of the Course. At the end of each academic year the student must produce a report of the activities carried out during the year. The report is evaluated by the Board for admission to the following year and the recognition of the CFR for the research activity. At the end of the three-year course, the PhD students must have acquired 180 CFR for the acquisition of the PhD in Veterinary Sciences, divided according to the following breakdown:

Scanning of the total 180 CFR three-year PhD program

Activity		Typology	CFR			
			Year 1	Year 2	Year 2	TOTAL
Project work		Minimum*				120
UNISS Teaching	Organized by the School	For all students of the School * (minimum)	6	2	0	8
	Organized by the PhD programs	Courses organized by PhD programs different from that of the student, at one's choice * (minimum)				4
		Courses organized by the PhD program of the student * (minimum)				10
Other activities (UNISS or elsewhere) *						
Seminars, courses, symposiums		Minimum				10
Teaching assistance and tutoring of students for thesis and practice		Minimum	5	5	5	15
Stages and practical trainings						
TOTAL CFR REQUIRED			60	60	60	180

* Specific rules and obligations defined by the PhD School or the PhD courses that promoted the event

PLAN OF MANDATORY TEACHING

common to all Curricula

COURSE	INSTRUCTOR	H	CFR	FINAL EXAM	LANGUAGE
I anno/I year					
Statistics	Prof. Nicolò Macciotta	32	4	Yes	English
Communication in Science	Prof. Quirico Migheli	24	3	Yes	English
Ethics in Science	Prof. Giuseppe Pulina	8	1	Yes	Italian/English

Research Policy and Planning	Prof. Costantino Sirca	16	2	Yes	English
Introduction to R Software	Dr. Antonio Pulina e Alberto Cesarani	8	1	Yes	English
Statistics and Experimental Design	Prof.ssa Rosella Motzo	16	2	Yes	English
II anno/II year					
Multivariate Statistics	Prof. Corrado Dimauro e Dr. Alberto Cesarani	24	3	Yes	Italian
Introduction to Modeling and System Dynamics	Prof. Alberto Atzori	24	3	Yes	English
Scientific Writing	Dott.ssa Ana Francesconi	16	2	Yes	English
III anno/III year					
Scientific Publication and Presentation	Dott.ssa Ana Francesconi	24	3	Yes	English

CONTACTS

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