# Annex A

## PH.D. PROGRAM IN SCIENCE, TECHNOLOGY AND BIOTECHNOLOGY FOR SUSTAINABILITY

<table>
<thead>
<tr>
<th>Coordinator</th>
<th>Prof. Andrea Vannini</th>
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<tr>
<td><strong>Department</strong></td>
<td>Department for Innovation in Biological, Agrofood and Forest systems (DIBAF)</td>
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</table>
| **Program duration** | 3 years: 1st November 2023 – 31st October 2026  
Thesis Defence: within April 2027 |
| **Program objectives** | The main aim of this PhD course is to provide high-quality training in research methods and prepare professional researchers for Universities, Research Institutions and Industries in three fields of research:  
1) Food products;  
2) Forest Ecology and environmental technologies;  
3) Biological systems/ Bioindustries;  
The research activities of the curriculum in *Food products* will cover the food science and technology sector and deal with food processing, preservation and quality assessment and management, as well as the assessment of the environmental impact of food processing. The teaching activity will involve the cooperation with the National Network of the Italian PhD Research in *Food Science Technology and Biotechnology*.  
The research activities of the curriculum *Forest ecology and environmental technologies* will include the functionality and structure of forest systems, the soil system being included; forest biodiversity; monitoring and management of forest and environmental resources; the ecological recovery of degraded ecosystems; climate and global change mitigation and adaptation.  
The research activities of the curriculum *Biological systems/ Bioindustries* will include basic and applied biology for animal, plant, and microbial systems; bioremediation and human health biotechnologies, as well as the white-, green- e red-biotechnologies.  
The research activities of the international curriculum *Urban Green Infrastructures and Sustainable Development* will include the study of the urban ecosystem and the development of green technologies to be used to reduce the environmental impact of urbanized areas.  
The teaching programme is directed to provide students with skills in English language, statistical analysis of experimental data, bioeconomic, and assessment of the environmental sustainability of complex systems. |
| **No. of positions** | Total positions 21  
A) Positions with “PNRR DM 117” scholarship 7 DM 117/2023 M4C2 Inv. 3.3  
B) Positions with “PNRR Digital and Environmental Transitions DM 118” scholarship 1 Dm 118/2023 M4C2 Inv. 3.4 |
<table>
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<tr>
<th></th>
<th>C) Positions with “PNRR Research DM 118” scholarship</th>
<th>4</th>
<th>Dm 118/2023 M4C1 Inv. 4.1</th>
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<tbody>
<tr>
<td></td>
<td>D) Positions with scholarships co-funded by public bodies/Department/University</td>
<td>8</td>
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<td></td>
<td>E) Scholarship co-funded by the Lazio Region</td>
<td>1</td>
<td>Notice of Call no. G09820 of 25 July 2022</td>
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**Curricula**  
(In the application form the candidate must specify the curriculum of interest)

- Curriculum in **Food products**  
  no. 2 positions with scholarship
- Curriculum in **Forest Ecology and environmental technologies**  
  no. 14 positions with scholarship
- Curriculum in **Biological systems/ Bioindustries**  
  no. 5 positions with scholarship
Positions with “PNRR DM 117” scholarship

M4C2 – Inv. 3.3 “Innovative doctorates aimed at strengthening the demand of innovation of enterprises and promoting the employment of researchers” no. 7 scholarships to undertake research on:

**Curriculum Food products**

1. Topic: Instant pasta (INSTPA): characterization of cooking quality and environmental impact of instant pasta with nutraceutical value
   Advisor: Prof. Alessio Cimini

**Curriculum Forest Ecology and environmental technologies**

2. Topic: Development of new methodologies for mapping and monitoring agroforestry crops through the use of remote sensing, modeling and AI techniques
   Advisor: Prof. Dario Papale

3. Topic: Agroforestry systems in sensitive environments: monitoring of abiotic stresses, effects and benefits produced by agrotechnical solutions
   Advisors: Prof.ssa Elena Brunori, Prof.ssa Rita Biasi

4. Topic: Innovative methods of Territorial Forest Planning to support the Multifunctional Management of forest systems
   Advisors: Prof. Francesco Carbone, Prof. L. Portoghesi

5. Topic: Experimental forest plan in a territorial context subject to environmental protection with forest types of socio-economic interest
   Advisors: Prof. Francesco Carbone, Prof. L. Portoghesi

6. Topic: Application of digital models and technologies for the creation of forest "digital twins"
   Advisor: Prof. Riccardo Valentini

**Curriculum Biological systems/ Bioindustries**

7. Topic: Bioactive materials based on lignin and cellulose
   Advisor: Prof.ssa Manuela Romagnoli

Positions with “PNRR Digital and Environmental Transitions DM 118” scholarship

M4C1 Inv. 3.4 – “Digital and Environmental Transitions” no. 1 scholarships to undertake research on:

**Curriculum Food products**

1. Topic: Creation of models, also with machine learning/artificial intelligence approaches, capable of guiding the players in the food chain linked to animal production
   Advisor: Prof. Giovanni Chillemi
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<tr>
<th>Positions with “PNRR Research DM 118” scholarship</th>
<th>M4C2 Inv. 4.1 “PNRR Research lines”</th>
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<tr>
<td>no. 4 scholarships to undertake research on:</td>
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<tr>
<td><strong>Curriculum Forest Ecology and environmental technologies</strong></td>
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</table>
| 1. Topic: Development of semi-automatic methodologies for the identification and mapping of disturbances in forest ecosystems through remote sensing  
   Advisor. Prof. Anna Barbati | |
| 2. Topic: Selection and application, in forest environments, of bioproducts effective in reducing the impact of *Phytophthora cinnamomi* on Fagaceae of the genus *Quercus* and *Castanea*  
   Advisor. Prof. Carmen Morales-Rodriguez | |
| **Curriculum Biological systems/ Bioindustries** | |
| 3. Topic: Enhancement of waste from complex processes to obtain a value-added product, aimed at the production of biopolymers through fermentation processes starting from waste  
   Advisor: Prof. Silvia Crognale | |
| 4. Topic: Development of "high performance" computational pipelines for the massive analysis of large amounts of data in the human health field  
   Advisor: Prof. Nico Sanna | |

Please note that the acceptance of a PNRR scholarship implies obligations additional to those of a regular scholarship: see art. 17 of this Call.
Positions with fellowship co-funded by public bodies and by DIBAF Department /University

no. 5 PhD scholarships co-funded by the Institute of Research on Terrestrial Ecosystems (IRET) of the National Research Council (CNR) in the framework of the ITINERIS project - Italian Integrated Environmental Research Infrastructures System

Curriculum Forest Ecology and environmental technologies

n. 2 scholarships co-funded by DIBAF
1. Topic: Development of software infrastructures and HPC computational pipelines for the analysis of environmental data of different nature
   Advisor: Prof. Giovanni Chillemi

2. Topic: Development of software infrastructures and HPC computational pipelines for the analysis of environmental data of different nature
   Advisor: Prof. Nico Sanna

n. 1 scholarship co-funded by Agenzia Regionale per la Protezione dell’Ambiente (ARPA) Regione Autonoma Valle d’Aosta
3. Topic: Evaluation of the CO2 Absorption Capacity of Different Land Uses (LULUCF) in the Alps
   Advisor: Prof. Dario Papale

n. 1 scholarship co-funded by Fondazione Edmund Mach
4. Topic: Impact of climate change on the carbon balance in alpine ecosystems
   Advisor: Prof. Dario Papale

n. 1 scholarship co-funded by UNITUS
5. Topic: Development, integration and use of terrestrial environmental research infrastructures part of the ITINERIS project (ICOS, AnaEE, eLTER, LifeWatch, DISSCo, IBISBA, EMPHASYS)
   Advisor: Prof. Dario Papale
### Position with scholarship co-funded by the Lazio Region – Notice of Call no. G09820 of 25 July 2022

<table>
<thead>
<tr>
<th>Curriculum Biological systems/ Bioindustries</th>
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<tr>
<td>n. 3 scholarships co-funded by FFO UNITUS</td>
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**Curriculum Biological systems/ Bioindustries**

n. 1 scholarship co-funded by CNR IRSA - Water Research Institute and by University of Tuscia, Viterbo

1. **Topic:** Acidogenic fermentation of organic waste for the production of substances with high added value and characterization of the microbial communities involved  
   Advisor: Prof. Maurizio Petruccioli

n. 1 scholarship co-funded by the EU project Highlander (DIBAF)

2. **Topic:** Development of innovative ML/AI methods applied to macromolecules of biological interest  
   Advisor: Prof. Giovanni Chillemi

**Curriculum Forest Ecology and environmental technologies**

n. 1 scholarship co-funded by DIBAF

3. **Topic:** Ecophysiology of forest areas subjected to environmental stress  
   Advisor: Prof. Paolo De Angelis

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<tr>
<th>Position with scholarship co-funded by the Lazio Region – Notice of Call no. G09820 of 25 July 2022</th>
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</table>
| **Admission requirements**  
Application to the public competition is open to all, regardless of age and citizenship, who, by the date this call expires, possess one of the qualifications listed below:  
an Italian “laurea specialistica” degree, obtained according to the Ministerial Decree n. 509/1999;  
an Italian “laurea magistrale” degree, obtained according to the Ministerial Decree n. 270/2004;  
an Italian equivalent university degree obtained under the Italian regulations previously in force, the timespan of which being no less than 4 years;  
a foreign university degree equivalent to those mentioned above.  
Admission is also open to university students who will finish their MS degree by October 31st, 2023. In this case, admission will be “conditional”; the applicants will send by mail (capuani@unitus.it) or hand out to the “Ufficio Offerta Formativa” a self-certification of the relative degree (a certification in case of Non-EU students). Self-certification (or certification in case of Non-EU students) should state the name of the awarding University, award date, grade and type of qualification (“vecchio ordinamento”, “Specialistica”/“Magistrale”) and a copy of a valid identity document. Applicants not in possess of the admission requirements must indicate the date by which they expect to obtain the qualification required. |
### Evaluation of candidates (Maximum score: 80 out of 80)

- Evaluation of academic qualification and oral examination
- Assessment of the English Language Knowledge (for Italian candidates only)

Language for the examination: English

The final score is given by summing the scores relative to the academic qualification and oral examination. These scores will be published within the section Didattica>Offerta post lauream>Dottorati di Ricerca of the web site of the University of Tuscia (www.unitus.it).

Together with the application form, candidates should present a research project, within the themes given below for each curriculum, up to a maximum of 8000 characters, which must be written in Italian or English. The research project will be discussed during the oral exam.

### Evaluation of academic qualification (Maximum score: 20 out of 80)

<table>
<thead>
<tr>
<th>Category</th>
<th>Points</th>
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<tbody>
<tr>
<td>Master’s thesis: max</td>
<td>2</td>
</tr>
<tr>
<td>University career (exams taken with the relative grades and final grade): max</td>
<td>5</td>
</tr>
<tr>
<td>Scientific publications relating to the areas of Ph.D.: max</td>
<td>4</td>
</tr>
<tr>
<td>Research and/or study activities in foreign institutions: max</td>
<td>2</td>
</tr>
<tr>
<td>Participation in research projects: max</td>
<td>1</td>
</tr>
<tr>
<td>Professional experiences and other qualifications that each candidate considers useful: max</td>
<td>2</td>
</tr>
<tr>
<td>Research project submitted by the candidate: max</td>
<td>4</td>
</tr>
</tbody>
</table>

Before of the oral exam, the evaluation of academic qualification results will be published on the Tuscia web site www.unitus.it (section Didattica>Offerta post lauream>Dottorati di Ricerca).

### Evaluation of the oral exam

Oral exam: maximum score 60 out of 80 points

The minimum score for a positive oral exam will be at least 40 out of 80 points.

### Topics of the oral examination

**Curriculum in Food products.**

The oral exam will be aimed at assessing the candidate’s basic knowledge of the agro-food science, technology, and biotechnology, and, specifically, will focus on the discussion of the research project presented by the candidate, which must be in line with one or more of the topics of the scholarships.

**Curriculum in Forest Ecology and environmental technologies**

The oral exam will be aimed at assessing the candidate’s basic knowledge of the forest ecology and environmental technologies with specific attention to the functionality, structure, biodiversity, monitoring and management of forest and environmental resources; climate and global change mitigation and adaptation, forest resilience and restoration of degraded ecosystems. It will also focus on the discussion of the research project presented by the candidate, which must be in line with one or more of the topics of the scholarships.

**Curriculum in Biological systems/Bioindustries**

The oral exam will be aimed at assessing the candidate’s knowledge of basic biology and industrial biotechnology related to plant, animal and microbial systems, and, specifically, will focus on the discussion of the research project presented by the candidate, which must be in line with one or more of the topics of the scholarships.

### Exam dates and locations

The exams will be held between 6th – 20th September 2023.

The date(s) of the interview will be published on the University website at the site: www.unitus.it >Didattica>Offerta post lauream> Dottorati di Ricerca by the deadline of the application call.

### Contacts to information

Responsible for the curriculum Food Products
<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
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<tbody>
<tr>
<td>Prof. Riccardo Massantini</td>
<td><a href="mailto:massanti@unitus.it">massanti@unitus.it</a></td>
</tr>
<tr>
<td>Prof. Dario Papale</td>
<td><a href="mailto:darpap@unitus.it">darpap@unitus.it</a></td>
</tr>
<tr>
<td>Prof. AnnaMaria Fausto</td>
<td><a href="mailto:fausto@unitus.it">fausto@unitus.it</a></td>
</tr>
</tbody>
</table>

Prof. Riccardo Massantini is responsible for the curriculum *Forest Ecology and Environmental Technologies*. Prof. Dario Papale is responsible for the curriculum *Biological systems/ Bioindustries*. Prof. AnnaMaria Fausto is responsible for the curriculum *Biological systems/ Bioindustries*. 