



**Estonian University of Life Sciences**  
**INSTITUTE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES**

# Contents

GENERAL INFO	4
STRUCTURE	12
CENTRES' MAP	35
CENTRES	36
SCIENTIFIC ACTIVITIES	47
STUDIES	52
STUDENT LIFE	59
CAMPUS MAP	61

**Compilers:** Elis Vollmer, Kristel Kirsimäe

**English Editor:** Marcus Denton

**Design:** Mait Luidalepp

**Photos:** Kalev Sepp, Elis Vollmer, Kristel Kirsimäe, Valdo Kuusemets, Merle Ööpik, Janar Raet, Merrit Noormets, Alar Astover, Tiit Hunt, Anu Metsar, Asta Libek, Neeme Univer, Krista Tiirmaa, Kadri Karp, Toomas Tõrra, Toomas Muru, Tiiu Kull, Olavi Kurina, Ülo Niinemets, Bellis Kullman, Marika Mänd, Karin Kauer, Kalju Tisler, Urmas Sellis, Rinaldo Anni, Steffen M. Noe, Joel Kuusk, Helja-Sisko Helmisaari, Elen Peetsmann, Kerttu Tammik, Peeter Veromann, Irma Zettur and departments

**Print:** Ecoprint

**INSTITUTE OF AGRICULTURAL AND  
ENVIRONMENTAL SCIENCES**



[www.emu.ee](http://www.emu.ee)

**Eesti Maaülikool**

Estonian University of Life Sciences





**The mission of the Estonian University of Life Sciences is to guarantee sustainable use of natural resources and enhance rural development.**

The Estonian University of Life Sciences (IAES) is the only university in Estonia whose priorities in academic and research activities provide the sustainable development of natural resources necessary for the existence of Human Society as well as the preservation of heritage and habitat.

The Estonian University of Life Sciences undertakes internationally acknowledged science research, carries out innovative activities, provides science based academic education and promotes life-long learning.

The Institute of Agricultural and Environmental Sciences at the Estonian University of Life Sciences is responsible for research and development, and university level education in plant cultivation and plant biology, horticulture, plant health, soil science and agrochemistry, landscape ecology and management, landscape architecture, biological diversity and applied hydrobiology in Estonia.

**According to QS World University Rankings, EMU belongs in the top 100 universities in the world in the field of Agriculture and Forestry. Thomson Reuters Essential Science Indicators database places EMU in the top 1% most cited research facilities in the world in the field of plant and animal science as well as environment and ecology.**

**In addition, three professors (Prof Ülo Niinemets, Prof Robert Bunce and Leading Researcher Peeter Nõges) belong to the top 1% of the most cited researchers list of ecology and environmental sciences.**



## SHORT HISTORY

The Institute of Agricultural and Environmental Sciences was established in 2005 by merging six of the ten research and education institutions, which comprised the Estonian University of Life Sciences:

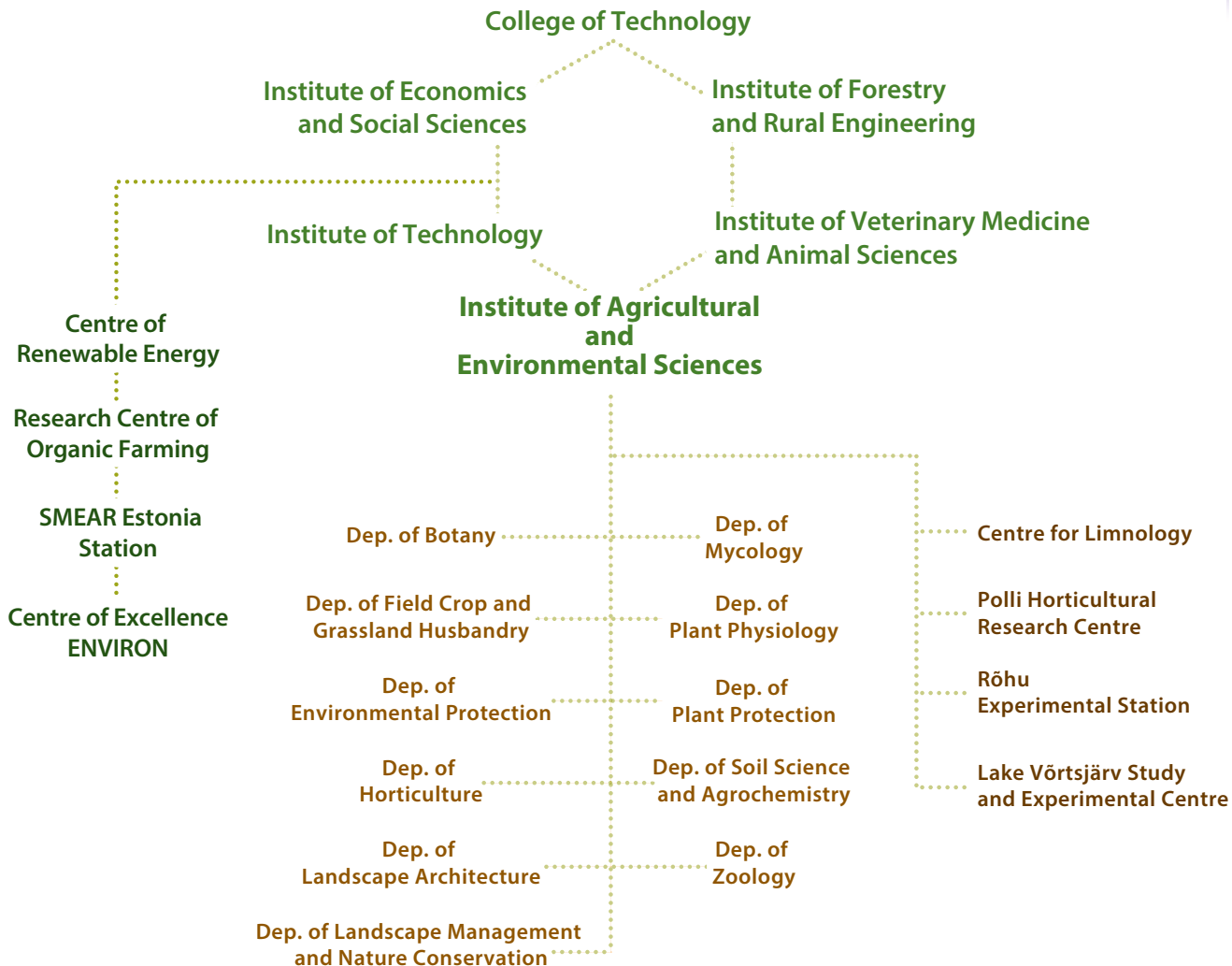
- I. The Faculty of Agronomy (which consisted of five Institutes - Horticulture, Plant Cultivation, Plant Protection, Soil Science and Agrochemistry, and Grassland Science),
- II. The Institute of Environmental Protection,
- III. The Institute of Experimental Biology,
- IV. The Institute of Zoology and Botany,
- V. Polli Horticultural Research Centre and
- VI. The Plant Biotechnology Research Centre EVIKA (which at the time of the merger belonged to the Faculty of Agronomy).

The Institute of Agricultural and Environmental Sciences is the largest of the five institutes, which comprise the Estonian University of Life Science, and attracts 74% of the research financing at the University and approximately 5% of Estonian research financing.

Currently the Institute of Agricultural and Environmental Sciences has 11 departments, two research centres and one experimental station. IAES is also involved in the activities of several interdisciplinary centres in the University.



## Estonian University of Life Sciences



## INTERNATIONAL RELATIONS AND COLLABORATION

The Estonian University of Life Science University (EMU) has set as an objective active participation in international networks. Since 1995, EMU has been part of the NOVA-BOVA network that unites agricultural universities and faculties of the Nordic ([www.nova-university.org](http://www.nova-university.org)) and Baltic ([www.bova-university.org](http://www.bova-university.org)) countries. The aim of NOVA-BOVA has been to enable Master's degree students from the Baltic States to participate in MSc courses in neighbouring countries. Every year EMU arranges at least two intensive courses in English, as do all the other agricultural universities representing each of the Baltic countries.

EMU has participated in the SOCRATES/ERASMUS Programme since 1999 and was granted the University Charter also for the beginning period (2014-2020). EMU has at present more than 200 ERASMUS agreements with 110 European Universities. Over the years almost 500 EMU students have benefitted from the student exchanges and internship possibilities in Europe.

EMU is involved in two Erasmus Mundus Action II partnerships called INFINITY and EFFORT. They are scholarship mobility schemes directed towards citizens of Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine. With a focus on urban agriculture, sustainable development, environmental protection, smart growth and urban design, the projects offer the students from the above-mentioned countries the opportunity to study at EMU.



Our two-year Master program “Landscape architecture” is very popular among our incoming exchange students. Since 2006 French students of ISA, Lille have an annual study week in Estonia on East-European Environmental problems and management and Estonian students have a return visit to France. More than 240 students have participated in this exchange so far.

There are many European and global networks for the exchange of information and provision of teaching opportunities etc. EMU has been involved with the following:

**AGRIMBA** - International Network for the MBA Agribusiness and Commerce

**AGRINATURA** - The European Alliance on Agricultural Knowledge for Development

**ALTER-net** - A Long-Term Biodiversity, Ecosystem and Awareness Research Network

**BSRUN** - Baltic Sea Region University Network – courses for students, librarians, language teachers, university officials, etc

**CEDIA** - the European Confederation of Agronomists Associations

**ERABEE** - Network for Education and Research in Agricultural and Biosystems Engineering in Europe

**GCHERA** - the Global Confederation of Higher Education Associations for the Agricultural and Life Sciences

**Le:Notre** - network on landscape architecture education

**IROICA** - the International Relations Officers' Network of the Association for European Life Science Universities

**Nordnatur** - nature has no borders. Supported by NORDPLUS and offers scholarships for student and staff exchange in the field of natural resource management

**NOVA - PhD network** (Nordic agricultural universities);

**NOVA-BOVA University Network** - MSc courses for students at Nordic-Baltic agriculture related universities

**SILVA** - European Forest Science Academic Network

**SuWaCo** - Education for Sustainable Development of Water Bodies and Coasts



At the moment the Institute of Agricultural and Environmental Sciences and Institute of Forestry is engaged annually into ca. 100 different research projects, incl. 5 Horizon 2020 and 7th FP projects; 3 national institutional research grants (IUT); 2 personal research grants (PUT). The main financial supporters of applied research have been the Ministry of Agriculture (now Ministry of Rural Affairs), the Ministry of Environment, and the Environmental Investment Centre and several international projects (Horizon 2020, FP 7, Interreg, Life+, Europe Culture, ERA-Net, Cost-Action).

The Institute of Agricultural and Environmental Sciences also actively promotes organizational co-operations with local entrepreneurs and business institutions in any area where mutual cooperation is possible. One of the aims of IAES is to make research know-how and inventions / innovations more publicly accessible.

Society oriented knowledge and technology in strategic areas enables the Institute to be a key partner for the Ministry of Education and Research, the Ministry of Rural Affairs, the Ministry of the Environment, Estonian Biofuels Association, Estonian Berry Growers Union, etc. We also work closely with most of Estonian largest companies like AS Estonian Cell, Ramboll Eesti AS, Eesti Energia, Agrochema Eesti OÜ, and several small and medium-size enterprises.



### Examples of development projects in co-operation with Estonian businesses:

- Storage possibilities of Estonian fruits and vegetables in a controlled and modified atmosphere
- Developing the Organic Plant Production Centre at EMU to optimize organic cropping systems with suitable cultures, varieties and cropping systems
- Developing the Competence Centre of Food Production Chain
- Collection and conservation of Plant Genetic Resources of agricultural plants



The Institute of Agricultural and Environmental Sciences has 11 research and teaching departments, two research centres and one experimental station.

### Administration

**Director:** Aret Vooremäe

**Director of Studies:** Endla Reintam

**Secretary:** Alvi Rõigas

**Head of Scientific Council:** Kalev Sepp

- Department of Botany
- Department of Environmental Protection
- Department of Field Crop and Grassland Husbandry
- Department of Horticulture
- Department of Landscape Architecture
- Department of Landscape Management and Nature Conservation
- Department of Mycology
- Department of Plant Physiology
- Department of Plant Protection
- Department of Soil Science and Agrochemistry
- Department of Zoology

### Centres

- Polli Horticultural Research Centre
- Centre for Limnology
- Rõhu Experimental Station
- Lake Võrtsjärv Study and Experimental Centre



### The Institute of Agricultural and Environmental Sciences

Institute of Agricultural and Environmental Sciences  
Fr.R. Kreutzwaldi 5  
51014 Tartu  
Estonia

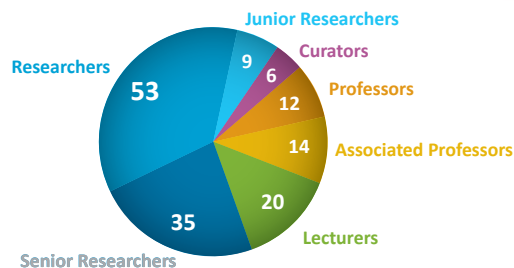
@ <http://pk.emu.ee/en/>

**Contact:** Phone (+372) 731 3820  
alvi.roigas@emu.ee  
Fax: (+372) 731 3988



The academic staff of the EMU comprises of professors, associated professors, lecturers and assistants who are engaged in teaching plus research fellows; leading researchers, senior-researchers and researchers. The average age of our staff is 47.3 years; gender division is 43 % Male and 57% Female.

### Division of academic staff of Institute of Agricultural and Environmental Sciences (Sept. 2015) (persons)



Publication of research results has intensified during recent years. The number of Thomson Reuters WEB of SCIENCE reflected papers increased by 23% during the period 2011–2013, publication per academic staff member has increased from 0.73 to 0.85. According to the University Action Plan on R&D (2015–2020) the aim is reach to one publication per person by 2020.

### IMPROVED INFRASTRUCTURE

**2007-2009** – Intensive modernization and development of laboratories

**2008** – Improvement of the efficiency of Laboratory of Soil Science and Agrochemistry

**2008** – Pilot installation of biogas Instrumentation, Control and Automation

**2009** – Development of the Centre for Limnology

**2009** – Development of the GoodFruit Project within the Estonian-Latvian programme

**2013** – Opening of the Science Centre of Renewable Resources (Green Building)

**2011-2013** – Estonian Science Roadmap projects Estonian Environmental Observations and Plant Biology

**2015** – The Station for Measuring Ecosystem-Atmosphere Relations (SMEAR) was opened at Järvselja

**2015** – Opening of Competence Centre for Knowledge-based Health Goods and Natural Products - PlantValor

**2015** – Opening of the renewed Lake Võrtsjärv Study and Experimental Centre

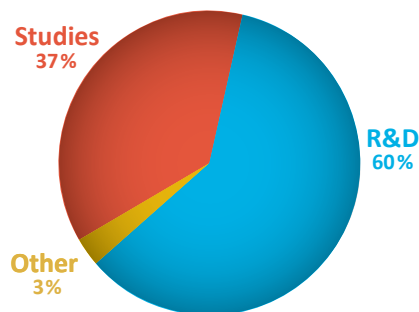
**2015** – Purchase of new limnology reserach boat “Lota”



### THE BUDGET

The annual budget in 2015 of the Institute of Agricultural and Environmental Sciences is 6.4 million Euros. The chart illustrates the major funding sources.

The annual budget in 2015 of the Institute of Agricultural and Environmental Sciences (%)



## SPECIMEN COLLECTIONS

IAES administers several specimen collections for the purposes of research and teaching:

- TAAM, Estonia's largest and most important collection of fungi, established in 1950 (185,000 specimens);
- EEA, collection of parasitic micro fungi and species growing on cultivated plants established in 1922 (23,000 specimens);
- TFC, Collection of fungal living cultures, established in 1970 (400 species and over 2,000 strains);
- IZBE, largest zoological collection in Baltic States (850,000 specimens), with more than 320 primary type specimens.
- Herbarium of vascular plants and mosses [TAA] - largest Estonian flora collection;
- Hydrobiological collection [EMHC];
- Soil museum [MUMU];
- Plant genetic resources collection at Polli Horticultural Research Centre;

Holotype of *Ramitia obliquelineata*  
Viidalepp, 1988 in entomological collection



Soil Museum



Example of the entomological collection



Mycological collections received contemporary rooms in 2013



ÖNNELEID

Esan Maailma

## THE GREEN UNIVERSITY INITIATIVE

@ <https://www.emu.ee/en/about-the-university/green-university-initiative/>

The mission of our university is to foster sustainable use of natural resources through knowledge based education. In order to support this concept we have created the Green University Initiative.

The initiative involves all the students and staff in EMU. We believe that EMU should be open to new ideas and focus on new environmentally friendly solutions in our everyday life. Developing The Green University is a long term process that also needs to be integrated with our educational and scientific activities.

The main areas in which we are developing green university:

- **Research** - promote sustainable development through research and development activities;
- **Education** - integrate the principles of sustainable development into teaching process and study outcomes;
- **Campus** - create a healthy learning, working and recreational environment, considering the principles of reducing the ecological footprint;
- **Society** – raise the environmental awareness of the employees and students of the university and the society and enhance collaboration with the society in the course of performing the aims related with sustainable development.



## THE GREEN BUILDING

The University aims at creating a high-quality, motivational working environment for research and studies and continues to develop the Tähtvere campus (see the map on page 65). The general principle of the spatial development is that structural units requiring similar infrastructure are located within the same building. EMU has decided to concentrate all so called “green” specialties (agriculture, forestry and environmental sciences) into one building, thus calling it the Green Building. To achieve that, we have built additional blocks of lecture rooms and Science Centre of Renewable Resources. Environmentally friendly materials and techniques are used when constructing new buildings in the campus.





## DEPARTMENT OF BOTANY

*The broad research project in cooperation with zoology and landscape departments is concentrating on the non-additive phenomena in ecological borders and their role for ecosystems. The department is responsible for curriculum on nature tourism and has at its disposal the largest scientific collection of Estonian plants that is important basis also for several monographies.*

## Research and studies

### • Diversity patterns in agricultural systems

Old and traditional agricultural systems provide space and habitats for many species. Habitat loss and fragmentation in such systems are usually associated with decline in biodiversity, but this relationship might not have solely negative effects on plants and animals. We assess the diversity patterns in patchy agricultural landscapes by using novel concepts and models that assume also positive effects of fragmentation to diversity, e.g. via border richness.

### • Species persistence dynamics

Recent publication of second- and even third-generation national atlases of species distribution maps provide data for assessing how well plant species have actually persisted during the last century, which have seen fundamental transformations of societies. Persistence patterns analysis can give us deeper insight of what are the mechanisms of securing species survival, how much human activities influence persistence patterns and how much does these depend on ecological context or larger-scale biogeographic and macroecological processes.

### • Evolution, phylogeography and population biology

We have studied population biology as a key for understanding species evolution as well their conservation needs in several families. Orchids with their complicated life cycle give broad opportunities for that research. We germinate seeds asymbiotically and work on parentage analysis. DNA markers are used to understand the diversity and evolution of these plants. Long-term population dynamics and vegetative dormancy is also studied in several orchid species. Isozyme diversity has been studied in various agriculturally important plant species and their wild relatives belonging to the grass and legume genera.

### • Grassland restoration processes

Restoring overgrown habitats is more than just cutting trees and bushes. We investigate habitat persistence borders and determine restoration requirements on different types of grasslands, mainly alvars and coastal meadows. Botany Department is involved in LIFE+ project "Life to Alvars" which aims to recreate 2500 ha of alvar habitat in Estonia. While this project is currently creating patches where to study different restoration patterns, we have several coastal meadows where management after restoration have been constant for over 10 years, which gives us good opportunity to assess its effects on soils and vegetation.

### • Past landscape and plant diversity reconstructions

Understanding the roles of past climate changes and human impact on biodiversity is important for being able to make predictions on possible future scenarios especially in the face of today's climate change and anthropogenic impact. Recently developed models allow quantitative land-cover reconstructions at different spatial scales based on sedimentary pollen. These models and modern pollen and vegetation databases help us to test different scenarios and help to understand the nonlinear relationships between pollen and vegetation diversity.

### • Sustainable bioenergy production options in agriculture

Estonia has significant resources for bioenergy production. This can be achieved through cultivation of dedicated bioenergy crops or better usages of existing biomass from nature. Hence we are studying the possible species, management options and diseases of the most promising bioenergy crop in local weather conditions – willow short rotation coppice. We also analyse the potential and energy





conversion options of plant biomass from seminatural grasslands that is harvested without further usage to meet the NATURA2000 aim. We assess also the environmental impact of bioenergy production.

#### • Nature tourism

Research on sustainable planning and stakeholder involvement in nature tourism.

### Main staff

**Tiiu Kull** – Professor, PhD, Head of Department, botany and ecology, distribution and population biology of threatened species, biodiversity conservation

**Malle Leht** – Associated Professor, PhD, taxonomy (especially *Rosaceae* and *Fabaceae*)

**Kaire Lanno** – Associated Professor, PhD, plant ecology

**Katrin Heinsoo** – Senior Researcher, PhD, sustainable biomass production for bioenergy, bioenergy in semi-natural meadows, short rotation coppice, vegetation filter

**Lauri Laanisto** – Senior Researcher, PhD, plant ecology – macroecological biodiversity patterns, intraspecific variability and climate change effects, evolutionary formation of plant communities, global patterns of plant stresses and trade-offs, the effects of heterogeneity and fragmentation on diversity.

**Kadri Tali** – Senior Researcher, PhD, reproduction and survival of Estonian orchids

**Vivika Väli** – Researcher, PhD, palaeoecology - quantitative vegetation reconstructions using pollen analysis.

**Vello Jaaska** – Researcher, DSc, genetic diversity and phylogenetic affinities among different *Fabaceae* and *Poaceae* by isozyme markers.

**Thea Kull** – Researcher, PhD, plant distribution and ecology, herbarium database

**Karin Kaljund** – Researcher, PhD, ecology, biosystematics and -physiology

**Roger Evans** – PhD, nature tourism

**Lea Sudakova** – Lecturer in nature tourism

**Aivar Ruukel** – Lecturer in nature tourism

**Marika Kose** – Lecturer in nature tourism

### Department of Botany

Estonian University of Life Sciences  
Kreutzwaldi 5  
51014 Tartu  
Estonia

@ <http://pk.emu.ee/en/structure/botany>

**Contact:** Prof. Tiiu Kull  
[tiiu.kull@emu.ee](mailto:tiiu.kull@emu.ee)  
(+372) 731 1883



### Recent publications

- Holm, B.; Heinsoo, K. (2013). The influence of composted sewage sludge on the wood yield of willow short rotation coppice - an Estonian case study. *Environment Protection Engineering*, 39(1), 17 - 32.
- Poska, A.; Saarse, L.; Koppel, K.; Nielsen, A.B.; Avel, E.; Vassiljev, J.; Väli, V. (2014). The Verijärv area, South Estonia over the last millennium: A high resolution quantitative landcover reconstruction based on pollen and historical data. *Review of Palaeobotany and Palynology*, 207, 5 - 17.
- Ilves, A.; Metsare, M.; Tali, K.; Kull, Tiiu (2015). The impact of recent colonization on the genetic diversity and fine-scale genetic structure in *Orchis militaris* (L.). *Plant Systematics and Evolution*, 301, 1875-1886.
- Kana, S.; Otsus, M.; Sammul, M.; Kull, Tiiu; Laanisto, L. (2015). Extreme Change in Species Composition over 55 years: A Re-Sampling Study of Species-Rich Meadows in Estonia. *Annales Botanici Fennici*, 52(3-4), 419 - 431.
- Laanisto, L.; Sammul, M.; Kull, Tiiu; Macek, P.; Hutchings, M.J. (2015). Trait-based analysis of decline in plant species ranges during the 20th century: a regional comparison between the UK and Estonia. *Global Change Biology*, 21, 2726–2738.
- Melts, I.; Heinsoo, K. (2015). Seasonal dynamics of bioenergy characteristics in grassland functional groups. *Grass and Forage Science*, 70(4), 571 - 581.
- Metsare, M.; Ilves, A.; Haldna, M.; Kull, T.; Tali, K. (2015). Four Seed Quality Measures in Orchids with different Pollination Systems. *Acta Botanica Gallica*, 1 - 9. [in press]



## DEPARTMENT OF ZOOLOGY

**The department is devoted to study and teach different aspects of animal biota: from systematics to ecology and conservation. In cooperation with botany and landscape departments, the broad research project emphasizes on the non-additive phenomena in ecological borders and their role for ecosystems.**

## Research and studies

### Conservation genetics of threatened bird species

Genetic diversity and gene flow shape animal populations both in large and small spatial scale. Our studies concentrate on the structure of European populations of Lesser and Greater Spotted Eagles, as well as the Black Stork; we have also been contributing to the analysis of European white-tailed eagle populations and to study on genetic variation and structure of Baltic population of Dunlin. These threatened species, as well as the Golden Eagle and the Osprey are studied also on the smaller scale in Estonia, where studies of genetic diversity and gene flow are complemented with those of population turnover.

### Long-term population studies including conservation and migration ecology

We have analysed the dynamics of breeding performance and sex ratio, changing habitat selection, population genetics and breeding biology of several raptors, as well as wintering waterbirds and meadowbirds. Long-term studies of Common Gull since 1962 enable to examine the mechanisms of the persistence and development of populations in changing environment. Both demographic and quantitative genetic aspects in conjunction with lifetime changes in individual's physiological state are important for insight into evolutionary dynamics and organism's ability to respond to climate change. Migration patterns of various raptors, Great Snipe and Dunlin have been studied by combining the novel technologies, such as GPS-telemetry, light level geolocators, and traditional ring recovery analysis. In addition to the contribution to the fundamental science, our studies have included also applied value and resulted to the nine conservation action plans for different bird species.

### Diversity, systematics and phylogeny of *Diptera* and *Lepidoptera*

Majority of the insect's diversity of the World is still waiting to be described while the ability for that is continuously declining. We are aimed at filling this gap in some extent with studying genus- and family group level systematics, taxonomy and phylogeny of mycetophiloid *Diptera* and geometroid *Lepidoptera*, based on combined analyses of morphological data and DNA sequences. We are focusing to the diversity of these taxa all over the World with describing temporal and spatial aspects of its changing.

The department maintain the largest entomological collection (acronym IZBE) in the Baltic States with more than 850 000 curated insect specimens; ca 3200 type specimens, including 329 name bearing types, from all over the World form an invaluable part of this collection.

## Recent publications

- Konovalov, A.; Kaldma, K.; Bokotey, A.; Brossault, P.; Chapalain, F.; Dmitrenok, M.; Dzyubenko, N.; Sellis, U.; Strazds, M.; Strenna, L.; Treinys, R.; Zielinski, P.; Väli, Ü. (2015). Spatio-temporal variation in nestling sex ratio among the Black Stork *Ciconia nigra* populations across Europe. *Journal of Ornithology*, 156(2), 381 - 387.
- Rattiste, K., Klandorf, H., Urvik, J., Sepp, T., Asghar, H., Hasselquist, D., Cooley, C., Hörak, P. (2015). Skin pentosidine and telomere length do not covary with age in a long-lived seabird. *Biogerontology*, 16(4), 435-441.
- Väli, Ü. (2015). Monitoring of spotted eagles in Estonia, 1994–2014: Decline of the Greater (*Aquila clanga*) and stability of the Lesser Spotted Eagle (*Aquila pomarina*). *Slovak Raptor Journal*, 9(1), 55 - 64.
- Pavon-Jordan, D.; Fox, D. A.; Clausen, P.; Dagys, M.; Deceuninck, B.; Devos, K.; Hearn, R.; Holt, C.; Hornman, M.; Keller, V.; Langendoen, T.; Ławicki, Ł.; Lorentsen, S.H.; Luigujõe, L.; Meissner, W.; Musil, P.; Nilsson, L.; Paquet, J.-Y.; Stipnicie, A.; Stroud, D.A.; Wahl, J.; Zenatello, M.; Lehikoinen, A. (2015). Climate-driven changes in winter abundance of a migratory waterbird in relation to EU protected areas. *Diversity and Distributions*, 1 - 12.
- Kurina, O.; Öunap, E.; Pöldmaa, K. (2015). Two new *Neuratelia Rondani (Diptera, Mycetophilidae)* species from Western Palaearctic: a case of limited congruence between morphology and DNA sequence data. *ZooKeys*, 496, 105 - 129.
- Kurina, O.; Hippa, H. (2015). A review of the South Pacific *Manota Williston (Diptera, Mycetophilidae)*, with the description of thirteen new species. *Zootaxa*, 4020(2), 257 - 288.
- Hausmann, A.; Viidalepp, J. (2012). *The Geometrid Moths of Europe vol. 3*. Denmark, Apollo Books. 743 pp.

## Main staff

**Olavi Kurina** – Senior Researcher, PhD, Head of Department, Systematics and faunistics of Diptera (Sciaroidea)

**Ülo Väli** – Senior Researcher, PhD, Population ecology and conservation of Spotted Eagles

**Jaan Viidalepp** – Senior Researcher, PhD, Systematics of Lepidoptera (Geometridae)

**Kalev Rattiste** – Researcher, PhD, Long-term population studies of the Common Gull

**Katrin Kaldma** – Head of laboratory, MSc, Genetic analysis of black stork populations

**Leho Luigujõe** – Specialist, Ecology and conservation of Great Snipe and waterbirds, migration of birds.

**Erki Õunap** – Specialist, PhD, Systematics and faunistics of Lepidoptera

**Hannes Pehlak** – Senior laboratory assistant, MSc, Ecology of waders

**Märt Kruus** – Specialist, databasing, technical work in insect collection

**Tõnu Kesküla** – Curator, databasing, technical work in insect collection



## Department of Zoology

Estonian University of Life Sciences  
Kreutzwaldi 5  
51014 Tartu  
Estonia

@ <http://pk.emu.ee/en/structure/zoology>

**Contact:** Olavi Kurina  
[olavi.kurina@emu.ee](mailto:olavi.kurina@emu.ee)  
(+372) 731 1887



## DEPARTMENT OF FIELD CROPS AND GRASSLAND HUSBANDRY

*We are a research intensive department dedicated to teaching, research and service related to plant production and grasslands. We conduct fundamental and applied research at multiple scales to ensure the sustainable and efficient management of arable and grassland systems. The department also offers undergraduate and graduate programs that will train tomorrow's agronomists.*

### Research and studies

- Adjustment of soil humus and nutrient balance;
- Phytproductivity of green manure crops;
- Effect of grassland fertilization, botanical composition and number of cuts on its yield and humus stock of soil;
- Upgrade of an internet based decision support system on plant protection;
- Complex applied research for different cultivation methods (incl. direct drilling)
- Impact of biochar on soil and plants;
- Fertilization properties of biomass ash;
- The situation and dynamics of carbon stock in Estonian agricultural soils;
- Long-term impact of organic and conventional cultivation on soil fertility, weeds and on crop yields and quality in crop rotation.



### Recent publications

- Kauer, K., Tein, B., Sánchez de Cima, D., Talgre, L., Eremeev, V., Loit, E., Luik, A. 2015. Soil carbon dynamics estimation and dependence on farming system in a temperate climate. *Soil and Tillage Research*, 154: 53–63.
- Tein, B., Kauer, K., Eremeev, V., Luik, A., Selge, A., Loit, E. 2014. Farming systems affect potato (*Solanum tuberosum* L.) tuber and soil quality. *Field Crops Research*, 156: 1–11.
- Raave, H., Keres, I., Kauer, K., Nõges, M., Rebane, J., Tampere, M., Loit, E. 2014. The impact of activated carbon on  $\text{NO}_3^-$ -N,  $\text{NH}_4^+$ -N, P and K leaching in relation to fertilizer use. *European Journal of Soil Science*, 65(1): 120–127.
- Tampere, M., Kauer, K., Keres, I., Loit, E., Selge, A., Viiralt, R., Raave, H. 2014. Effects of sward botanical composition on nitrogen and potassium leaching in cut grassland. *Zedmirbyste-Agriculture*, 101(4): 389–394.
- Alaru, M., Talgre, L., Eremeev, V., Tein, B., Luik, A., Nemvalts, A., Loit, E. 2014. Crop yields and supply of nitrogen compared in conventional and organic farming systems. *Agricultural and Food Science*, 23: 317–326.
- Talgre, L., Lauringson, E., Roostalu, H., Makke, A. 2014. Phosphorus and potassium release during decomposition of roots and shoots of green manure crops. *Biological Agriculture and Horticulture: An International Journal for Sustainable Production Systems*, 30(4): 264–271.

## Main staff

**Evelin Loit** – Senior Researcher, PhD, Head of Department, Plant genetics, plant biotechnology

**Juhan Jõudu** – Prof. Emeritus, PhD, Field crop husbandry, potato, oilseed rape

**Rein Viiralt** – Prof. Emeritus, PhD, Grassland technologies and forage production, grassland science, grassland nutrition and fertilizer application; irrigation of grasslands

**Are Selge** – Assoc. Prof. DSc, Estonian agriculture, state regulation of the agricultural sector, advisory service and systems, grassland science

**Enn Lauringson** – Assoc. Prof., DSc, Land cultivation, soil management, green manures, weed management

**Henn Raave** – Researcher, DSc, Lawns, grassland science, biochar, ash

**Karin Kauer** – Researcher, PhD, Nutrient cycling in plant-soil systems, humus stock of soil

**Liina Talgre** – Researcher, PhD, Soil management, green manures, weeds, crop rotation, Internet based decision support system for plant protection

**Maarika Alaru** – Researcher, DSc, Winter crops, triticale, bioenergy, field crop husbandry

**Vyacheslav Eremeev** – Researcher, PhD, Field crop husbandry, crop rotation, organic and conventional farming, potato cultivation

**Berit Tein** – Lecturer, PhD, Organic and conventional farming, potato cultivation, field crops

**Erkki Mäeorg** – Lecturer, MSc, Seed quality, oil quality, rape seed cultivation

**Argaadi Parol** – Lecturer, PhD, Botany with fundamentals of agronomy, forage plants

**Toomas Laidna** – Lecturer, MSc, Agricultural botany

**Indrek Keres** – Specialist, MSc, Estonian agriculture, regulation of agriculture and environment in European Union, Field crop husbandry

**Maiilis Tampere** – Specialist, MSc, Organic fertilizer, leaching

**Seyed Mahyar Mirmajlessi** - junior researcher, MSc, Molecular markers in plant pathogen diagnostics

## Department of Field Crops and Grassland Husbandry

Estonian University of Life Sciences  
Kreutzwaldi 5  
51014 Tartu  
Estonia

@ <http://pk.emu.ee/en/structure/fieldcrophusbandry>

**Contact:** Evelin Loit  
[evelin.loit@emu.ee](mailto:evelin.loit@emu.ee)  
(+372) 731 3502; (+372) 5912 5549



## DEPARTMENT OF MYCOLOGY

- The department is devoted to keep the largest fungal collection in Estonia and to teach the fungal diversity, with special attention to endophytic fungi.



## Research and studies

## Mycological collection

The total number of dry specimens is ca 200 000, including ca 500 type specimens of new taxa described mostly by Estonian mycologists. More than 800 mycological studies based on collections have been published. In cooperation with the Museum of Natural History of the Tartu University the databasing of collection is in process, > 50 % of specimens data are public available using PlutoF platform of biodiversity databases via <http://natarc.ut.ee/seenekogud.php>. The collection comprises 3 subcollections with separate international acronyms: TAAM, EAA and TFC.

**Mycological collection EAA**, the mycological collection of E. Leppik, comprises mainly parasitic microfungi and species growing on cultivated plants, >23 000 specimens in total. Herbarium was established by the first professional mycologist, professor Elmar Leppik 1922 at the laboratory of plant diseases of Tartu University.

**Mycological collection TAAM** was founded in 1950 at the Institute of Zoology and Botany where the distribution, taxonomy and phylogeny of mainly pore and gill fungi, gasteromycetes and discomycetes was being studied. The fungarium is one of the most important collections of

macromycetes of the northern part of Eurasia, and the most complete collection of Aphyllophoraceous fungi of Siberia and the Russian Far East.

**Mycological collection TFC**, the fungal pure culture collection was founded in 1970 at the former Institute of Zoology and Botany. It contains ca 1500 fungal strains representing ca 400 fungal species, online catalogue is available <http://iris.ut.ee/unite/temp/cfungi/index.php>.

Using collection specimens the **Fungal Genome Size Database** has been developed by Bellis Kullman. The database is available online <http://www.zbi.ee/fungal-genomesize/>.

## Recent publications

- Tamm, H. Põldmaa, K. Kullman, B. 2010. Phylogenetic relationships in genus *Geopora* (Pyronemataceae, Pezizales). *Mycological Progress*, 9(4), 509–522.
- Kullman, B., Tamm, H., Kullman, K. 2011. Fungal Genome Size Database. NAR Molecular Biology Database Collection entry number 955. *Nucleic Acids Research*, 39 (November), 955.
- Parmasto, E; Saar, I; Larsson, E; Rummo, S. 2013. Phylogenetic taxonomy of *Hymenochaete* and related genera (*Hymenochaetales*). *Mycological Progress*, 1 - 10.
- Varvas, T.; Kasekamp, K.; Kullman, B. 2013. Preliminary study of endophytic fungi in timothy (*Phleum pratense*) in Estonia. *Acta Mycologica*, 48(1), 41 - 49.
- Pärtel, K. 2014. Ultrastructure of the ascus apical apparatus of *Encoelia furfuracea* (*Helotiales*). *Mycological Progress* 13(4): 981-986.

*Melastiza* sp.

## Main staff

**Kadri Pärtel** – Curator, MSc, Biosystematics

**Kuulo Kalamees** – Senior specialist, DSc, Biosystematics and biophysiology

**Ilmi Parmasto** – Curator, PhD, Biosystematics and biophysiology

**Anu Kollom** – Curator of TFC

**Bellis Kullman** – Lecturer, PhD, biosystematics

**Triin Varvas** – MSc, Specialist, fungal endophytes

**Irma Zettur** – MSc, specialist, biosystematics

## Department of Mycology

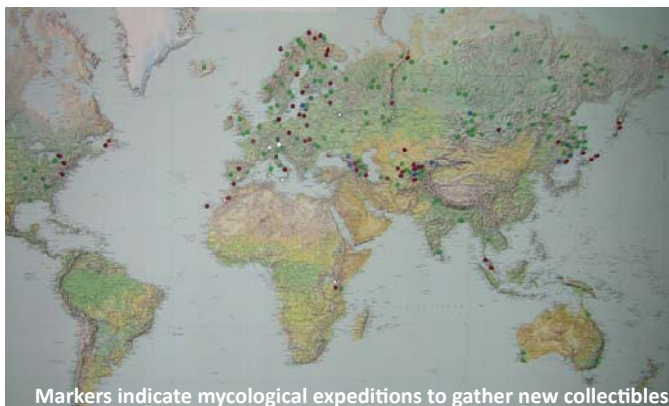
Estonian University of Life Sciences  
Kreutzwaldi 5  
51014 Tartu  
Estonia

@ <http://pk.emu.ee/en/structure/mycology>

**Contact:** Kadri Pärtel  
[kadri.partel@emu.ee](mailto:kadri.partel@emu.ee)  
(+372) 731 1895



*Phallus impudicus*



Markers indicate mycological expeditions to gather new collectibles



*Cordyceps militaris*

## DEPARTMENT OF PLANT PHYSIOLOGY

*The department is responsible for research and PhD-studies in plant physiology, and also acts as the leading institution in the Centre of Excellence in Environmental Adaptation (ENVIRON). It is also involved in establishing the Station for Measuring Ecosystem-Atmosphere Relations (SMEAR Estonia).*

### Research and studies

The key research areas of the department are plant response to biotic and abiotic stresses, and emission of plant-generated biogenic volatile organic compounds (BVOC). Global change leads to simultaneous modification of multiple environmental drivers and is expected to result in enhanced frequency and severity of environmental and biotic stresses, and stress interactions worldwide. Interdisciplinary experimental, monitoring and modelling approaches are used to analyze stress effects at the molecular, physiological, whole plant and ecosystem levels. Data obtained from these efforts will be used to determine the limits of adaptation to multiple sequential and interacting stresses and to develop new knowledge and models of BVOC dynamics under changing climatic conditions.

The department conducts interdisciplinary research and PhD-studies in the following fields of plant science:

- Plant physiology and anatomy
- Plant stress ecophysiology
- Modelling of biosphere-atmosphere processes
- Biotechnology and genetics
- Molecular biology

The research group has been highly productive with more than 15 – 20 international peer-reviewed papers produced each year. The research group is involved in 13 current projects funded from national (Estonian Research Council, Archimedes Foundation in cooperation with European Structural Funds) and international (EU 7th framework, ERC, EUROCORES/EUROVOL) sources.



Phytotron

### Laboratory and field facilities

During the last few years the lab has become one of the best-equipped plant physiology laboratories in Europe. To grow plants for lab experiments the phytotron is used - the room with regulated temperature and light conditions. Among the major available equipment is proton transfer reaction time-of-flight mass spectrometer for online monitoring of BVOCs in ambient air in ppt range, which makes it possible to track plant responses to environmental factors such as light, drought stress, herbivory, exposure to ozone, etc. The gas-exchange chamber with gas chromatograph MS is used for the measurements of trace gases (BVOCs) emitted by stressed plants.

Plant genetics lab researcher Leila Pazouki working with the shaker-incubator to culture bacteria that carry the gene which

Walz gas-exchange measuring system  
Photo: L. Kübarsepp

Gas-exchange chamber





Plant genetics laboratory. Photo: M. Mirmajlesi

is responsible for terpenoid (BVOC) emission (above).

More devices: high performance liquid chromatograph, portable photosynthesis system and imaging fluorometers, chemiluminescence isoprene analyzer, chemiluminescence NO-NO<sub>2</sub>-NOx analyzer, ozone analyzer, ultramicrotome, PCR and real time PCR systems, ultrasonic anemometers, UV-VIS spectrophotometer, parallel computing cluster, a large scale research infrastructure - SMEAR (see "SMEAR Estonia station" on page 49).

## Recent publications

- Rasulov, B.; Talts, E.; Kännaste, A.; Niinemets, Ü. (2015). Bisphosphonate inhibitors reveal a large elasticity of plastidic isoprenoid synthesis pathway in isoprene-emitting hybrid aspen. *Plant Physiology*, 168, 4. pp. 532-548.
- Krasnova, A.; Noe, S. M.; Niinemets, Ü.; Krasnov, D. (2015). Dynamics of CO<sub>2</sub> fluxes above a hemiboreal mixed forest. Proceedings of the 1st Pan-Eurasian Experiment (PEEX) Conference and the 5th PEEX Meeting. Report Series in Aerosol Science. 163. pp 318-321.
- Pazouki, L.; Rajabi Memari, H.; Kännaste, A.; Bichele, R.; Niinemets, Ü. (2015). Germacrene A synthase in yarrow (*Achillea millefolium*) is an enzyme with mixed substrate specificity: gene cloning, functional characterization and expression analysis. *Frontiers in Plant Science*, 6, 111. pp 1-15.
- Laanisto, L.; Niinemets, Ü. (2015). Polytolerance to abiotic stresses: how universal is the shade-drought tolerance trade-off in woody species? *Global Ecology and Biogeography*, 24, 5. pp 571-580.
- Niinemets, Ü. (2015) Is there a species spectrum within the world-wide leaf economics spectrum? Major variations in leaf functional traits in the Mediterranean sclerophyll *Quercus ilex*. *New Phytologist*, 205, 1. pp 79-96.

## Department of Plant Physiology

Estonian University of Life Sciences  
Kreutzwaldi 5  
51014 Tartu  
Estonia

@ <http://pk.emu.ee/en/structure/plantphysiology/>  
<http://environ.emu.ee>

**Contact:** Prof. Ülo Niinemets  
[ylo.niinemets@emu.ee](mailto:ylo.niinemets@emu.ee)  
(+372) 731 3140



## Main staff

Currently, the international team consists of 16 researchers and 8 PhD-students from 12 countries: Estonia, United States, Germany, Romania, Iran, Spain, Russia, Ukraine, Tajikistan, Sri Lanka, Pakistan and China.

**Ülo Niinemets** – Professor, plant physiology, Head of Department, Member of Estonian Academy of Sciences, European Research Council Advanced Grant Awardee.

**Tiina Tosens** – Associate professor, PhD, plant physiology

**Eero Talts** – Researcher, PhD, plant physiology

**Steffen M. Noe** – Senior researcher, Dr.rer.nat, Integrated biosphere-atmosphere interaction measurements on ecosystem scale, modelling ecophysiological processes

**Astrid Kännaste** – Senior researcher, PhD, plant stress physiology, chemistry

**Bakhtier Rasulov** – Senior researcher, PhD



Working with a ultramicrotome. Photo: R. Anni



## DEPARTMENT OF PLANT PROTECTION

**The department is responsible for teaching, research and extension activities on national issues related to plant protection. Our priority is to develop environmentally friendly technologies enhancing the abundance of natural enemies and depressing the incidence of plant pests.**

## Research and studies

Research efforts of the Department of plant protection are directed towards both fundamental and applied results. The most important subjects under research include following topics:

### 1. Ecology and behaviour of pest and beneficial insects:

- Influence of host plant varieties, fertilization and plant protection measures on the ecology, physiology and behaviour of key pests and their natural enemies and pollinators
- Influence of food quality and environmental conditions on the physiological state and vitality of pests and beneficial insects
- Influence of exposure to sub-lethal doses of pesticides on tritrophic (host–insect–parasitoid) interactions
- Study of the ecology, behaviour and distribution of pests, their natural enemies and pollinators in relation to the landscape

### 2. Epidemiology of plant pathogens on field crops

### 3. Insect behaviour and sensory responses:

- Morphology and functioning of antennal sensillae
- Impact of external chemical and physical stimuli on the
- searching behaviour of insects

### 4. Conservation of beneficial insects within integrated pest management strategies

## Recent publications

- Karise, R., Muljar, R., Smaghe, G., Kaart, T., Kuusik, A., Dreyersdorff, G., Williams, I.H., Mänd, M. (2015). Sublethal effects of kaolin and the biopesticides Prestop-Mix and BotaniGard on metabolic rate, water loss and longevity in bumble bees (*Bombus terrestris*). *Journal of Pest Science*, 1–8. DOI: 10.1007/s10340-015-0649-z.
- Nurme, K., Merivee, E., Must, A., Sibul, I., Muzzi, M., Di Giulio, A., Williams, I., Tooming, E. (2015). Responses of the antennal bimodal hygroreceptor neurons to innocuous and noxious high temperatures in the carabid beetle, *Pterostichus oblongopunctatus*. *Journal of Insect Physiology*, 81, 1–13.
- Runno-Paurson, E., Loit, K., Hansen, M., Tein, B., Williams, I.H., Mänd, M. (2015). Early blight destroys potato foliage in the northern Baltic region. *Acta Agriculturae Scandinavica, Section B - Soil & Plant Science*, 65(5), 422–432.
- Kaasik, R., Kovacs, G., Kaart, T., Metspalu, L., Williams, I.H., Veromann, E. (2014). *Meligethes aeneus* oviposition preferences, larval parasitism rate and species composition of parasitoids on *Brassica nigra*, *Raphanus sativus* and *Eruca sativa* compared with on *Brassica napus*. *Biological Control*, 69, 65–71.
- Jõgar, K., Kuusik, A., Metspalu, L., Williams, I.H., Ploomi, A., Hiiesaar, K., Luik, A., Kivimägi, I., Mänd, M. (2014). The length of discontinuous gas exchange cycles in lepidopteran pupae may serve as a mechanism for natural selection. *Physiological Entomology*, 39, 322–330.



## Main staff

**Marika Mänd** - Professor, PhD, Head of Department, Social insects, pollinators, environmentally friendly plant protection

**Anne Luik** - Professor, PhD, Plant-insects interactions, ecophysiology of insects, organic and sustainable cropping systems

**Anders Kvarnheden** - Visiting Professor, PhD, Plant virology

**Katrin Jõgar** - Associate Professor, PhD, Insects physiology

**Eve Veromann** - Associate Professor, PhD, Beneficial insects, parasitoids, organic and sustainable cropping systems

**Küllü Hiiesaar** - Senior Researcher, PhD, Biological control, biopesticides, insects' hibernation physiology

**Aare Kuusik** - Senior Researcher, PhD, Insects physiology, pathophysiology

**Enno Merivee** - Senior Researcher, PhD, Insect sensor physiology, insects behaviour

**Luule Metspalu** - Senior Researcher, PhD, Insects physiology, pathophysiology, biological control

**Ingrid Williams** - Senior Researcher, PhD, Applied entomology, pollinators, parasitoids

**Reet Karise** - Researcher, PhD, Foraging behaviour of bumble bees, effects of pesticides

**Angela Ploomi** - Researcher, PhD, Ecology and physiology of insects, biopesticides

**Eve Runno-Paurson** - Lecturer, PhD, Phytopathology

**Anne Must** - Researcher, PhD, Insect sensory physiology, insects behaviour

**Eha Kruus** - Researcher, PhD, Nematology

**Riina Kaasik** - Researcher, PhD, Beneficial insects



## Department of Plant Protection

Estonian University of Life Sciences  
Kreutzwaldi 5  
51014 Tartu  
Estonia

@ <http://pk.emu.ee/en/structure/plantprotection/>

**Contact:** Prof. Marika Mänd  
[marika.mand@emu.ee](mailto:marika.mand@emu.ee)  
(+372) 731 3510



## DEPARTMENT OF SOIL SCIENCE AND AGRO-CHEMISTRY

*Our mission is to provide academic education and research in soil science and its sub-disciplines. We are aimed to advance basic understanding and practical management of soils in natural and agricultural ecosystems and disseminate knowledge about sustainable use of soil resources.*

### Research and studies

- Soil properties, productivity and fertility
- Sustainable use of soil resources
- Soil organic carbon, humus status of soils, biochemically active organic compounds in soils
- Soil degradation (compaction)
- Nutrient cycles and plant nutrition: nutrients in plant-soil-environment systems, efficiency of fertilization, balanced fertilization
- Classification and evaluation of soils
- Soil information systems, digital soil maps, pedoecological models for land use planning
- Rational land use, development of spatial agro-economic decision support system

### Recent publications

- Ritz, C., Putku, E., Astover, A. (2015). A practical two-step approach for mixed model-based kriging, with an application to the prediction of soil organic carbon concentration. *European Journal of Soil Science*, 66, 548–554.
- Sanchez De Cima, D., Luik, A., Reintam, E. (2015). Organic farming and cover crops as an alternative to mineral fertilizers to improve soil physical properties. *International Agrophysics*, 29.
- Rossner, H., Ritz, C., Astover, A. (2014). Optimisation of fertiliser rates in crop production against energy use indicators. *European Journal of Agronomy*, 55, 72–76.
- Krebstein, K., von Janowsky, K., Kuht, J., Reintam, E. (2014). The effect of tractor wheeling on the soil properties and root growth of smooth brome. *Plant, Soil and Environment*, 60(2), 74–79.
- Köster, T., Kölli, R. (2013). Interrelationships between soil cover and plant cover depending on land use. *Estonian Journal of Earth Sciences*, 62(2), 93–112.

### Main staff

**Alar Astover** - Professor, PhD, Head of Department, Soil models, fertilizer optimization, agricultural land use planning and economics

**Endla Reintam** - Associate Professor, PhD, Soil physics (compaction), soil classification, agro-ecology

**Merrit Shanskiy** - Associate Professor, PhD, soil organic matter, organic soils, GHG.

**Raimo Kölli** - Prof. Emeritus, DSc, Soil organic carbon, pedo-ecological aspects of soil use and protection, humus forms

**Tõnu Tõnutare** - PhD, soil chemistry laboratory methods



## Soil Museum

Collections are used in teaching agro-chemistry and soil and environmental sciences, as well in scientific research. Currently 133 soil monoliths are viewable. The soil archive, including over 20,000 samples acquired from national soil monitoring, long-term field experiments, research areas and transects, forms the most valuable scientific part of museum. Other collections concern minerals, soil parent materials, fertilizers, soil maps etc.

## Soil Science Laboratory

The laboratory aims to provide technical support for fulfilling various research projects in areas of soil science, agronomy and ecology. Highly qualified staff ensures successful operation and development of the laboratory.

## Department of Soil Science and Agrochemistry

Estonian University of Life Sciences  
Fr. R. Kreutzwaldi 5  
51014 Tartu,  
Estonia

@ <http://pk.emu.ee/en/structure/soilscience/>

**Contact:** Alar Astover  
alar.astover@emu.ee  
(+372) 731 3546



## DEPARTMENT OF ENVIRONMENTAL PROTECTION

*The department provides academic education and performs research on human impact on environment and environmental management. We focus on the studies of air quality, matter cycling in soils, insects as indicators for habitat quality, habitats and landscapes, management of heritage communities, environmental management, energetic biomass conversion. The department has a laboratory of Bio- and Environmental Chemistry.*

## Research and studies

- Impact of human activity on biosphere, habitats and landscapes
- Environmental changes in Estonia in the context of global changes
- Habitat and landscape quality
- Air quality
- Matter cycling in soils
- Insects as biomarkers
- Changes in semi-natural communities
- Environmental management: environmental impact assessment, environmental economics, analysis of environmental risks
- Environmental planning based on landscape ecology



- Ecological engineering
- Energetic biomass conversion
- Biogas studies
- Studies on emissions from landfills

## Recent publications

- Kaczala, F.; Mehdinejad, M.H.; Lääne, A.; Orupõld, K.; Bhatnagar, A.; Kriipsalu, M.; Hogland, W. (2015). Leaching characteristics of the fine fraction from an excavated landfill: physico-chemical characterization. *Journal of Material Cycles and Waste Management*, in press
- Liivamägi, A.; Kuusemets, V.; Kaart, T.; Luig, J.; Diaz-Forero, I. (2014). Influence of habitat and landscape on butterfly diversity of semi-natural meadows within forest-dominated landscapes. *Journal of Insect Conservation*, 18(6), 1137-1145.
- Diaz-Forero, I.; Kuusemets, V.; Mänd, M.; Liivamägi, A.; Kaart, T.; Luig, J. (2013). Influence of local and landscape factors on bumblebees in semi-natural meadows: a multiple-scale study in a forested landscape. *Journal of Insect Conservation*, 17(1), 113 - 125.
- Orupõld, K.; Heinlaan, M.; Põllumaa, L.; Dubourguier, H.C.; Kahru, A. (2012). Impact of oil shale opencast mining and combustion on Narva River and its tributaries: chemical and ecotoxicological characterisation. *Oil Shale*, 29(2), 173 - 189.
- Luna del Risco, M., Orupõld, K., Dubourguier H.-C. (2011). Particle-size effect of CuO and ZnO on biogas and methane production during anaerobic digestion. *Journal of Hazardous Materials*, 189, 603 - 608



## Main staff

**Valdo Kuusemets** – Professor, PhD, Head of Department, Landscape ecology, ecological engineering

**Robert Gerald Henry Bunce** – Professor, PhD, Landscape ecology, Habitat and vegetation monitoring.

**Ülle Püttsepp** – Senior Researcher, PhD, Soil and root ecology, fineroot parameters, decomposition

**Kaja Orupõld** – Senior Researcher, PhD, Environmental chemistry

**Kadri Kask** – Lecturer, MSc, State of the Environment and indicator species

**Ave Liivamägi** – Researcher, MSc, Insects as bioindicators

**Milvi Purgas** – Chemist, MSc, Chemical analyses

## Department of Environmental Protection

Estonian University of Life Sciences  
Kreutzwaldi 5  
51014 Tartu  
Estonia

@ <http://pk.emu.ee/en/structure/environprotection>

**Contact:** Prof. Valdo Kuusemets  
[valdo.kuusemets@emu.ee](mailto:valdo.kuusemets@emu.ee)  
(+372) 731 3770



## DEPARTMENT OF LANDSCAPE MANAGEMENT AND NATURE CONSERVATION

Department of Landscape Management and Nature Conservation focuses on the integrated and multidisciplinary study of landscapes and innovative practices in nature conservation. The members of research team work together in building theory and developing knowledge of landscape patterns and processes, landscape values and functions, developing integrative management tools (methodologies on landscape planning, monitoring, evaluation etc), and making them applicable to real landscape situations. Special attention is paid on land-use change, landscape management and regional development, but also to landscape ecology and ecology of bird species and communities.



### Main staff

**Kalev Sepp** – Professor, PhD, Head of Department, Landscape ecology and management, nature conservation

**Aivar Leito** – Senior Researcher, PhD, Ecology of bird species and communities

**Are Kaasik** – Researcher, PhD, Landscape ecology, land use and landscape change, ecological networks

**Monika Suškevičs** – Post-doc, PhD, Effectiveness of participatory decision-making models, stakeholder analysis, research relating to environmental policy

**Ants Vain** – Researcher, PhD, Remote sensing, Lidar, geoinformatics

**Ray Ward** – Researcher, PhD, Landscape ecology, wetlands ecology, geoinformatics

**Jaak Kliimask** – Lecturer, MSc, Regional development, planning and policy

**Anne Kull** – Lecturer, MSc, GIS analysis, modelling of soil erosion and nutrients flows, cartography

**Pille Tomson** – Researcher, PhD student, MSc, Landscape management, historical landscapes

**Eva-Liis Tuvi** – Lecturer, MSc, Nature conservation, vascular plant conservation

**Ene Hurt** – Specialist, MSc, GIS and landscape ecology

**Henri Järv** – Technician, MSc, PhD student, Project management, nature conservation and regional development

**Kristel Kirsimäe** – Head of the information centre

**Karin Kruusmaa** – Senior Specialist, MSc, Project management

**Miguel Villoslada Pecina** – GIS specialist, MSc, PhD student, Landscape theatre, visualising and analysing of landscape change, ecosystem services, GIS

**Janar Raet** – Specialist, MSc, PhD student, GIS, land use, landscape monitoring

**Siiri Römer** – Senior Specialist, MSc, PhD student, Historical landscapes, cemeteries

**Maaria Semm** – Lecturer, MSc, Landscape management and governance



## Research and studies

- Assessment of landscape values and functions
- Ecological responses of species to land use change
- Environmental policy and measures
- Evaluating the human impact on agricultural landscapes
- Green infrastructure in spatial planning
- Investigation of bird migration ecology and dynamics of bird communities
- Landscape planning, management and maintenance
- Land-use and driving forces of land-use change
- Management of protected areas
- Methodological approaches for landscape and biodiversity monitoring
- Regional development, planning and policy



## Department of Landscape Management and Nature Conservation

Estonian University of Life Sciences  
Kreutzwaldi 5  
51014 Tartu  
Estonia

@ <http://pk.emu.ee/en/structure/landscapemanagement>

**Contact:** Prof. Kalev Sepp  
[kalev.sepp@emu.ee](mailto:kalev.sepp@emu.ee)  
(+372) 731 3777



## Recent publications

- Kliimask, J., Järv, H., Sepp, K., Ward, R. (2014). Nature conservation in remote rural areas: a win-win situation? Dünkel, Fr., Herbst, M. (Eds). Think Rural! 193-208 .Springer Verlag.
- Lang, M., Vain, A., Bunce, R.G.H., Jongman, R., Raet, J., Sepp, K., Kuusemets, V., Kikas, T., Liba, N. (2015). Extrapolation of in situ data from 1-km squares to adjacent squares using remote sensed imagery and airborne lidar data for the assessment of habitat diversity and extent. *Environmental Monitoring and Assessment*, 187(3), 1-16.
- Leito, A., Bunce, R.G.H., Külvik, M., Ojaste, I., Raet, J., Villoslada, M., Leivits, M., Kull, A., Kuusemets, V., Kull, T., Metzger, M. J.; Sepp, K. (2015). The potential impacts of changes in ecological networks, land use and climate on the Eurasian crane population in Estonia. *Landscape Ecology*, 30, 887-904.
- Suškevičs, M., Tillemann, K., Külvik, M. (2013). Assessing the relevance of stakeholder analysis for national ecological network governance: The case of the Green Network in Estonia. *Journal for Nature Conservation*, 21(4), 206-213.
- Tomson, P., Bunce, R.G.H., Sepp, K. (2015). The role of slash and burn cultivation in the formation of southern Estonian landscapes and implications for nature conservation. *Landscape and Urban Planning*, 137(May), 54-63.
- Ward, R.D., Burnside, N.G., Joyce, C.B., Sepp, K. (2013). The use of medium point density LiDAR data in determining the location of plant community types in Baltic coastal wetlands. *Ecological Indicators*, 33, 96-104.



## DEPARTMENT OF LANDSCAPE ARCHITECTURE

*The department of landscape architecture teaches and carries out research on the relationship between people and the environment, including urban, rural and natural landscapes. It involves the integration of subjects from natural sciences, social sciences and the humanities. The department focuses on aspects special to Estonia, such as post-Soviet landscapes, outdoor recreation in natural areas and post-industrial areas. Since landscape architecture is intimately connected with places used by people in both everyday life and also for relaxation and recreation, the department can offer advice, carry out special studies and research and supply problem solving services to national and local government, companies and community groups.*

### Research and studies

- Historic and modern cultural landscapes including post-Soviet relics
- Outdoor recreation and salutogenic landscapes (landscapes for health)
- Urban forestry
- Restoration and reuse of industrial, post-industrial and disturbed landscapes
- Landscape and visual impact assessment of new infrastructure
- Spatial planning
- Urban green area planning, management and maintenance

## Landscape Theatre

<http://pk.emu.ee/en/structure/landscapearchitecture/landscapetheatre/>

### Virtual Landscape Modelling and Visualisation System

One of the department's facilities is the virtual landscape theatre. The system's software enables modelling and real-time visualisation on a 160 degree cylindrical relocateable screen of accurate, life-like urban, rural and natural landscapes with natural atmospheric effects. The source data can be derived from either GIS or CAD based databases, which typically includes elevation data, aerial ortho-imagery, land-use and biotope maps, shape files of vectors and polygons and accurately textured 3D models.

The installation can host up to 15 people at a time and display computer generated landscapes that are freely navigable. The viewing experience is immersive – with many people readily getting the feeling of being in the actual landscape.

The Landscape Theatre can be used in the study of landscape preferences, visual impact assessment and environmental perception. While the Theatre can greatly assist in regional and landscape planning, it is also a valuable tool for spatial planning of smaller areas and prominent single sites. The Theatre is also used in teaching situations when an overview of a current situation or process happening over a large area is necessary.

The Theatre can be relocated within a day, which makes it a feasible option, for example, for use at public participation meetings. The highly immersive experience has been found to generate greater public interest and participation in spatial planning issues and therefore to achieve more democratic results in decisions influencing landscapes as public resources.



## Main staff

**Simon Bell** – Professor, PhD, Head of Department, Outdoor recreation planning and design, landscape and visual impact assessment, urban forestry

**Friedrich Kuhlmann** – Professor, Dipl.Ing., Urban design and landscape urbanism, theory and history of recent and contemporary landscapes

**Mart Külvik** – Professor, PhD, Biosciences and environment, research relating to environmental policy, environmental economy and environmental law

**Mari Nõmmela** – Associate Professor, PhD, Culture and society, history of Estonian architecture and landscape architecture

**Toomas Muru** – Lecturer, MSc, Landscape character analysis, spatial planning, forest landscape planning and design.

**Peeter Vassiljev** – Lecturer, MSc, Recreation related environmental psychology, spatial planning

**Kadri Maikov** – Lecturer, MSc, Design principles for healing landscapes, CAD for landscape architects

**Gloria Niin** – Lecturer, MSc, PhD student, Recreational use and management of urban forests

**Jekaterina Balicka** – Lecturer, MSc, PhD student, Urban wasteland potentials



## Department of Landscape Architecture

Estonian University of Life Sciences  
Kreutzwaldi 56/3  
51014 Tartu  
Estonia

@ <http://pk.emu.ee/en/structure/landscapearchitecture>

**Contact:** Prof. Simon Bell  
[maastikuarhitektuur@emu.ee](mailto:maastikuarhitektuur@emu.ee)  
(+372) 731 3139, (+372) 506 7931



## Recent publications

- Bell, S. (2012) Landscape: pattern, perception and process (2nd Edition) Routledge, London
- Hansson, K., Kylvik, M., Bell, S. and Maikov, K. (2012) A preliminary assessment of preferences for Estonian natural forests. *Baltic Forestry*, Vol. 18, No. 2, 299-315.
- Nilsson, K., Pauleit, S., Bell, S., Aalbers, C and Nielsen, T.S. (2013) Peri-urban futures: Scenarios and models for land use change in Europe. Springer, Berlin
- Ruskule, A., Nikodemus, O., Bell, S., Kasparinkis, R. & Ilze, U. (2013) The perception of abandoned farmland by local people and experts: Landscape value and perspectives on future land use. *Landscape and Urban Planning*. 115, 49-61.
- Unt, A.-L. And Bell, S. (2013) The impact of small-scale design interventions on the of the users of an urban wasteland. *Urban Forestry and Urban Greening*, pp. 121–135
- Unt, A.-L, Travlou, P. And Bell, S. (2014) Blank spaces: exploring the sublime qualities of urban wilderness at the former fishing harbour in Tallinn, Estonia. *Landscape Research* 39(3), 267 - 286
- Bell, S. (2014) Cultures in flux in Roe, M. And Taylor, K. (Eds) *New cultural landscapes*. Routledge, Abingdon
- Bell, S. (2014) The power of the market: landscape and economics. *Landscape Architecture Frontiers*, 2(2), 78 - 85.



## DEPARTMENT OF HORTICULTURE

## Research and studies

- Physiology and biochemistry of horticultural plants
- Cultivation technologies of fruits, vegetables and ornamentals
- Post-harvest quality and storage technologies of horticultural products
- Urban horticulture

## Recent publications

- Rätsep, R.; Karp, K.; Vool, E.; Tõnutare, T. (2014). Effect of pruning time and method on hybrid grapevine (*Vitis* sp.) 'Hasanski Sladki' berry maturity in a cool climate conditions. *Acta Scientiarum Polonorum - Hortorum Cultus*, 13(6), 99 - 112.
- Pedastsaar, P.; Vaher, M.; Helmja, K.; Kulp, M.; Kaljurand, M.; Karp, K.; Raal, A.; Karathanos, V.; Püssa, T. (2014). The Chemical Composition of Red Wines made from Hybrid Grape and Common Grape. *Proceedings of the Estonian Academy of Sciences*, 63(4), 444 - 453.
- Vool, E.; Rätsep, R.; Karp, K.; Kruus, M.; Luik, A.; Veromann, E.; Mänd, M. (2014). Does Thinning of Old Apple Trees Improve Fruit Quality and Decrease Pest Incidence? *International Journal of Fruit Science*, 1 - 14.
- Tasa, T.; Starast, M.; Vool, E.; Moor, U.; Karp, K. (2012). Influence of soil type on half-highbush blueberry productivity. *Agricultural and Food Science*, 21(4), 409 - 420.
- Põldma, P.; Tõnutare, T.; Viitak, A.; Luik, A.; Moor, U. (2011). Effect of selenium treatment on mineral nutrition, bulb size, and antioxidant properties of garlic (*Allium sativum* L.). *Journal of Agricultural and Food Chemistry*, 59(10), 5498 - 5503.

## Department of Horticulture

Estonian University of Life Sciences  
Kreutzwaldi 5  
51014 Tartu

@ <http://pk.emu.ee/en/structure/horticulture>

**Contact:** Prof. Kadri Karp  
[kadri.karp@emu.ee](mailto:kadri.karp@emu.ee)  
(+372) 731 3515



## Main staff

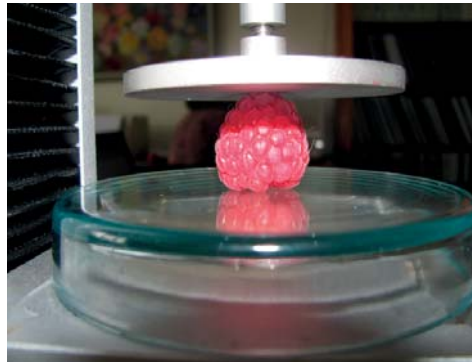
**Kadri Karp** – Professor, DSc, Head of Department, Fruit production.

**Ulvi Moor** – Associate Professor and Researcher, PhD. Post-harvest quality and storage technologies of horticultural crops.

**Marge Starast** – Associate Professor, PhD, Plant physiology, fruit production.

**Priit Põldma** – Lecturer, MSc, Vegetable production, greenhouse horticulture.

**Ele Vool** – Associate Professor, PhD, Fruit production, ornamental plants.

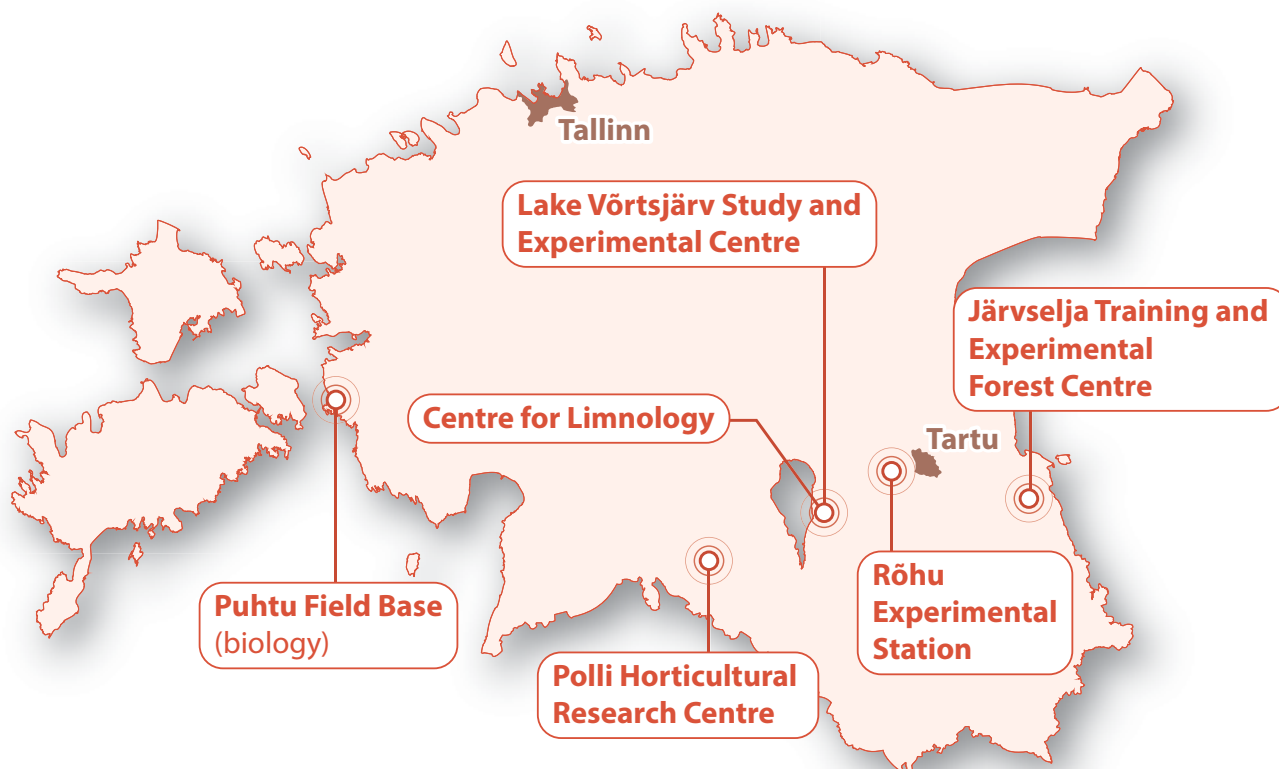






## CENTRES AND FIELD BASES OF IAES

To improve co-operation with entrepreneurs and research organisations outside our university we have seven centres. Three of them are part of IAES and four are interdisciplinary centres with aim to improve also co-operation between different institutes in our University. Such collaboration helps to cover requirements of the community and strengthen University's role in the society.



## POLLI HORTICULTURAL RESEARCH CENTRE

**Short historical overview**

Polli Horticultural Research Centre joined EMU in 1995 and is the centre for fruit and berry breeding and cultivar's trials with a history of more than half a century. Research has been focused on providing cultivars and growing technologies suitable for the region. It is responsible for preserving the genetic resources collections of fruits and berries of over 1000 accessions.

Besides 50 hectares of top fruit and berry experimental plots, plant nursery and contemporary storage facilities, the centre has two units to implement the results of the research in product development in collaboration with entrepreneurs:

- **The Experimental fruit and berry processing unit** with pilot scale range primary processing equipment

- **The Competence Centre for Knowledge-Based Health Goods and Natural Products – PlantValor** which main field of activity lies in the research and development of health goods and natural products using modern high-technology methods, including the extraction of bioactive ingredients of plant origin, which are used in functional foods, eco-cosmetics, household chemicals and pharmaceuticals.

**Areas of development and research activity**

- Breeding apple, pear, plum, sweet cherry, black currant, and new raspberry cultivars and apple vegetative rootstocks
- Research in new technologies of fruit and berry cultivation, plant protection, organic cultivation and post-harvest handling.
- Introducing new cultivars for fruit and berry production in Estonia; evaluation of cultivars for use in commercial production
- Agro-technology, cultivars and product development of minor fruit and berry crops such as sea-buckthorn, edible honeysuckle and rowan
- Preserving genetic diversity and cultivars' resources of fruit and berry crops of Estonian origin.
- Processing and preservation technologies of natural raw material, innovative solutions in the field of food processing technologies, mapping the possibilities of

implementation of these in Estonia;

- Extraction methods of bioactive compounds, including steam distillation, microwave and ultrasound assisted extraction, dynamic solid-liquid extraction, supercritical CO<sub>2</sub> extraction and supercritical fluid fractionation;
- Dehydration and concentration methods and technologies, including infrared- vacuum drying, spray drying, freeze drying, rotary evaporation;
- The nutritional quality and preservation of fruits and berries; Preservation of bioactive compounds in finished product. Developing methods of analysis of bioactive compounds in plant material and extending the industrial research;

**Recent publications**

- Kviklys, D.; Bielicki, P.; Bite, A.; Lepsis, J.; Univer, T.; Univer, N.; Uselis, N.; Lanauskas, J. (2013). Baltic fruit rootstock studies: evaluation of apple (*Malus domestica Borkh.*) new rootstocks. *Zemdirbyste-Agriculture*, 100(4), 441 - 446.
- Arus, Liina; Kikas, Ave; Kaldmäe, Hedi; Kahu, Kersti, Luik, Anne (2013). Damage by the raspberry beetle (*Byturus tomentosus De Geer*) in different raspberry cultivars. *BIOLOGICAL AGRICULTURE & HORTICULTURE*, 00, 1 - 9.
- Kviklys, D.; Kviklienė, N.; Bite, A.; Lepsis, J.; Univer, T.; Univer, N.; Uselis, N.; Lanauskas, J.; Buskienė, I. (2012). Baltic fruit rootstock studies: evaluation of 12 apple rootstocks in North-East Europe. *Horticultural Science (HORTSCI)*, 1, 1 - 7.
- Arus, L.; Kikas, A.; Luik, A. (2012). Carabidae as natural enemies of the raspberry beetle (*Byturus tomentosus F.*) . *Žemdirbystė=Agriculture*, 99, 327 - 332.
- Antonius, K.; Karhu, S.; Kaldmäe, H.; Laciš, G.; Rugenius, R.; Baniulis, D.; Sasnauskas, A.; Schulte, E.; Kuras, A.; Korbin, M.; Gunnarsson, A.; Werlemark, G.; Ryliskis, D.; Todam-Andersen, T.; Kokk, L.; Järve, K. (2012). Development of the Northern European *Ribes* core collection based on a microsatellite (SSR) marker diversity analysis. *Plant Genetic Resources: Characterization and Utilization*, 10(1), 70 - 73.
- Arus, L.; Luik, A.; Monikainen, M.; Kikas, A. (2011). Does mulching influence potential predators of raspberry beetle? *Acta Agriculturae Scandinavica, Section B - Soil & Plant Science*, 61(3), 220 - 227.
- Kaldmäe, H.; Kikas, A.; Arus, L.; Libek, A-V. (2013). Genotype and microclimate conditions influence ripening pattern and quality of blackcurrant (*Ribes nigrum L.*) fruit. *Zemdirbyste-Agriculture*, 100(2), 167 - 174.





## Main staff

**Piia Pääso** – Senior specialist, head of the centre, project management

**Ave Kikas** – Senior Researcher, PhD, research director of the centre; Small fruits breeding, testing, cultivation and handling technology, genetic resources

**Uko Bleive** – Senior specialist, storage and product development. Head of technology unit of the competence centre

**Kersti Kahu** – Researcher, MSc, stone fruit breeding and testing, integrated control system, organic farming

**Asta-Virve Libek** – Senior Researcher, PhD, Small fruits breeding, testing, cultivation technology

**Toivo Univer** – Project manager, PhD, Scab resistant apple breeding, apple cultivar and rootstock evaluation, sea buckthorn and rowan tree cultivars evaluation

**Liina Arus** – Researcher, PhD, Raspberry cultivars breeding and testing; agro technologies, plant protection, entomophagous studies. Edible honeysuckle cultivars investigation

**Piret Raudsepp** – Researcher, MSc, Biochemistry and functional foods

**Reelika Rätsep** – Technician, PhD student, biochemical analysis

**Hedi Kaldmäe** – Senior specialist, Small fruit genetic resources, Head of the analytical unit of the competence centre



## Polli Horticultural Research Centre

Polli, 69104  
Karks-Nuia  
Viljandi county  
Estonia

@ <http://polli.emu.ee/>

**Contact:** Head of the Centre: Piia Pääso  
[piia.paaso@emu.ee](mailto:piia.paaso@emu.ee)  
(+372) 50 61316



## CENTRE FOR LIMNOLOGY

The history of the Centre for Limnology (up to 2005 known as Võrtsjärv Limnological Station) goes back to 1954, when the first field station was created in a small farmhouse close to Lake Võrtsjärv. The opening of the new building in 1963 on the eastern shore of Lake Võrtsjärv was an important milestone in the history of Estonian limnology. Over its nearly 60-year existence, the Centre for Limnology has become a unique centre of competence in Estonia collecting data, carrying out research and educating people for water protection, research and management. In 2012-2014, the main building at the lake was totally reconstructed whereas part of the staff working in Tartu moved into a new building in EULS campus.

### Areas of research and development activity

- Fundamental hydrobiological research
  - Scientific groups and group leaders:
    - Functional ecology of lakes and rivers – Prof. Tiina Nõges
    - Biota of large lakes – PhD. Helle Mäemets
    - Biota of small lakes – Prof. Ingmar Ott
- Applied research (state environmental monitoring, fish management, environment impact assessment, lake restoration, nature protection)
- Teaching of students and post-graduate students – Prof. Ingmar Ott
- Hydrobiological collections – PhD Henn Timm

**Limnological database** includes material on about 730 small lakes in Estonia.



Full overview of research projects and publications can be found at:

<http://pk.emu.ee/en/structure/limnology/research>

## Fundamental Research

### Main Topics and Projects:

#### Functional ecology of lakes and rivers:

The basic task of the Functional ecology group is to maintain and develop in Estonia the internationally acknowledged competence on carbon cycling and lake food webs that would sustain knowledge based water policy and compliance with international obligations in global change conditions. A functional group specific conceptual model of carbon metabolism was established for Lake Võrtsjärv. The research is financed under the following projects:

Lake food webs and C metabolism across gradients of catchment alkalinity and climate. Institutional research grant of the Estonian Ministry of Education and Research, 2014-2019, Prof. Tiina Nõges

Managing Aquatic ecosystems and water Resources under multiple Stress (MARS). 7th EU Framework Programme, Theme 6 (Environment including Climate Change), 2014 - 2018, Tiina Nõges

Modelling of Lake Võrtsjärv food webs, carbon cycle and impacts of the climate. Estonian Science Foundation grant, 2012-2015, Tiina Nõges

Modelling of metabolism and food web structure of Estonian lakes. PUT777, 2012 – 2016, PhD Fabien Cremona



Networking Lake Observatories in Europe. COST, 2012-2016. A. Laas, T.Nõges

Estonian observatory of aquatic environments (VeeOBS). 2012 - 2015, PhD A. Laas

### Biota of large lakes

The research of the Large lakes group is mainly targeting Lake Peipsi as the most important inland water body in Estonia. The main research topics range from internal loading of phosphorus from sediments to genetic diversity of Cyanobacteria in relation to toxic algal blooms, ecological demands and structuring role of green macroalgae in littoral communities, indicator value of zooplankton, and changes in fish populations related to the food composition of juvenile fish. The research is funded under projects:

Biodiversity of Estonian large lakes under the pressure of stressor-affected changing environment. 2015-2016. PhD H. Mäemets

Studies of the internal phosphorus loading in Lake Peipsi as a scientific basis for the water management and protection of the lake. 2014-2015. PhD O. Tammeorg

### Biota of small lakes

Complex investigations of small lakes. Main activities are dedicated to exploring of ecological mechanisms of water-ecosystems; changes of ecological status; elaboration of assessment of ecological status in cooperation with EU countries; fishery of small lakes, lake restoration, compilation



### Võrtsjärv Centre for Limnology

61101 Rannu municipality  
Tartu County  
ESTONIA

@ <http://pk.emu.ee/en/structure/limnology/>

**Contact:** Head of the Centre: Ain Järvalt  
[info@limnos.ee](mailto:info@limnos.ee)  
(+372) 745 4544



of management plans; investigation of rare and protected species; elaboration methodology of ecosystem services of water bodies. The research is funded under projects:

EU 7FP project: Grant agreement no. 226273 - WISER (Water bodies in Europe: Integrative Systems to assess Ecological status and Recovery) 2009-2012. T. Nõges

Intercalibration of borders of ecological quality classes of river and lake types in European Union 2003-2011. I. Ott



## Applied research

**Monitoring of inland water bodies** includes sub-programmes for running waters, small lakes, Lake Peipsi, Lake Võrtsjärv, and Narva Reservoir.

Centre for limnology carries out complex state monitoring (surveillance monitoring) of inland waters since 1992 aiming at assessment of ecological status and long-term changes in functioning of ecosystems, and development of classification principles. Responsible persons I. Ott, P. Pall, L. Tuvikene, M. Haldna.

**Increasing the capability of environmental monitoring on Estonian lakes and rivers.** Estonian-Swiss Cooperation Programme, 2012-2016. (L. Tuvikene, K. Kangur, A. Kisand) aims at rehabilitation and modernisation of basic infrastructure for improvement of the environmental monitoring, and basic equipment for analytical capability.

## Protection, management and restoration of inland water bodies- limnological assessment and recommendations

Applied projects aiming at improving goal-setting and quality of lake restoration and increasing effectiveness of regional lake management. A programme of measures is prepared for improving the ecological quality of Estonian lakes – “from limnological knowledge and skills to restoration of lakes”.

Towards joint management of the transboundary Gauja/Koiva river basin district. INTERREG 2012-2014 (I. Ott)

LakeAdmin-Regional administration of lake restoration initiatives. 2012-2014 INTERREG IVC L. Tuvikene

The implementation of the EU WFD necessitates the development of common criteria and methodological standards for inland and marine water ecosystem monitoring and assessment across Europe. Since the concept of ecosystem services follows socio-economic approach, there is a high probability that the wider community understands better the need for conservation and protection of ecosystems. A special goal is to improve methodologies of mapping and assessing inland water ecosystem services select environmental indicators and give further recommendations for the assessment methods.

Development of methods for assessment and mapping of ecosystem services of marine and inland waters, 2014-2015. I. Ott, S. Vilbaste

The development of fish indicators to assess the ecological status of

Estonian small lakes and its collation with indices developed by other member states. 2014 T. Krause

Science-based forecast and quantification of risks to properly and timely react to hazards impacting Estonian mainland, air space, water bodies and coasts, KESTA, 2012-2014. Sea pollution theme –A. Tuvikene

Assessment of Estonian coastal sea pollution by means of fish biomarkers. KIK, 2014 -2016. A. Tuvikene

### Fish and fisheries management

Information (stock assessment, migrations, growth rate, etc.) obtained from marking of fish is one of the basic method for the management of fishery resources. Inventory and report on different obstacles (dams, turbines, traps etc.) concerning the migration of fish and proposals for opening migrating routes in Estonian rivers. Basic equipment for fish stock assessment

capability was improved through obtaining new research vessel and different fishing gear (multimesh gillnets, purse seine, trawls) supported by European Fisheries Fund.

Modernization of equipment and improvement of stock assessment methodology for estimation commercial fish stocks in Estonian University of Life Sciences. (EFF) 2013-2015. A. Järvalt

Chemical tagging of European Eel. (EFF) 2014-2015 M. Silm

Estimation of stocks and migration of eel and improvement of the assessment methodology in inland waterbodies. EFF 2010-2013. A. Järvalt

Status of fish stocks in Lake Võrtsjärv and analysis of implementation of Estonian Eel Management Plan. 2013-2015 A. Järvalt

Study on fish assemblages and the fishing efficiency of gear in small Estonian lakes. 2013-2015 T. Krause

Reproduction potential of migratory brown trout in Estonian rivers. Ministry of Environment, 2013-2015. R. Järvekülg



## LAKE VÖRTSJÄRV STUDY AND EXPERIMENTAL CENTRE

Lake Võrtsjärv Study and Experimental Centre of Estonian University of Life Sciences provides non-formal environmental education both for schoolchildren and adults. Its mission to introduce water biota through presentation of more than half of local freshwater fish species in 23 aquariums makes the Centre unique in Estonia.

As a lake museum it is open for all the visitors wishing to see our fish species with their own eyes and to use the means of active learning for acquiring knowledge about fish fauna as well as rules of sustainable fishing. A variety of study programs on water biota is available for different age groups ranging from kindergarten to gymnasium level.

The Centre is located on the shore of Lake Võrtsjärv – the largest inland water body in Estonia, making it possible to complete indoor studies with practical activities in natural environment. The Centre also owns a vessel that can take a study group on the lake for research and to observe waterfowl or fishermen in action.

The most popular study programs focus on fish, be it discussions by the aquariums, fishing on the lake or identification of the fish species caught. Catching aquatic invertebrates in the nearby pond, their identification and examining with the help of stereomicroscope are likewise exciting. The programs are put together with respect to the age of the pupils and the topics in the curricula. While younger children are more playfully engaged in learning about fish, aquatic plants and



### Lake Võrtsjärv Study and Experimental Centre

61117 Rannu municipality  
Tartumaa  
ESTONIA

@ <http://kalala.emu.ee/>

**Contact:** Anu Metsar  
[anu.metsar@emu.ee](mailto:anu.metsar@emu.ee)  
(+372) 522 9570



invertebrates, the programs for gymnasium-level pupils also include studies of the chemical and physical properties of plankton and water bodies.

There is a possibility to involve researchers from the University in teaching and supervising the explorations of schoolchildren. The ecological aspect and cultivation of the sustainable-development-centred mentality are essential in execution of the programs.



### RESEARCH CENTRE OF ORGANIC FARMING

Research Centre of Organic Farming is an interdisciplinary centre in order to bring together different organic farming and food studies in Estonian University of Life Sciences and to initiate further activities in Estonia.

#### Areas of development and research activity

- Research of organic food and agriculture
- Promotion and education of organic food and agriculture
- Pool of expertise on different areas of organic farming: plant production and horticulture, animal husbandry, food processing and food quality
- Finding the best solutions for developing the organic sector in a close cooperation with entrepreneurs and organic farming organisations

The centre rewards best young researchers in the Estonian University of Life Sciences with an organic scholarship. The aim of the scholarship is to encourage research in organic food and farming and it is based on donations.

In order to raise public awareness about organic food, we introduce organic principles at different levels, starting from kindergartens. To help to develop the organic sector in Estonia, we also work on organic processing and marketing issues. We work in cooperation with entrepreneurs and research institutions from Estonia and abroad. Please feel free to contact us, if you are interested!



#### Research Centre of Organic Farming

Estonian University of Life Sciences  
Õsu küla, Ülenurme vald  
Tartumaa 61713  
Estonia

@ <http://mahekeskus.emu.ee/en/>

**Contact:** Head of the Centre: Elen Peetsmann  
[mahekeskus@emu.ee](mailto:mahekeskus@emu.ee)  
(+372) 742 5010



## CENTRE OF RENEWABLE ENERGY

The purpose of the centre is to develop co-operation between workgroups, entrepreneurs and relevant institutions and support our researchers in following tasks:

- Renewable energy related information and consulting
- Initiating and leading renewable energy projects
- Participating in cooperation networks

The Centre is bringing together wide approach of research of renewable energy; for industrial partners we offer:

- **Consultation** regarding growing and using different energy crops and short rotation forest species.
- **Specific related research**, for example soil maps, biomass resource and quality, energy audits, cost-benefit analysis, etc.
- **Laboratory analysis**, for example calorific value of firewood, biogas potential, chemical characteristics of biomass, etc.
- **Engineering and product development**, for example construction of pilot units or testing (bio)fuels in Engine Tests Bench.

University has renewable energy **research and development cooperation** with many different companies; if we look by economic branches then the most important partners are: forestry, agriculture, energetics and waste management companies and organisations.

Once a year we organise the national conference **Investigation and Usage of Renewable Energy Sources** (TEUK), where the main focus is to introduce latest renewable energy research in Estonia and to bring together scientists, practitioners and politicians.

### Centre of Renewable Energy

Estonian University of Life Sciences  
Kreutzwaldi 5  
51014 Tartu  
Estonia

@ <http://tek.emu.ee/en/>

**Contact:** Elis Vollmer  
[elis.vollmer@emu.ee](mailto:elis.vollmer@emu.ee)  
(+372) 731 3268





### LABORATORY OF BIO- AND ENVIRONMENTAL CHEMISTRY

Established in October 2007, the unit is an interdisciplinary R&D team associating scientists and personnel from the Institute of Agricultural and Environmental Sciences, the Institute of Technology and the Institute of Veterinary Medicine and Animal Sciences.

#### Our research facilities consist of:

- The Laboratory of Bio- and Environmental Chemistry
- The installation for development of pilot scale anaerobic digesters (Instrumentation - Control – Automation)

#### The Unit has five main roles:

- Analysis of substrates suitable for bioconversion and measurement of their methanogenic potential
- Research in bioconversion of bio-wastes and biomass to renewable fuels
- Monitoring of fermentation processes at pilot and full scale by developing an ICA strategy
- Scientific and technical training of EMU scientists and partner organisations
- Expert assistance for the development of agricultural biogas production at full-scale in Estonia.

#### Our main research goals are:

- Development of lignocellulosic biomass pre-treatment technologies
- Potential inhibitors including kinetics and efficiency of biogas production
- Digestate composition, possible toxicity and effective use as organic fertilizer.

#### Laboratory of Bio- and Environmental Chemistry

Estonian University of Life Sciences  
Kreutzwaldi 5  
51014 Tartu  
Estonia

@ <http://pk.emu.ee/en/structure/environprotection/biochemistrylab/>

Contact: Kaja Orupõld  
[kaja.orupold@emu.ee](mailto:kaja.orupold@emu.ee)  
(+372) 731 3255



## CENTRE OF EXCELLENCE IN ENVIRONMENTAL ADAPTATION – ENVIRON

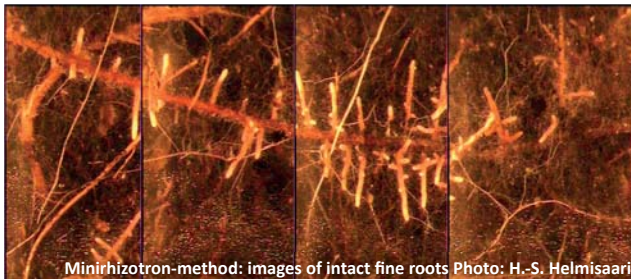
Researchers of ENVIRON investigate the mechanisms of environmental adaptation from molecular to global scales, and feedbacks between the plant and ecosystem adaptation and climate change.

Ecosystems have a large capacity to adapt to environmental perturbations, but most of the future projections of global change ignore the adaptation responses. In the Centre, interdisciplinary experimental and modelling approaches are used to analyse abiotic and biotic stress effects at molecular, physiological, individual and ecosystem levels, determine the limits of adaptation to multiple sequential and interacting stresses. Apart from excellence in science, the consortium builds a foundation for sustainable management of natural resources of Estonia and other Nordic countries under globally changing conditions.

ENVIRON involves five research groups from three Estonian universities - Estonian University of Life Sciences (coordinating institution), University of Tartu and Tallinn University of Technology – and more than 50 staff scientists and over 40 PhD-students. The Centre scientific activities are supported by an International Advisory Board.



CENTRE OF EXCELLENCE  
TEADUSE TIPPKEKUS  
ENVIRON



Minirhizotron-method: images of intact fine roots Photo: H.-S. Helmisaari

## Centre of Excellence in Environmental Adaptation ENVIRON

Estonian University of Life Sciences

Kreutzwaldi 1  
51014 Tartu  
Estonia

@ <http://environ.emu.ee/>

**Contact:** Head of the Centre: prof. Ülo Niinemets  
[ylo.niinemets@emu.ee](mailto:ylo.niinemets@emu.ee)

Executive director: Tiia Kurvits  
[tiia.kurvits@emu.ee](mailto:tiia.kurvits@emu.ee)  
(+372) 5590 8819



The research activities of the Centre are supported by the European Commission (European Regional Development Fund) and the Estonian Ministry of Education and Research. In addition, a large-scale ecosystem infrastructure will be developed, including a SMEAR station (Station for Measuring Forest Ecosystem–Atmosphere Relations), and a FAHM (Free Air Humidity Manipulation) platform.



A key task of ENVIRON is to develop new methods for rapid screening of plant stress responses using volatile emissions. Photo: Ü. Niinemets

SMEAR ESTONIA STATION

A large scale research infrastructure, the Station for Measuring Ecosystem-Atmosphere Relations (SMEAR) has been established in cooperation with University of Tartu, Tartu Observatory and University of Helsinki. During 2013, the 130 meter tower was built to conduct eddy covariance measurements of CO<sub>2</sub>, H<sub>2</sub>O and BVOC. Further assessing meteorological data, concentrations of greenhouse gases and reactive trace gases such as ozone and NOx. In the vicinity of the high tower are soil flux measurements, soil profiles and vegetation's ecophysiological parameters conducted permanently.

Located at the Järvselja Training and Experimental Forest Center, it provides a base for interdisciplinary studies and research and the possibility for transnational research projects. Linking the fields of plant- and ecophysiology, soil sciences, forestry, micrometeorology, atmospheric chemistry and physics and mathematical modelling, it is aimed to solve major uncertainties in the Earth system and global sustainability questions related to climate change, air quality, biodiversity loss, chemicalization, food supply and the use of natural resources. SMEAR Estonia project is supported from EU structural funds.

SMEAR Estonia Station

Estonian University of Life Sciences  
 Kreutzwaldi 5  
 51014 Tartu  
 Estonia

@ <http://smear.emu.ee/>

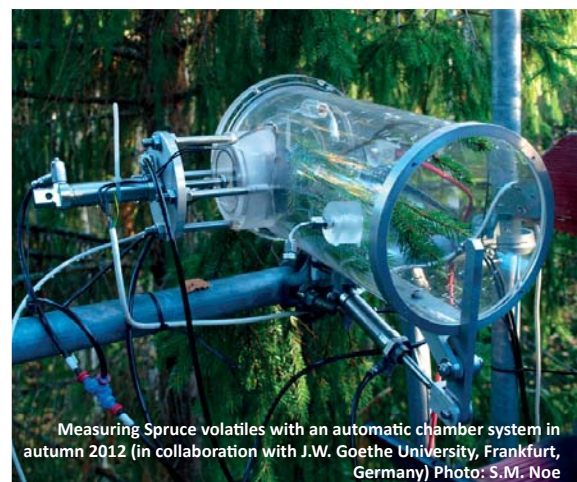
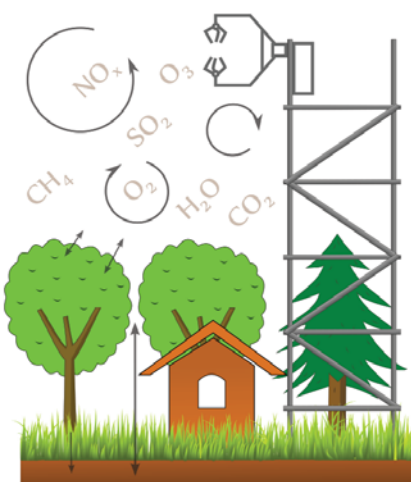
Contact: Dr. Steffen M. Noe  
[steffen.noe@emu.ee](mailto:steffen.noe@emu.ee)  
 (+372) 731 3207



Building of SMEAR station tower (130m high) in Järvselja Forest area, Estonia, summer 2013. Photo: S.M. Noe



Photo: J. Kuusk



Measuring Spruce volatiles with an automatic chamber system in autumn 2012 (in collaboration with J.W. Goethe University, Frankfurt, Germany) Photo: S.M. Noe



## RÕHU EXPERIMENTAL STATION

### Introduction of Experimental Station

The Rõhu experimental station has been part of IAES since March 2007 when the experimental centre at Rõhu and the experimental station at Eerika were merged. Rõhu is IAES' main base for field experiments. The activities of the station are mainly focusing on plant breeding and on various agricultural field trials.

### Experimental Station Land Fund

Rõhu has a total 60 ha of land, of which 36 ha are arable, 9 ha are under experiments (e.g. energy crops, apple-tree, grapes, etc.) and 15 ha is miscellaneous (e.g. buildings, road, hedges etc.)



### Rõhu Experimental Station

Rõhu, 61409, pk.31  
Tähtvere vald  
Tartumaa  
Estonia

@ <http://pk.emu.ee/en/structure/rohuexperimentalcentre>

**Contact:** Director: Toomas Tõrra  
[toomas.torra@emu.ee](mailto:toomas.torra@emu.ee)  
(+372) 741 8535





IAES is involved in following scientific fields:

AREA TITLE	ACTIVITIES
<b>Agronomy and Plant Biology</b>	Agronomy; processing and storage of plant products; grassland science; production and quality of forage; growth and developmental biology of grassland plants, productivity and management of grasslands; agricultural systems; organic plant cultivation; bioenergy crops; plant stress biology; stress adaptation, biogenic emissions
<b>Horticulture</b>	Cultivation and storage technologies of fruits, vegetables and ornamentals; quality and processing of horticultural crops; breeding of fruits; greenhouse production, garden design, biochemistry of horticultural plants.
<b>Plant Health</b>	Chemical, integrated and biological plant protection; phytosanitary; applied entomology- ecology, physiology, ethology and morphology of insects; ecochemical communication; nematology; phytopathology – plant diseases (fungal, microbial and viral) and their prevention
<b>Soil Science and Agrochemistry</b>	Soil ecology, chemistry and physics; soil functions; humus status of soils; nutrient cycling in the system soil-plant- environment; plant nutrition and optimal fertilization; soil genesis and classification; soil cartography and databases; rational land use
<b>Landscape and Environmental Management</b>	Environmental protection and management, environmental economics, environmental auditing and assessment of environmental impacts, analysis of environmental risks, abiotic and biotic markers of environment; quality of habitat, landscape ecology and management, relations between landscape structure and organisms, values and functions of landscape, changes and scenarios in/ for land use, spatial planning, landscape maintenance (grounds keeping), recultivation/recovery of technogenic landscapes, nature preservation
<b>Landscape Architecture</b>	Historical and contemporary cultural landscapes and settlement environment, landscape design and aesthetics, history of landscape architecture, design of urban public open spaces, outdoor recreation planning and design, technogenic and healing landscapes; universal design of outdoor space, landscape and visual impact assessment, local spatial planning, landscape character assessment and urban green space management
<b>Biological Diversity</b>	Evolution, protection and monitoring of biological diversity, agro ecosystems and their ecology, botany, zoology and mycology, floristics, faunistics and fungistics, biosystematics, population and production biology, nature tourism
<b>Applied Hydrobiology</b>	Ecology of inland water bodies; hydrochemistry and –physics; limnology; planktology; water microbiology; biota, protection of water resources; ecotoxicology of water bodies, fishery, assessment and management of fish stock of inland water bodies, protection of endangered species of fish, limnological modelling, healing of inland water bodies, forming of biota of inland water bodies

## INTERNATIONAL RESEARCH PROJECTS

- Networking Lake Observatories in Europe; (2012-2016); Nõges, Tiina; COST
- Urban Agriculture Europe; (2012-2016); Bell, Simon; COST Office
- Green Infrastructure approach: linking environmental with social aspects in studying and managing urban forests; (2013-2017); Bell, Simon; COST Office
- Tourism, Wellbeing and Ecosystem Services; (2012-2016); Bell, Simon; COST Office
- Urban Allotment Gardens in European Cities - Future, Challenges and Lessons Learned; (2012-2016); Bell, Simon; COST Office
- Cyanobacterial blooms and toxins in water resources: Occurrence, impacts and management; (2012-2016); Kangur, Külli; COST Office
- Renewable energy and landscape quality; (2014-2018); Kõlvik, Mart; COST Office
- Networking Lake Observatories in Europe; (2012-2016); Laas, Alo; Nõges, Tiina; COST Office
- Innovations in Climate Governance: Sources, Patterns and Effects; (2013-2017); Orru, Kati; COST Office
- Towards a sustainable and productive EU organic greenhouse horticulture; (2012-2016); Põldma, Priit; COST Office
- Biochar as option for sustainable resource management; (2012-2016); Raave, Henn; COST Office
- Making European Policy Popular through Challenge, Learning, Innovation, Cooperation: An experiment on the Landscape Convention; (2013-2015); Bell, Simon; European Commission
- Interactive Soil Quality Assessment in Europe and China for Agricultural Productivity and Environmental Resilience; (2015-2020); Reintam, Endla; European Commission
- QUESSA - Quantification of ecological services for sustainable agriculture; (2013-2017); Veromann, Eve; European Commission
- Innovative Education towards the Needs of the Organic Sector; (2014-2016); Luik, Anne; European Commission
- Converting C3 to C4 photosynthesis for sustainable agriculture; (2012-2016); Niinemets, Ülo; European Commission
- Stress-Induced Plant Volatiles in Biosphere-Atmosphere System; (2013-2018); Niinemets, Ülo; European Commission
- Managing Aquatic ecosystems and water Resources under multiple Stress; (2014-2018); Nõges, Tiina; European Commission
- Integrated planning tool to ensure viability of grasslands; (2014-2018); Sepp, Kalev; European Commission
- Vocational education and training connecting higher education and rural companies; (2013-2015); Sudakova, Lea; European Commission
- Restoration of Estonian alvar grasslands; (2014-2019); Tali, Kadri; European Commission
- Educational network on soil and plant ecology and management (EduSapMan); (2014-2017); Reintam, Endla; European Commission
- Freely Accessible Central Europe Soils (FACES); (2015-2018); Reintam, Endla; European Commission
- Nordic-Baltic Centre of Advanced Research on Forestry Serving Urbanised Societies II; (2011-2015); Bell, Simon; Council of Nordic Ministers' Office in Estonia
- Drying, Juices and Jams of Organic Fruit and Vegetables: what happens to Desired and Non-Desired compounds. (2015-2018); Moor, Ulvi; ERA-Net Core Organic Plus



## RESEARCH PROJECTS

## Estonian Science Foundation (ETF) grants and target funding themes (SF)

@ <https://www.etis.ee>

- Diversity of Bumblebees in the Agricultural Landscapes; (2015-2015); Mänd, Marika; Agricultural Research Centre
- Hydrobiological monitoring and studies of Lake Peipsi; (2014-2016); Haldna, Marina; Environmental Agency
- Monitoring of protected vascular plant species; (2015-2015); Kattai, Kaili; Environmental Agency
- Monitoring of the Common Crane; (2015-2015); Leito, Aivar; Environmental Agency
- Hydrobiological monitoring of small lakes; (2014-2016); Ott, Ingmar; Environmental Agency
- Moth monitoring 2015; (2015-2015); Öunap, Erki; Environmental Agency
- Hydrobiological monitoring and research of rivers; (2014-2016); Pall, Peeter; Environmental Agency
- Hydrobiological monitoring and studies of Lake Võrtsjärv; (2014-2016); Tuvikene, Lea; Environmental Agency
- Tagging and restocking of eels from Lake Ülemiste to the sea; (2015-2015); Järvalt, Ain; Environmental Investment Centre
- Increasing the capability of environmental monitoring on Estonian lakes and rivers; (2012-2015); Kangur, Külli; Environmental Investment Centre
- Inventory of Historical Land Cover Change and Zoning of the Cultural Landscapes in Karula and Soomaa National Parks; (2015-2016); Sepp, Kalev; Environmental Investment Centre
- Landscape Monitoring Programme for 2016-2025, Results Analysis and Methodology Improvement; (2014-2016); Sepp, Kalev; Environmental Investment Centre
- Wood ash valorisation as functional fertilizers in agri- and horticulture; (2015-2016); Raave, Henn; Environmental Investment Centre
- Assessment of Estonian coastal water pollution by means of fish biomarkers; (2014-2016); Tuvikene, Arvo; Environmental Investment Centre
- Study of the Eurasian Crane; (2015-2017); Sepp, Kalev; Environmental Investment Centre
- Assessing restoration success in semi-natural habitats; (2013-2015); Tali, Kadri; Environmental Investment Centre
- Studies of the internal phosphorus loading in Lake Peipsi as a scientific basis for the water management and protection of the lake; (2014-2015); Tammeorg, Olga; Environmental Investment Centre
- XXII Annual Plant Protection Meeting “Novel Trends in IPM”; (2013-2015); Mänd, Marika; Estonian Agricultural Registers and Information Board
- Chemical tagging of European Eel; (2014-2015); Silm, Maidu; Estonian Agricultural Registers and Information Board
- Conservation assessment for *Cornus suecica* L.; (2012-2015); Kull, Thea; Estonian Environmental Board
- Gathering of data of satellite-tracked Eurasian cranes; (2014-2015); Leito, Aivar; Estonian Environmental Board
- Plain procurement no. 154723 part 1: Mapping the need of maintenance of *Angelica palustris* and part 2: Specifying inventory of *Pulmonaria angustifolia*; (2014-2015); Tali, Kadri; Estonian Environmental Board
- Modelling of metabolism and food web structure of Estonian lakes; (2015-2016); Cremona, Fabien; Estonian Ministry of Education and Research
- Non-additive impact of border-richness to biota; (2014-2019); Kull, Tiiu; Estonian Ministry of Education and Research
- Botanical collections; (2009-2015); Kull, Tiiu; Estonian Ministry of Education and Research
- Zoological collections; (2009-2015); Kurina, Olavi; Estonian Ministry of Education and Research
- Polytolerance in woody species: how universal is shade-drought tolerance trade-off?; (2015-2016); Laanisto, Lauri; Estonian Ministry of Education and Research
- From soil to crop: quality indicators of soil, plant production and crop in different farming systems; (2013-2016); Loit, Evelin; Estonian Ministry of Education and Research
- International cooperation research activity EUPHRESCO; (2013-2015); Loit, Evelin; Estonian Ministry of Education and Research
- Biodiversity of Estonian large lakes under different stressors and in a changing environment; (2015-2016); Mäemets, Helle; Estonian Ministry of Education and Research
- Sustainable crop protection: harnessing ecosystem services



- for plant production; (2015-2020); Mänd, Marika; Estonian Ministry of Education and Research
- Plant stress in changing climates: from stress responses to acclimation and adaptation; (2014-2018); Niinemets, Ülo; Estonian Ministry of Education and Research
- Integration of SMEAR Estonia station into international networks of environmental research; (2013-2015); Noe, Steffen Manfred; Estonian Ministry of Education and Research
- Lake food webs and C metabolism across gradients of catchment alkalinity and climate; (2014-2019); Nöges, Tiina; Estonian Ministry of Education and Research
- Mycological collections; (2009-2015); Pärtel, Kadri; Rahi, Märt; Estonian Ministry of Education and Research
- Reproduction potential of migratory brown trout in Estonian rivers; (2014-2016); Järvekülg, Rein; Estonian Ministry of Environment
- Study on fish assemblages and the fishing efficiency of gear in small Estonian lakes; (2014-2016); Krause, Teet; Estonian Ministry of Environment
- Development of methods for assessment and mapping of ecosystem services of marine and inland waters; (2014-2015); Sepp, Kalev; Estonian Ministry of Environment

- Collecting and maintenance of genetic resources of fruit crops for 2007-2013; (2007-2015); Kahu, Kersti; Kikas, Ave; Estonian Ministry of Rural Affairs
- The cultivars breeding program 2009-2019: The breeding of winter hardy, productive and with high fruit quality sweet cherry and plum cultivars; (2010-2015); Kahu, Kersti; Kikas, Ave; Estonian Ministry of Rural Affairs
- Blueberry (*Vaccinium*) breeding; (2010-2015); Karp, Kadri; Estonian Ministry of Rural Affairs
- Complex applied research for different cultivation methods (incl. direct drilling); (2012-2016); Lauringson, Enn; Estonian Ministry of Rural Affairs
- The small fruit breeding - breeding of blackcurrant and raspberry cultivars; (2009-2015); Libek, Asta-Virve; Estonian Ministry of Rural Affairs
- A detailed climate change risk assessment for European agriculture and food security, in collaboration with international projects; (2015-2017); Loit, Evelin; Estonian Ministry of Rural Affairs
- Fertility building management measures in organic cropping systems; (2015-2017); Luik, Anne; Estonian Ministry of Rural Affairs
- Targeted precision biocontrol and pollination enhancement in organic cropping systems; (2011-2015); Mänd, Marika; Estonian Ministry of Rural Affairs
- Drying, Juices and Jams of Organic Fruit and Vegetables: What Happens to Desired and Non-Desired Compounds; (2015-2018); Moor, Ulvi; Estonian Ministry of Rural Affairs
- The breeding and evaluation of pear cultivars; (2010-2015); Tiirmaa, Krista; Univer, Neeme; Estonian Ministry of Rural Affairs
- Fruit tree breeding - breeding of scab resistant apple cultivars; (2009-2015); Univer, Toivo; Estonian Ministry of Rural Affairs
- The status and dynamics of soil carbon stock; (2015-2019); Kauer, Karin; Estonian Ministry of Rural Affairs
- Assessment of needs for plant protection products for minor use crops and compilation of guidelines for integrated pest management of horticultural crops; (2015-2016); Starast, Marge; Estonian Ministry of Rural Affairs
- The impact of biogas digestate usage to short rotation coppice agroecosystem; (2012-2015); Heinsoo, Katrin; Estonian Research Council





- Selected clades of Mycetophilidae (Diptera, Sciaroidea): systematics, phylogeography and coevolution; (2012-2015); Kurina, Olavi; Estonian Research Council
- Estonian observatory of aquatic environments; (2012-2015); Laas, Alo; Estonian Research Council
- Impact of pesticide residues on the foraging behaviour and physiology of pollinators; (2012-2015); Mänd, Marika; Estonian Research Council
- Environmental, physiological and genetic controls on isoprene emission in *Populus* and *Salix*; (2012-2015); Niinemets, Ülo; Estonian Research Council
- Modelling of Lake Võrtsjärv food webs, carbon cycle and impacts of the climate; (2012-2015); Nõges, Tiina; Estonian Research Council
- Trade-offs in anti-herbivore defence: the perspectives of insects and plants; (2011-2016); Rimmel, Triinu; Estonian Research Council
- Trade-offs in plant defence against herbivores; (2012-2015); Rimmel, Triinu; Estonian Research Council
- Phenotypic and genotypic characterisation of Baltic and Russian Pskov region populations of *Phytophthora* infestants; the role of oospores as a source of primary inoculum to late blight pathogen epidemiology; (2012-2015); Runno-Paurson, Eve; Estonian Research Council
- Applied Research in Nature Conservation; (2012-2015); Sepp, Kalev; Estonian Research Council
- Effect of the organic cultivation technologies on content of bioactive compounds in blueberry and grapevine fruits; (2012-2016); Vool, Ele; Estonian Research Council
- Swedish biogas research expertise integration for the establishment of internationally acknowledged Estonian Biogas Competence Centre; (2014-2015); Pitk, Peep; Estonian University of Life Sciences
- Expert opinion on heavy metal pollution in Jägala River; (2015-2015); Tuvikene, Arvo; Horizon Tselluloosi ja Paberi AS
- Monitoring of fish in connection with dredging in the harbour of Rohuküla in 2015; (2015-2015); Järvalt, Ain; Marine Systems Institute of Tallinn University of Technology
- Development and application of the methodology for the calculation of average greenhouse gas emissions from the cultivation of rapeseed, wheat, rye, barley and triticale in Estonia; (2014-2015); Astover, Alar; Ministry of Environment
- Hydrobiological investigations of Lake Peipsi during the Estonian-Russian joint expedition in winter; (2015-2015); Haldna, Marina; Ministry of Environment
- Status of fish stocks in Lake Võrtsjärv and analysis of implementation of Estonian Eel Management Plan; (2014-2016); Järvalt, Ain; Ministry of Environment
- Increasing the capability of environmental monitoring on Estonian lakes and rivers; (2012-2015); Kangur, Külli; Tuvikene, Lea; Ministry of Environment
- Climate change adaptation strategy and measures for thematic fields of natural environment and bioeconomy; (2015-2015); Suškevic, Monika; Ministry of Environment
- Monitoring of restored spawning and nursery areas of fish in Lake Võrtsjärv; (2014-2015); Järvalt, Ain; OÜ Vesiehitus
- Participation in additional bird studies for environmental impact assessment of North-Western Estonian inshore areas; (2014-2015); Kuresoo, Andres; Ramboll Eesti AS
- RESIST project: Breeding for disease resistance in plants; (2011-2015); Niinemets, Ülo; SA Archimedes
- Centre of Excellence in Environmental Adaptation; (2011-2015); Niinemets, Ülo; SA Archimedes
- Estonian Environmental Observatory; (2010-2015); Noe, Steffen Manfred; SA Archimedes
- Optimization of biochemical pathways of an anaerobic digestion process of biogas energy technologies and development of process monitoring and control methods; (2010-2015); Normak, Argo; SA Archimedes
- RESIST project Breeding for disease resistance in plants; (2011-2015); Runno-Paurson, Eve; SA Archimedes
- Consideration of land-use changes and ecosystem services and goods in sustainable land-use planning; (2012-2015); Sepp, Kalev; SA Archimedes
- The methodology for assessing the impact of clearcutting and conflict prevention at landscape level, taking into account social, economic and ecological aspects; (2013-2015); Sepp, Kalev; State Forest Management Centre
- Ornithological survey of the Livonian Bay/Gulf of Riga; (2012-2015); Kuresoo, Andres; University of Tartu
- Inventory and development of monitoring programme for nature values in Estonian marine areas; (2014-2016); Kuresoo, Andres; Luigujõe, Leho; University of Tartu



## Studies in IAES

Conforming to the principles of the European Higher Education Area, the Estonian University of Life Sciences has adopted the two-tier degree structure, which has a compulsory Bachelor's degree in all degree programmes.

All study programmes are based on accredited curricula and teaching at the Institute of Agricultural and Environmental Sciences is of a high European standard.



### Study levels:

- Bachelor's studies with the volume of 180 ECTS (European Credit Transfer and Accumulation System credits), official standard study period 3 years.
- Master's studies with the volume of 120 ECTS, official standard study period 2 years.
- Doctoral studies with the volume of 240 ECTS, official standard study period 4 years.

Our teaching and learning take place in a research environment where students benefit from interaction with researchers who are working at the frontiers of knowledge in their disciplines.

The Institute of Agricultural and Environmental Sciences has nearly 1,050 degree students and approximately 250 degrees are completed annually.

We have web-based Study Information System (SIS) of the Estonian University of Life Sciences. The database supports the organisation of studies, keeps and systemises data concerning the studies at the University.

For more information: <http://www.emu.ee/en/studies>

## IAES offers the following degree programs:

### HORTICULTURE

Horticulture is one of the most popular specialities in the University. The students of this field study all branches of horticulture: production and postharvest technologies of fruits, vegetables and ornamentals and also garden design.

The graduates of horticulture are warmly welcome in enterprises producing fruits, vegetables and ornamentals. Good knowledge about growth habits, cultivation and maintenance demands of different groups of ornamentals enable the graduates to work in landscaping businesses as specialists and managers.

The proportion of optional subjects enables students to take courses from other universities either in Estonia or abroad.

### What do the students learn?

- Production of high quality horticultural crops;
- Contemporary methods in production optimisation;
- Quality assessment and postharvest technologies of horticultural crops;
- Design and maintenance of green areas and private gardens.



## AGRICULTURAL PRODUCTION AND MARKETING

Higher education in rural economy and sustainable use of natural resources allows flexibility in specialization, taking into account any changes in the labour market. Graduates of this field can analyse the economic efficiency and sustainability of different branches of rural economy, plan the development of enterprises, co-operation actions, farms and regions.

Graduates are well aware of the scientific-innovative problems and developments of the agricultural sector as well as the research methodology applied and how to put them into practice.

### What do the students learn?

- Animal and crop husbandry (including horticulture);
- Economics, marketing and economic analysis;
- Business management;
- Environmentally friendly, efficient and contemporary methods of production optimisation;
- Rational land use and the application of GIS;
- Sustainable administration.



## MANAGEMENT OF URBAN AND INDUSTRIAL LANDSCAPES

The speciality provides a broad knowledge in the following fields: environmental politics and environmental management in industry and municipalities, assessment of the effects of human activity on the environment, restoration of ruined landscapes and industrial areas and planning of sustainable living environment.

The aim of the current Master's program is to provide in-depth knowledge and understanding of the following fields:

- environmental policies and environmental management in the industry and municipalities;
- assessment of the effects of human activity on the environment;
- restoration of ruined landscapes and industrial areas, and planning of sustainable living environment both at Estonian and international levels;
- provide competence for working as a specialist of environmental protection in the fields of environmental management, spatial planning, landscape preservation, nature conservation;
- provide fundamental knowledge and skills for continuing studies in doctorate programs.



## ENVIRONMENTAL PROTECTION

The aim of the current bachelor curricula is to give basic knowledge and understanding of the influence of natural processes and human activity on environment, biodiversity, landscapes and human environment, including an understanding of the impact of human activities, use of landscape and natural resources, environment management, nature conservation, spatial measures including spatial and landscape planning improving the status of the environment; competence to work in a position which requires the qualifications of an environmental protection specialist in the areas of environment management, nature conservation, spatial planning under the supervision of a specialist in charge; basic knowledge to continue studies in the Master's level.

The curriculum gives a student theoretical knowledge and practical skills to work in local and environmental authorities, administration units and environmental management companies in Estonia, the countries of the European Union, and other countries. A high percentage of graduates are working in environmental fields having found jobs in state or local authorities, the environmental protection system, other universities or environmental companies as specialists, many of them continue their studies to Master's degree level.

### What do the students learn?

- Plan and elaborate on the environmentally friendly and aesthetic living environment;
- Work both in the public and private sector;
- Plan and preserve landscapes;
- Compile and apply different environmental measures, such as environmental impact assessment, environmental management, and environmental audit.



## LANDSCAPE PROTECTION AND PRESERVATION

The curriculum gives a student theoretical knowledge and practical skills to work in scientific institutions, environmental management companies and administration units of local authorities and ministry of environment in Estonia, countries of the European Union, and other countries.

A high percentage of graduates are working in environmental fields having found jobs in state authorities, other universities or environmental companies as specialists, some have come to complete their doctoral studies.

The aim of the current Master's program in landscape protection and preservation is to:

- Give specialized knowledge in and understanding of the impact of natural processes and human activities on biodiversity, landscapes and the human living environment, incl. ways of using landscape and natural resources, landscape and spatial planning, environmental management and its principal measures, nature conservation, and the status of the environment in Estonia and internationally;
- Give the competence needed to work as an environmental protection specialist in the fields of environmental management, spatial planning, landscape preservation and nature conservation;
- Give the basic knowledge and skills for continuing studies in the doctoral level.



## ENVIRONMENTAL PLANNING AND LANDSCAPE DESIGN

Landscape Architects are concerned with the design, management, preservation and use of the land. Landscape architects share with garden designers a concern for the planning and design of outdoor space. Like architects that design buildings where people enjoy working and living, landscape architects create comfortable, safe and interesting landscapes.

Landscape architects help to solve the problems concerning day-to day living space. Nowadays urban landscapes must accommodate commercial and residential needs, transportation requirements, leisure spaces and much more, for both public and private users. Students participate in general and detailed planning, perform visual evaluation of landscape quality and draw up plans for landscape preservation and old park restoration.

### What do the students learn?

- Perceive nature, human culture and technical solutions;
- Develop creative and problem-solving abilities, environmental awareness and professional attitudes;
- Elaborate design proposals and find technical solutions for actual sites;
- Express themselves orally, graphically and in writing;
- Spatial planning, landscape planning and design and manage green areas;
- Plan, design and manage the functional environmentally friendly and aesthetic living environment.



## APPLIED BIOLOGY OF AQUATIC AND TERRESTRIAL ECOSYSTEMS

Applied biology is one branch of biology, in which, different from academic direction, more attention is paid to practical aspects.

Important field of activities is management, restoration, assessment, monitoring of terrestrial and water ecosystems in a broader meaning. This kind of applied direction is based on fundamental academic research and this is familiar to teaching staff. Prevailing are projects dealing with investigation of cause-relations ecological functions.

Curriculum „Applied biology of water and terrestrial ecosystems“ educates as scientists as applied specialists/experts.

The best conditions for studies of practical hydrobiology are at Centre for Limnology, locating on eastern shore of Lake Võrtsjärv. In turn, studies of terrestrial ecosystems, use field stations on shore of sea near Virtsu at Puhtu and near Lake Peipsi at Järvelja. Curriculum has large proportion of field studies all over Estonia.

Students participate with scientists and PhD students in field works, data analysing, experiments. Students become acquainted with different field of investigations: reviews of plants and – animals, global changes in nature, productional ecology, ecological restoration, ecology of Lake Peipsi, Lake Võrtsjärv, running water bodies, nature protection, toxicology, management of nature protection areas and water bodies, fishery etc.

### What do the students learn?

- Foreign languages, communication psychology, philosophy;
- Environmental policy – and management, environmental protection
- Fundamentals of economics, fundamentals of law
- Animal - and plant species, their ecology
- Marine science, hydrology
- Environmental physics and – chemistry, toxicology
- Estonian flora and – fauna and their ecology
- Biostatistics
- Methods for investigation of aquatic and terrestrial ecosystems
- Restoration of ecosystems



## NATURE TOURISM

Estonia is famous for its genuine and diverse nature – people interested in nature can find rare plants and animals, virgin marshes and woodlands.

Nature tourism is the travel through and enjoyment of the natural world, its seasonal cycles and events, carried out in a manner that promotes the protection of natural and human communities and consideration for those who will inherit our world.

Students accumulate a thorough knowledge of nature, tourism and entrepreneurship. The increasing number of tourists constitutes a real threat to our comparatively untouched nature, which makes tourism management and planning absolutely necessary.

Masters studies in this field concentrate more on specific topics in nature and international nature tourism.

### What do the students learn?

- Diversity of Estonian nature and landscapes;
- Fundamentals of nature tourism, fishing and hunting tourism, tourism management, project management and project writing;
- Environmental philosophy and ethics;
- Environmental sociology, ecology, GIS;
- Skills necessary for nature guide: foreign languages, communication psychology, risks and work safety in nature tourism, photography, methodology for nature interpretation;
- Basics of nature protection and environmental management.



## INTERNATIONAL MASTERS' COURSE

Our University is actively developing international courses to improve students' mobility and the quality of the studies. At the moment international students can study at the landscape architecture. In addition we regularly organise short international courses of the BOVA and NOVA universities on agricultural and environmental sciences.

### LANDSCAPE ARCHITECTURE

#### 2-year full-time

The overall objective of the Master programme in Landscape Architecture is to enable students to become professional landscape architects recognised both in Estonia and internationally, primarily through European Federation of Landscape Architecture (EFLA) accreditation. The programme is designed to reflect the EU Bologna process and the EFLA criteria. Students entering the master programme will already have a Bachelor degree after three or four years and wish to complete their studies through the Master programme which is considered to provide an advanced curriculum and to equip students with a higher level of academic and professional expertise. The curriculum builds on the level of achievement expected at bachelor level with in depth studies of a range of more specialised subjects covering both practical and theoretical fields, including ones which have special aspects suitable for study in Estonia.

#### The learning environment is based on:

- a mix of individual study and group project work,
- a diversity of teaching modes ranging from formal lectures and seminars or field trips to tuition on studio-based design projects,
- opportunities for research ranging from library-based research to field work,
- assessment methods which range from writing examination papers, essays and reports to hand-drawn or digital graphic-based plans and images
- the use of open, public presentation and criticism of design projects
- realistic planning, design or management problems forming the basis of the project work

## DOCTORAL PROGRAMS

### AGRICULTURAL SCIENCES

The objectives are to train prospective research and teaching staff members, as well as leading specialists for positions:

- in universities, research and development institutions,
- as leading experts in governmental agencies, agribusinesses, rural enterprises and the sectors supporting these institutions.



### ENVIRONMENTAL SCIENCES AND APPLIED BIOLOGY

The objectives are to train competent teachers, researchers and top specialists in environmental sciences and applied fields of biology for positions:

- in institutions of higher education, research and development institutes,
- as experts in government agencies, in institutions for the protection of nature and the environment and in agricultural production and the sectors that serves these institutions.

The graduate will have thorough knowledge in the broader area of Environmental Sciences and Applied Biology and deep and up-to-date knowledge in his/her narrower area of research; he/she will be competent in the research methods of his/her field and is able to modify them as appropriate;







### ESTONIAN LANDSCAPE ARCHITECTURE STUDENTS ORGANISATION

Landscape architecture – the entirety of landscape surrounds us, an extremely broad and complex domain, which contributes to the orientation of the Estonian Landscape Architecture Students Organisation. Our organisation includes students from both the Estonian University of Life Sciences and Tartu College of Tallinn University of Technology. The organisation provides excellent and practical opportunities for committed students to find professional guidance.

The Estonian Landscape Architecture Students Organisation was founded in Tartu in 1999 by the graduates of the first Landscape Architecture course who have been working as pioneers in our field in Estonia sharing their knowledge. In addition to the founding members, other experienced members and visiting lecturers visit us often to speak about topics in our speciality.

A weekly tradition is to meet once or twice a week, either to watch a film or attend lectures afterwards in the evenings, participate in competitions, attend product presentations, conduct workshops, practice football, listen to music or just enjoy good conversation with each other.

Membership in 2015 was 63.



### ENVIRONMENTAL PROTECTION STUDENTS' ASSOCIATION

The Environmental Protection Students' Association (EPSA) of EMU (Keskkonnakaitse Üliõpilaste Selts, KÜS) is a non-profit student organisation, founded in Tartu, on March 19th 2001. EPSA's aims are: to improve both the professional skills and the ecological awareness and natural-interest of members, to cooperate with students and student organisations with similar interests in Estonia, to promote a nature and environmentally friendly way of thinking amongst the general public, to organise and participate in environmental events and also to organise social activities for members.

The association was founded to unite students of landscape protection and preservation in EMU and since the spring of 2005 all students of EMU who are interested in environmental protection can join the association. Membership in 2015 was 32 active members and 120 alumni.



## ACCOMMODATION

@ <http://www.emu.ee/en/student-life/practical-information/student-hostel/>

The Estonian University of Life Sciences guarantees accommodation in its hall of residence for all international exchange students. The Life Science's campus is located 2 km from Tartu's Town Hall Square. There are two residential blocks – Betton (Tuglase 7) and Torn (Kreutzwaldi 52).

The rooms are mostly double rooms with a WC, shower and a small kitchen, but there are also single rooms available. There is a permanent Internet connection in every room. Visitors can use the bicycle depot and washing-machine.

Students can also find a room at a dormitory with the help of the Student Village, which is a non-profit organization. The Student Village owns eight fully functional dormitories. The dormitories are located at various places around the city. All dormitories are close to bus routes and the town centre.

## SPORTS CENTRE

@ <http://sport.emu.ee/>

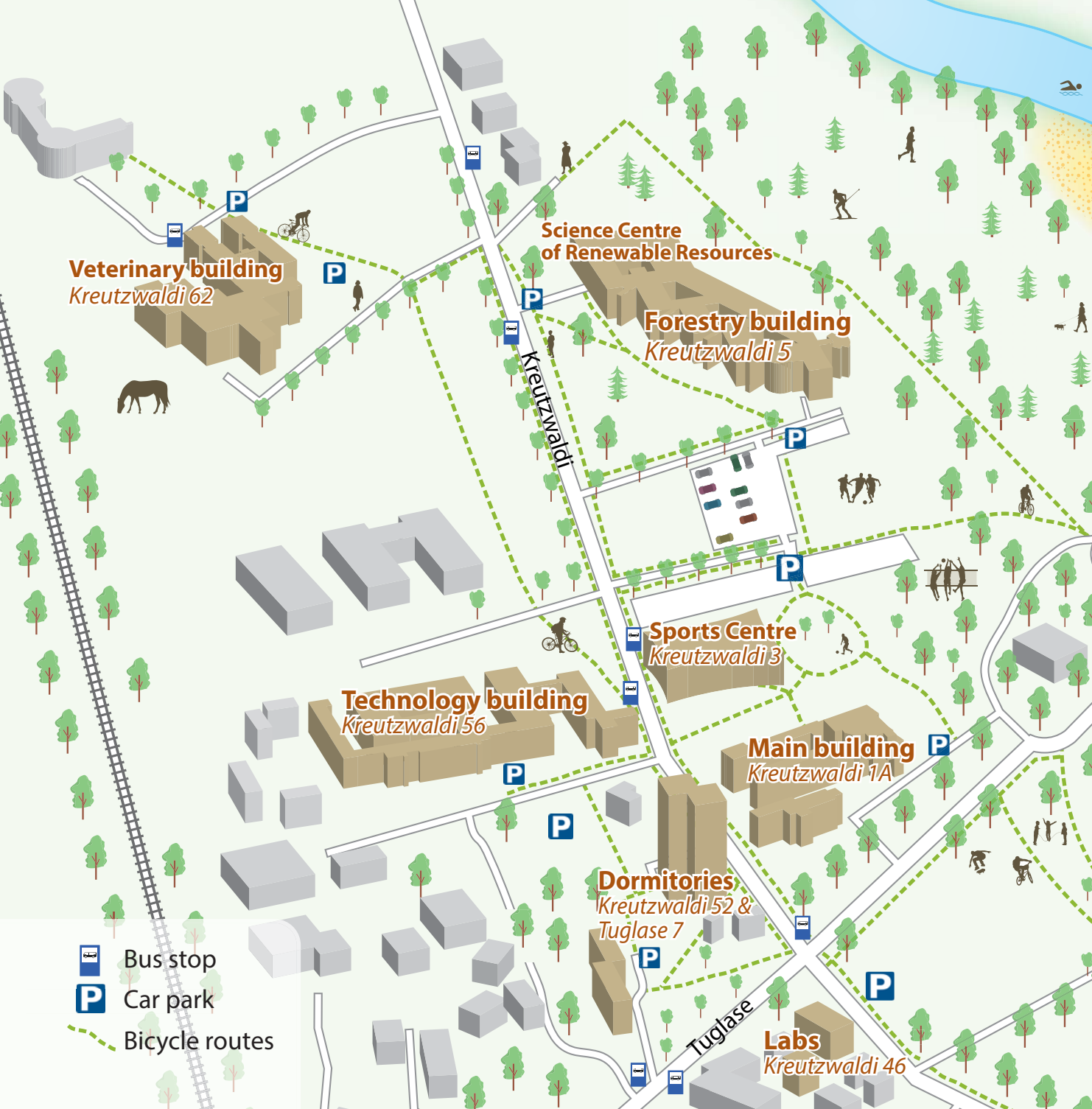
The Estonian University of Life Sciences' Sports Centre is located on campus, opposite the Main Building of the University, providing easy access and convenience for staff and students. The 2,437 m<sup>2</sup> sports and fitness complex was completed in 2009.

The Estonian University of Life Sciences is proud of its sports facilities. The Sports Centre is home to the majority of the indoor and outdoor facilities at the University.

### We have:

- 3 outdoor volleyball courts
- 1 small outdoor soccer ground
- 3 indoor sporting halls
- 2 aerobics halls
- 1 climbing wall
- Table Tennis Room
- special rooms for weight lifting, wrestling and bodybuilding





**Veterinary building**  
*Kreuzwaldi 62*

**Science Centre  
of Renewable Resources**

**Forestry building**  
*Kreuzwaldi 5*

**Sports Centre**  
*Kreuzwaldi 3*

**Technology building**  
*Kreuzwaldi 56*

**Main building**  
*Kreuzwaldi 1A*

**Dormitories**  
*Kreuzwaldi 52 &  
Tuglase 7*

**Labs**  
*Kreuzwaldi 46*

 Bus stop

 Car park

 Bicycle routes



Printed by environmentally friendly printinghouse Ecoprint



[www.emu.ee](http://www.emu.ee)

**Eesti Maaülikool**

Estonian University of Life Sciences

Põllumajandus- ja keskkonnainstituut

Institute of Agricultural and Environmental Sciences