



Freie Universität Bozen
Libera Università di Bolzano
Università Lìedia de Bulsan

Faculty of Science and Technology

PhD programme in MOUNTAIN ENVIRONMENT AND AGRICULTURE

Website:

<https://www.unibz.it/en/faculties/sciencetechnology/phd-mountain-environment-agriculture/>

Duration: 3 years

Academic year: 2022/2023

Start date: 01/11/2022

Official programme language: English

Programme contents:

The full-time PhD programme comprises lectures and research activities.

The PhD programme is based on the following milestones:

- Students develop and organize their research plan in the first six months of the course together with their supervisor and defend it in front of the PhD Committee.
- Students prepare, within 12 months of starting the programme, a public seminar in which they discuss the state-of-the-art of their research topic.
- Students take part in at least one international conference where they are expected to deliver an oral paper or present a poster.
- Students spend at least three months abroad conducting research.
- Students attend and pass specific compulsory courses and additional courses or summer/winter schools.

In order to be admitted to the final exam, students have to have at least one scientific paper, as first author, accepted for publication in an international peer-reviewed journal.

Only in exceptional cases, the PhD Committee can authorize motivated exceptions.

Stages of the PhD:

During the first year PhD students attend courses, prepare and submit their research plan under the guidance of the main supervisor, and they also present a seminar on the state-of-the-art in the area of interest. PhD students are encouraged to develop an excellent command on methodological techniques and to start preliminary research activity.

In the second and third year, they are expected to carry out research activities according to the research plan and schedule, to spend a training period in a foreign university or research centre, to process data and on to write the thesis.

Along the three-year period, PhD students are also required to attend seminars, summer/winter schools, present contributions to international conferences and write scientific papers for high-ranked international journals. The dissertation is expected to be a collection of scientific papers with a comprehensive introduction, discussion and conclusion. The final thesis must be written in English and include abstracts in German and Italian.

This PhD course consists of two curricula.

Curriculum 1: Sustainable agricultural production systems

Producing healthy food through agricultural systems that avoid negative environmental impacts is one of the main challenges globally as well locally. The expertise of the research groups covers soil fertility, plant physiology and biochemistry, entomology, plant pathology, crop management, animal science, and agricultural economics, with special reference to problems of mountain areas. Studies mainly deal with the complexity of biological systems, the interactions among organisms, precision farming, livestock performance and welfare, the effects of climate change and economic system evaluations.

The research activity aims at improving the quality of agricultural products and the sustainability of the production process at local, national and international level, by developing production systems and novel technologies that increase yields, the quality of the products and animal health and welfare, while reducing the use of non-renewable resources, environmental pollution and production costs.

Short Description of the research groups

Agricultural chemistry (Prof. T. Mimmo, Prof. P. Illmer, Dr. L. Borruso)

The research activity of the group of Agricultural Chemistry focuses on the biogeochemical cycles of nutrients in the rhizosphere as affected by biotic and abiotic factors. In particular, the activities are carried out by a multidisciplinary approach including chemical, biochemical, physiological, microbiological and molecular aspects of the mechanisms involved in the nutrient acquisition, translocation and allocation and the interactions occurring within the rhizosphere between plant roots, soil and microorganisms (both bacteria and fungi) affected by biotic and abiotic stress.

Insect chemical ecology and apiculture (Dr. S. Angeli and Prof. J. A. Pickett)

The research group addresses issues related to the evolutionary biology of chemically-mediated insect-plant interactions of agricultural ecosystems. The main goal is to provide novel tools to control pest insects in an environmentally friendly manner, with a chemical ecology approach. In particular, we combine different methodologies (e.g. GC-MS chemical characterization, electroantennography and behavioural assays) to discover how host plants respond to insect attacks through the releasing of volatile compounds and which ecological functions these compounds may mediate. Our studies in apiculture focus on Varroa-Apis interactions, impact of insecticides, and monitoring of pesticides.

Fruit tree physiology and ecosystems (Prof. M. Tagliavini, Prof. C. Andreotti, Dr. L. Montagnani, Dr. A. Zanella and Dr. D. Zanotelli)

The research focuses on the exchange of carbon, mineral nutrients, water and energy between soil, plants and atmosphere in orchards and in vineyards under climate change and multiple environmental (in cooperation with Prof. G. Wohlfahrt and Dr. G. Niedrist) or biotic stresses conditions (in cooperation with Dr. K. Janik). Research approaches include eco-physiological, micrometeorological, isotopic, biochemical, biotechnological and biometric methods, as well as the application of spectral analysis. The final aim is the enhancement of the use efficiency of resources in crop production systems and the development of sustainable management techniques with special emphasis on the quality of the produces.

Agrofood economics, management and marketing (Prof. C. Fischer and Dr. G. Sacchi)

The research activity in this area aims at improving the competitiveness of farms and agribusiness enterprises and the agrofood sector as a whole in South Tyrol and elsewhere. Current approaches and topics include: food supply and value chain economics and management; agribusiness economics and management; market analysis and marketing research; food marketing; tourism and agritourism; regional, agricultural and rural development (in cooperation with Dr. T. Streifeneder); grassroots collective action, alternative agro-food networks, consumer study, sustainable consumption, statistical data evaluation and econometrics (cross-section, time series and pooled datasets).

Phytopathology (Prof. S. Baric, Dr. S. Tomada)

The group of Phytopathology focuses on the investigation of different groups of plant pathogenic organisms affecting crop species in South Tyrol. Particular attention is laid on the research of population structure and diversity of plant pathogens, their interaction with host plants and

epidemiology of plant diseases. Furthermore, new techniques for plant disease diagnosis and sustainable control of plant diseases are developed and implemented. The methods employed range from field studies to advanced microbiological and molecular tools.

Animal Science (Prof. M. Gauly, Prof. J. Sölkner, Dr. T. Zanon, Dr. I. Pouloupoulou, Dr. H. Gamper)

Research activities in the Animal Science Group focus on relevant questions of livestock production. For dairy cattle, evaluations and improvements of existing production systems is the main area of research. In particular, commonly used dairy cattle breeds are compared in terms of performance and functional traits (health, welfare) and different production systems are evaluated. For beef cattle, the group focuses on the development of high-quality beef production systems. In addition, grazing activity and grassland use depending on breed and species is another focus of the work.

Grassland farming (Dr. G. Peratoner, Prof. C. Wellstein, Prof. M. Gauly)

The research focuses on productive and environmental aspect of forage systems (addressing both meadows and pastures), depending on the management intensity and on the site conditions and meteorology. Research approaches include the analysis of vegetation dynamics, forage yield, forage production and nutrient fluxes by means of biometric methods and statistical modelling, with possible applications at the interface with remote sensing. The final aim is providing scientifically sound information and innovation for a sustainable agronomic management of grassland resources under the climatic and topographic challenges of the mountain agriculture.

Curriculum 2: Ecology, environment and protection of mountain areas

The evaluation of the effects of management and climate change on natural ecosystems and humankind is at the core of this subject area: main topics include biodiversity, water quality, protection from natural disasters, and the mitigation of climate change through the maintenance or enhancement of carbon stocks. The use and development of advanced technologies for monitoring and the functional study of ecosystems, including innovative approaches, such as those involving the use of stable isotopes, are some of the features of this area.

Short Description of the research groups

Interdisciplinary landscape, vegetation and conservation ecology (Prof. C. Wellstein, Prof. N. Hölzel, and Dr. G. Bonari)

The working group addresses regional to global environmental issues, such as biodiversity research, functional diversity, climate change research, nature conservation, ecosystem restoration and sustainable and resource-efficient land use. We apply a large set of methods tailored for the scale of interest ranging from biogeography to molecular ecology and study various ecosystems, habitats and land-use types. We pursue studies on a global scale and focus on Europe, the Near East, Russia and North- and South-Africa. Our research covers Mediterranean, temperate and alpine regions. We combine research on ecological patterns and processes, management and conservation, under natural environmental variation and human impact.

Forest ecology (Dr. E. Tomelleri, Prof. H. Pretzsch)

The focus of this research group is the ecology of montane forests and their dynamics in response to natural and human-induced perturbations with special emphasis to climate change and including the biogeochemical cycles (in cooperation with Prof. G. Alberti). The group studies the ecophysiology of forests, integrating functional traits and processes over a range of temporal and spatial scales. The range spans from the single tree (physiology, IoT, proximal sensing) to stand and watershed (biodiversity, resilience, eddy covariance, lidar, UAVs), up to regional and national scales (climate-smart forestry, remote sensing).

River processes and natural hazards mitigation (Prof. F. Comiti, Prof. L. Mao)

The group investigates the complex dynamics of mountain basins through their hydrological and sediment transport processes and by analyzing their morphological evolution, with a special focus on glacierized environments and on debris flow catchments. The activities are mostly related to field

monitoring, GIS modelling and laboratory analysis, and tracers for both water runoff (EC, isotopes) and bedload transport (passive integrated transponders, PITs) are utilized. Ecohydrological issues relative to natural and anthropic-related vegetation are also investigated, as well as modern early warning systems and soil bioengineering techniques.

Possible research projects and supervisors (this is only a partial list of available projects, other topics dealing with the activity of the research groups can be matter of study)		
Curriculum 1: Sustainable agricultural production systems		
Title	Supervisor(s)	Curriculum
1. Mechanisms of drought tolerance in new grapevine genotypes	Prof. C. Andreotti, Dr. D. Zanotelli	1
2. Adaptation and recovery of grapevines from extreme climatic events and multiple stresses	Prof. M. Tagliavini, Dr. G. Niedrist	1 (Joint project with Eurac Research)
3. Ecosystem carbon and water fluxes in vineyards	Prof. M. Tagliavini, Prof. C. Andreotti, Prof. G. Wohlfahrt, Dr. D. Zanotelli, Dr. L. Montagnani	1
4. Manipulation of the ripening syndrome in grapevine berries with different canopy management	Prof. C. Andreotti	1
5. Impact assessment of socio-economic support options for mountain farmers in developing and transition countries	Prof. C. Fischer, Dr. G. Sacchi	1
6. Production efficiency analysis of fruit-growing farms in South Tyrol	Prof. C. Fischer, Dr. G. Sacchi	1
7. The identification of indicators for evaluating animal health and the quality of animal products in mountain livestock systems	Prof. M. Gaulty, Prof. J. Sölkner	1
8. Grazing behaviour of ruminants.	Prof. M. Gaulty, Prof. J. Sölkner	1
9. Soil –plant-microorganism interaction driving rhizosphere dynamics to unravel the underlying mechanisms in crops subject to abiotic stress.	Prof. T. Mimmo, Dr. L. Borruso	1
10. The effect of soil management and agronomic practices on the soil agrobiodiversity networks	Prof. T. Mimmo, Dr. L. Borruso	1
11. Contribution of soil to carbon storage in South Tyrolean apple orchards: possible improvement measures and influence of cover crops	Prof. T. Mimmo, Dr. L. Borruso	1 (project supported by Süditoler Apfelkonsortium/Consorzio Mela Alto Adige)
12. Effect of cover crops on biological soil quality and biodiversity in South Tyrolean apple orchards	Prof. T. Mimmo, Dr. L. Borruso	1 (project supported by Süditoler Apfelkonsortium/Consorzio Mela Alto Adige)
13. Epidemiology of postharvest pathogens of apple	Prof. S. Baric, Dr. S. Tomada	1

14. Epidemiology and biological control of chestnut blight	Prof. S. Baric, Dr. S. Tomada	1
15. Estimation of the forage quality of permanent meadows based on environmental and management-related factors	Dr. G. Peratoner (Laimburg Research Center) Prof. M. Gauily	1 (Laimburg Research Center)
Curriculum 2 Ecology, environment and protection of mountain areas		
Title	Supervisor(s)	Curriculum
16. Climate change and Montane Forests: implications for management and biodiversity conservation.	Dr.E. Tomelleri, prof. H. Pretszch	2
17. Sediment transfer in debris flow catchments Interaction among riparian vegetation, sediment transport and channel morphology in mountain rivers	Prof. F. Comiti, Prof. L. Mao, Dr. V. Coviello	2
18. Monitoring and modelling runoff and soil erosion in mountain forests; sediment transfer and morphological evolution in glacial and periglacial environments	Prof. F. Comiti, Prof. L. Mao, Dr. V. Coviello	2
19. Effect of farm organic fertilizer application on the nutrient cycle and botanical composition of moderately species-rich permanent grassland	Dr. G. Peratoner (Laimburg Research Center) Prof. C. Wellstein	2 (Laimburg Research Center)
20. Ecological transition and open science in mountain grassland research in the global change era	Prof. C. Wellstein	2
21. The protection of cultural heritages goes through the study of biodiversity and chemistry of their surfaces	Dr. L. Borruso	2

Admission requirements

- One cycle degree according to the former Italian system: all
- Master degree (laurea specialistica/magistrale if obtained in Italy): all
- Foreign degrees - Applicants who have done their degrees abroad must have university education of at least five years and hold the requisites listed below.
- B2 level certification of English (or higher).

Candidates are expected to have acquired an appropriate educational, and/or cultural and/or professional background in the field of agriculture, biology or environment, or earth sciences, or animal sciences.

Application for both PhD curricula is not foreseen.

To apply for the PhD programme, applicants must indicate in the application portal max. 3 research topics from the list of the topics included in the PhD curriculum they have applied to (Remember to select topics only from one of the two curricula)

To apply for the PhD programme, applicants must upload in the application portal:

- a motivational letter written in English (max. 1 page)
- Curriculum vitae (CV) (in English and possibly following the EU format that can be downloaded here <https://europass.cedefop.europa.eu/en/documents/curriculum-vitae>). The

CV should include the list of publications, presentations at conferences, awards, and any experience or activity that prove her/his qualification.

- Copy of the master degree (laurea specialistica/magistrale) or of the one cycle degree (former Italian system) or of an equivalent foreign degree, with the final mark/grade and the marks obtained in each exam. For foreign degrees, if the marking system is different, the mark will be transformed. Those who have not obtained the diploma yet, but plan to get it before the enrolment date, must submit a certificate bearing the mark obtained in each exam.
- English Language certification at level B2 (or higher levels).

Language skills are demonstrated on the pre-registration portal (in the "upload language certificates" and/or "register for language examinations" sections) after completing the pre-registration form in the "create/manage applications" section. If the language skills are demonstrated by a high school diploma/diploma or master's degree, the diploma must also be uploaded a second time in the above section.

If the certificates or diplomas were awarded by **Italian** public bodies, the relevant **self-certifications** must be completed in the portal.

If the certificates or diplomas were awarded by **foreign** bodies, the certificates or diplomas must be uploaded to the portal.

Linguistic competence can be proven by:

1. If the **main language of instruction in the final year of the diploma** is English, it counts as C1.
 2. **A bachelor's or master's degree** in English certifies the C1 level. Unibz graduates must upload the language certificates they have obtained or declare that they have passed the language examinations at the Unibz Language Centre (B2, B2+ or C1).
 3. **A recognised language certificate** (see the list of recognised certificates from the Language Centre: [unibz-recognised-language-certificates-2019-2020.pdf](#)).
- Please note:** the certificate must not have been obtained more than 5 years before the application for recognition.

Other documents to be included in the application if available:

- reference letters, written in English from a university lecturer or a researcher from a research institute (drawn up in the year of the call or in the previous one);
- copy of the publications (including the master thesis, published or accepted).

Evaluation criteria and process

Admission to the programme is based on the evaluation of a) the academic qualification as it appears from the CV and other documents, b) of the motivational and reference letters, and c) on the outcome of the interview.

For those applicants who fulfil the admission requirements, the Evaluation Committee will first evaluate the application and draw up a short list of applicants admitted to the interview. The Committee will select the best applicants on the basis of a comparative assessment.

The following points will be awarded:

- up to 23 points for the academic qualification of the applicant as it appears in the CV and in the other documents, for the motivational and reference letters;
- up to 7 points for the specific qualification of the candidates for carrying our research within the project topics they have selected;
- up to 20 points for the interview.

The final score is the sum of the previous scores. The maximum score is 50. The lowest score to be

admitted to the ranking list is 25/50. The final score is used for ranking the applicants and to establish A) the list of the admitted candidates and B) the list of candidates entitled to receive the fellowships. If two or more applicants have the same score, the younger candidate will be given priority.

The rank list will be published on the website of unibz (www.unibz.it) and at the notice boards of the Faculty of Science and Technology.

Examination dates:

Description	Date	Place
Personal Interview	21 and 22 July 2022	At unibz for those living in Italy. For other admitted candidates, the opportunity will be offered, as an alternative to physical presence at the unibz spaces, to take the interview by videoconference - Microsoft TEAMS unless otherwise notified.

PhD-positions and grants

Total PhD-positions: 17

PhD-Positions with grants from the University: 7 (5 for curriculum 1 and 2 for curriculum 2)
 PhD-positions with other grants: 7 (4 for curriculum 1 and 3 for curriculum 2)
 PhD-positions without grant: 3 (2 for curriculum 1 and 1 for curriculum 2)

PhD scholarship bound to specific research topics/areas:

2 scholarships with bound research topic and minimum 6-month study period abroad requirement pursuant to MD 351/2021 funded by PNRR:

Research topics:

1. Ecological transition and open science in mountain grassland research in the global change era
2. The protection of cultural heritages goes through the study of biodiversity and chemistry of their surfaces.

3 scholarships with bound research topic and minimum 6-month study period abroad and minimum 6-month in-company internship pursuant to MD 352/2021 funded by PNRR:

Research topics:

1. Contribution of soil to carbon storage in South Tyrolean apple orchards: possible improvement measures and influence of cover crops (in collaboration with Consorzio Mela Alto Adige)
2. Effect of cover crops on biological soil quality and biodiversity in South Tyrolean apple orchards (in collaboration with Consorzio Mela Alto Adige)
3. Adaptation and recovery of grapevines from climatic extreme events and multiple stresses in collaboration with Eurac Research Centre).

2 scholarships with bound research topic in collaboration with Laimburg Research Centre:

Research topics:

1. Effect of farm organic fertilizer application on the nutrient cycle and botanical composition of moderately species-rich permanent grassland
2. Estimation of the forage quality of permanent grassland in the Province of Bolzano by means of predictive statistical models and/or remote sensing

1 scholarship with bound research topic in honor of Prof. Giustino Tonon:

Research topic:

1. Climate change and Montane Forests: implications for management and biodiversity conservation