



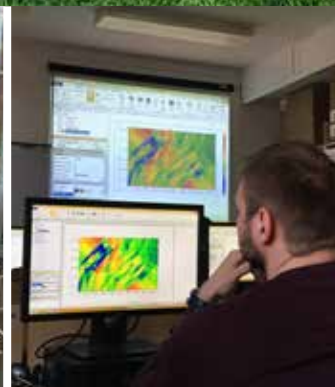
UNIVERSITY of
DEBRECEN
HUNGARY

INSTITUTES

OF THE FACULTY OF AGRICULTURAL
AND FOOD SCIENCES AND
ENVIRONMENTAL MANAGEMENT



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Contents

Dean's Introduction	4
Institute of Agricultural Chemistry and Soil Science	6
Institute of Animal Science, Biotechnology and Nature Conservation	8
Institute of Applied Plant Biology	10
Institute of Crop Production, Breeding and Plant Technology	12
Institute of Horticulture	14
Institute of Plant Protection	16
Institute of Land Use, Engineering and Precision Farming Technology	18
Institute of Food Science	20
Institute of Food Technology	22
Institute of Water and Environmental Management	24
Central Laboratory of Agricultural and Food Products	26
Centre for Agricultural Genomics and Biotechnology	28
Center for Complex Systems and Microbiome Innovations	30
Precision Crop Production Research and Development Service Centre	32
Kálmán Kerpely Doctoral School	34
Doctoral School of Food Sciences	36
Doctoral School of Animal Science	38



Dear Students, Partners and Friends of the Faculty,

It is my pleasure to welcome you to the Faculty of Agricultural and Food Sciences and Environmental Management at the University of Debrecen. Located in one of Hungary's most important agricultural region, our Faculty combines strong academic tradition with future-oriented education, research and innovation.

Our mission is to educate professionals, researchers and innovators who can respond effectively to the major challenges of modern agri-food systems. Agriculture today is closely linked to climate adaptation, water management, soil health, biodiversity, food safety, nutrition, digital technologies, circular bioeconomy and rural development. These themes shape our programmes and give our students a clear professional objective.

The Faculty covers the full agricultural, food and environmental value chain. Our institutes and centres bring together expertise in crop production, horticulture, plant protection, soil science, animal science, biotechnology, food science and technology, nutrition, precision agriculture, engineering, water and environmental management, genomics and laboratory analytics. This broad academic environment enables students to connect biological, technological, environmental and economic perspectives.

We are strongly committed to practice-oriented education. Students learn not only in classrooms, but also in laboratories, demonstration sites, experimental farms, field trials, research facilities and professional partner environments. They are encouraged to ask relevant questions, analyse real problems and develop solutions that are applicable in agriculture, food production, environmental management and related industries.

Internationalisation is one focus area of our development. Through English-language programmes, doctoral schools, research collaborations and mobility opportunities, we welcome students and partners from many countries and cultures. At the same time, our regional embeddedness allows us to connect international knowledge with the needs of farmers, companies, institutions and communities in Hungary and Central Europe.

University life in Debrecen also offers a supportive and vibrant student experience. Student organisations, cultural traditions, sport, health initiatives, mentoring and community programmes help students develop not only academically, but also personally and professionally.

We invite prospective students, universities, research organisations and industry partners to join us in building sustainable food systems, resilient agriculture and responsible natural resource management.

Welcome to our Faculty.

Dr László Stündl

Professor, Dean

Faculty of Agricultural and Food Sciences
and Environmental Management
University of Debrecen

Institute of Agricultural Chemistry and Soil Science

1. Institute Overview

The Institute of Agricultural Chemistry and Soil Science advances research and education on the soil–plant system, with a strategic focus on soil fertility, nutrient dynamics, biostimulants, soil conditioners, and climate-related stress responses. Its mission is to generate scientifically robust, application-oriented knowledge that supports resilient crop production, soil health, and sustainable land management in Hungary and internationally.

2. Education

The Institute contributes to the Faculty's academic portfolio by providing specialist expertise in soil science, agricultural chemistry, and plant–soil interactions. Its educational role equips students with a strong scientific foundation in nutrient management, soil functionality, and analytical approaches relevant to contemporary agricultural and environmental challenges.

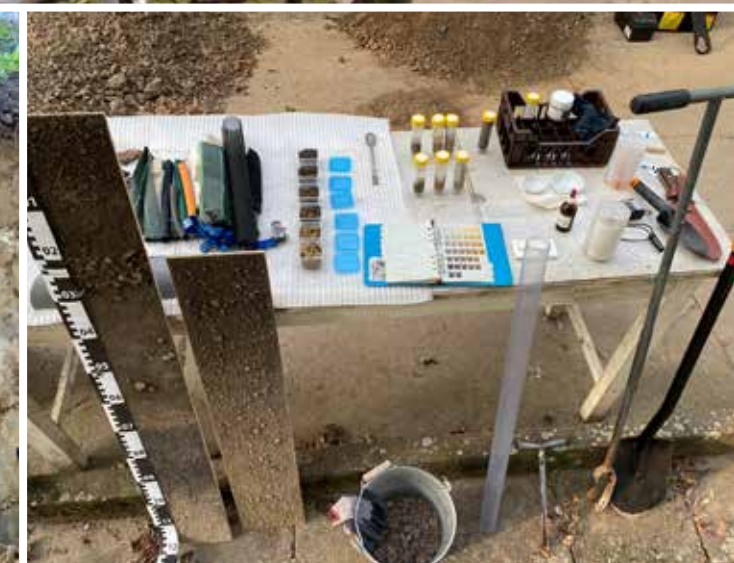
3. Research Areas and Infrastructure

Research addresses nutrient regimes, drought and excess-water stress, crop productivity, nutrient uptake, soil chemical properties, and soil microbiological processes through controlled greenhouse and soil-profile investigations. The Institute operates advanced analytical infrastructure, including atomic absorption spectrometry, high-performance liquid chromatography, carbon and nitrogen fraction analysis, and gas chromatography integrated with microbiological platforms for detailed plant, soil, and microbiome assessment.

Current research activity is strongly aligned with applied and internationally relevant themes in climate adaptation, nutrient-use efficiency, and sustainable soil management. The Institute's project portfolio supports solution-oriented investigations that strengthen the Faculty's competitive position in agricultural and environmental research.

4. National and International Partnerships

The Institute maintains active international collaborations through Hungarian-Turkish, Hungarian–Ecuadorian, Hungarian–American, and Hungarian–Austrian initiatives focused on soil fertility evaluation, nutrient stress diagnostics, and the agricultural use of industrial by-products. These partnerships extend the Institute's scientific visibility and reinforce its contribution to globally relevant soil and crop research.



Institute of Animal Science, Biotechnology and Nature Conservation

1. Institute Overview

The Institute of Animal Science, Biotechnology and Nature Conservation integrates education, empirical research, and innovation across animal breeding, nutrition, physiology, aquaculture, wildlife management, and conservation zoology. Its mission is to advance sustainable animal production, biodiversity conservation, and molecularly informed livestock research through internationally connected, practice-oriented scholarship.

2. Education

The Institute delivers teaching in Hungarian and English across BSc, MSc, and PhD programmes, with a particularly strong role in Animal Husbandry MSc, Nature Conservation Engineering, Wildlife Management, and related specialist pathways. Its academic staff teach subjects spanning animal breeding, genetics, physiology, reproductive biology, proteomics, nutrition, aquaculture, ecology, zoology, and habitat management, while also supporting dual and off-campus training models.

3. Research Areas and Infrastructure

Research covers molecular markers of economically important livestock traits, bioactive feed additives, indigenous breed evaluation, dairy and poultry systems, aquaculture technology, fish nutrition and reproduction, animal welfare, environmental footprint assessment, avian ecology, mammalian population genetics, herpetofauna monitoring, invertebrate ecology, and game management. Infrastructure includes the Animal Genetics and Proteomics Laboratory, assisted reproduction facilities, recirculating aquaculture systems, aquaponics units, aquaria systems, digestibility facilities for pigs and poultry, hatchery capacity, and equine and small-ruminant experimental resources.

The Institute's research activity is supported through a sustained portfolio of applied projects in livestock adaptation, animal welfare, precision feeding, aquaculture development, and conservation-related field research. Its long-term scientific agenda strengthens regional relevance while addressing wider international priorities in sustainable animal production and biodiversity management.

4. National and International Partnerships

The Institute collaborates with universities, research institutes, breeding associations, national park directorates, companies, and sectoral stakeholders in Hungary and abroad. Key partnerships include cooperation with MASTERGOOD and OSI in poultry research, practical and research links with Aggtelek and Hortobágy National Park Directorates, and service-oriented collaborations with aquaculture enterprises including Aranypony Zrt., Bocskai Halászati Kft., Biharugrai Halgazdaság Kft., and Clari Kft.



Institute of Applied Plant Biology

1. Institute Overview

The Institute of Applied Plant Biology is a distinguished centre of education and research in botany, plant physiology, and plant biotechnology, combining long-standing academic tradition with application-driven innovation. Its mission is to generate plant-science knowledge that supports sustainable crop production, bioeconomy development, and resilient agricultural systems in an international context.

2. Education

The Institute provides an essential scientific foundation for the Faculty's educational programmes and offers international students advanced training in modern plant science. Its teaching profile supports the development of interdisciplinary knowledge in plant biology, sustainability, and agricultural innovation.

3. Research Areas and Infrastructure

Research focuses on space crop production, biomass as an alternative nutrient and protein source, plant nitrogen utilization, plant fibers, applied plant anatomy and plant morphology, plant stress biology, and practice-oriented bioindustrial applications. A major asset is the plant condition diagnostic system within the Faculty's TOP50 national excellent research infrastructure cluster, enabling controlled, semi-controlled, and open-field investigations of nutrient-use efficiency, carbon and nitrogen metabolism, stress physiology, precision-agriculture indicators, and alternative nutrient replenishment strategies.

The Institute's current research agenda is aligned with high-priority themes in sustainable crop production, bioindustrial development and plant-in-space research. Its projects support translational research with clear relevance for future-oriented agriculture and plant-based bioeconomy solutions.

4. National and International Partnerships

By linking fundamental plant science with innovation, the Institute provides an attractive platform for international students, collaborators, and research partners interested in sustainable agriculture. Its globally relevant research themes position it well for continued engagement in interdisciplinary and cross-border scientific cooperation.



Institute of Crop Production, Breeding and Plant Technology

1. Institute Overview

The Institute of Crop Production, Breeding and Plant Technology advances high-level education and research in arable production systems, plant breeding, and production technology. Its mission is to develop scientifically grounded, climate-responsive, and resource-efficient crop production models that strengthen agricultural resilience and productivity.

2. Education

The Institute contributes to the Faculty's training portfolio by supporting the scientific and technological foundations of crop production and related disciplines. Its teaching integrates agronomy, production physiology, environmental aspects of arable systems, and quality-oriented crop management.

3. Research Areas and Infrastructure

Research spans traditional crop production, landscape ecology, environmental protection, production physiology, and quality testing, with strong emphasis on adaptation to climate change and the causal mechanisms underlying agrotechnical interventions. Infrastructure includes long-term experimental platforms and access to advanced measurement systems such as LICOR photosynthesis and soil CO₂ flux analysers, NIR instrumentation, chromameters, NDVI tools, canopy analysers, LAI and SPAD devices, and soil-moisture sensors.

Flagship projects include long-term multifactorial experiments established in 1983 on wheat, maize, and soybean systems, as well as genotype and technology studies in wheat, barley, sunflower, maize, pulses, oats, alfalfa, durum wheat, and black locust. These programmes generate strategic evidence for sustainable intensification, abiotic stress mitigation, and practical technology development in field crop systems.

4. National and International Partnerships

The Institute works in close cooperation with other Faculty units and research partners to implement complex experimental measurements and multidisciplinary crop-science studies. Its research agenda addresses globally shared challenges in climate adaptation, yield stability, and sustainable arable production, enhancing opportunities for broader scientific collaboration.



Institute of Horticulture

1. Institute Overview

The Institute of Horticulture conducts integrated education and research across fruit and vegetable production, ornamental horticulture, viticulture, and enology. Its mission is to advance innovative, climate-responsive, and economically viable horticultural systems while supporting the professional development of students and the competitiveness of the sector.

2. Education

The Institute contributes to the Faculty's horticultural education through research-led teaching supported by demonstration facilities and experimental collections. Its academic environment connects crop-specific expertise with applied training relevant to commercial horticulture, viticulture, and ornamental plant production.

3. Research Areas and Infrastructure

Research includes rootstock and cultivar evaluation, nutrient management, yield regulation, protected and open-field vegetable production, grapevine research, ornamental plant improvement, biotechnology, and horticultural economics. Key infrastructure comprises the Experimental Farm in Pallag with a grapevine collection exceeding 100 rootstock and cultivar varieties, the on-campus demonstration garden, unheated foil tunnels, a climate-controlled greenhouse, and plant propagation laboratory facilities.

The Institute's project activity supports technological innovation in fruit growing, vegetable production, ornamental cultivation, and sectoral market analysis. Its work generates evidence for production improvement, regulatory decision support, and the development of climate-resilient horticultural practices.

4. National and International Partnerships

The Institute cooperates closely with FruitVeB Hungarian Interprofessional Organization for Fruit and Vegetable and has hosted professional conferences featuring experts from Germany, Austria, and France. It also collaborates with the University of Maribor in viticulture and enology through participation in the International University Wine Award, strengthening its European academic profile.



Institute of Plant Protection

1. Institute Overview

The Institute of Plant Protection coordinates the Faculty's education, research, innovation, and service activities in plant protection through interdisciplinary, sustainable, and solution-oriented approaches. Its mission is to develop scientifically advanced and environmentally responsible plant protection systems that enhance food safety, agricultural sustainability, and international competitiveness.

2. Education

The Institute plays a central role in undergraduate, master's, postgraduate, and doctoral education in both Hungarian and English, with particular strength in the Plant Protection MSc. Its courses cover plant protection zoology, plant pathology, weed biology, biological and precision plant protection, and integrated pest management, while its academic staff also contribute widely to other degree programmes.

3. Research Areas and Infrastructure

Research focuses on biological and precision plant protection technologies, plant protection products, pest monitoring and decision-support systems, population biology of pest communities, biological invasions, agrobiodiversity, and environmentally friendly production methods. Through the MÉK-GEP Research Facility and the Faculty's Plant Protection Research Portfolio, the Institute operates nationally distinctive infrastructure, including Hungary's only higher-education-based accredited platform for pesticide licensing trials.

The Institute has an outstanding record in grant acquisition and research, development, and innovation, supporting internationally competitive education and scientific output. Its project activity underpins both disciplinary advances and comprehensive farm-to-fork research services relevant to public authorities and industry stakeholders.

4. National and International Partnerships

The Institute maintains active cooperation with specialists, industry partners, and scientific communities through conferences, professional training, and research projects. Its flagship dissemination platforms include the more than 30-year-old Trans-Tisza Plant Protection Forum, organized every third year as the International Plant Protection Symposium, and the Debrecen Applied Entomology Conference.



Institute of Land Use, Engineering and Precision Farming Technology

1. Institute Overview

The Institute of Land Use, Engineering and Precision Farming Technology focuses on the transition to precision agriculture and the deployment of innovative engineering solutions in modern farming. Its mission is to advance digital, data-driven, and sustainable agricultural systems through integrated research, education, and international collaboration.

2. Education

The Institute supports high-quality education in agricultural engineering, land use, geoinformatics, and precision technology through modern methodological tools and advanced technical infrastructure. Its training environment equips students with the competences required for technology-intensive agricultural and environmental practice.

3. Research Areas and Infrastructure

Research is organized through the departments of Agricultural Engineering and Robotics, Land Use, and Precision Farming Technology, covering automation, robotics, sustainable land management, soil conservation, sensors, digital technologies, and long-term maize field experiments. Infrastructure includes precision plant imaging systems, agricultural drones, soil-mapping scanners, precision sensor systems, a dedicated geoinformatics laboratory, and specialized software for spatial and agronomic data analysis.

In the past five years, the Institute has played a major role in two significant international projects: the Erasmus+ TERRATECH initiative, which developed a certified MSc in Smart/Precision Agriculture, and the International Visegrad Fund-supported Water Renovation in Ukraine project. These grants highlight the Institute's leadership in innovation-focused education and its contribution to climate- and water-related research in Central Europe.

4. National and International Partnerships

The Institute cooperates with international university partners through curriculum development, student mobility, thesis supervision, and joint intensive courses. Its project-based partnerships with institutions in Hungary, Poland, Slovakia, and the Czech Republic reinforce its regional leadership in precision agriculture, water management, and environmental engineering.



Institute of Food Science

1. Institute Overview

The Institute of Food Science contributes to the Faculty's scientific and educational mission through interdisciplinary expertise in food quality, food safety, elemental analysis, and microbiology. Its mission is to support the production of safe, high-quality food through analytically rigorous, research-driven, and internationally relevant scholarship.

2. Education

The Institute offers the Food Safety and Quality Engineering MSc and contributes extensively to several BSc, MSc, and doctoral programmes. Its educational role connects advanced analytical methods with food-system challenges relevant to agriculture, health, and industry.

3. Research Areas and Infrastructure

Research is structured across product qualification, elemental analysis, and microbiology groups, addressing cereal and legume quality, processing technologies, brewing parameters, functional sprouts, honey quality, toxic elements, trace analytics, food contaminants, grape endophytes, plant pathogenic fungi, fungicide resistance, and probiotic microbes in fish nutrition. The Institute's infrastructure supports sophisticated analytical sample preparation and measurement for food, soil, plant, environmental, and agricultural matrices.

Institute staff have participated in numerous national and international educational and research projects in recent years. This project engagement reflects a strong commitment to interdisciplinary problem-solving across food quality, food safety, and environmental analytics.

4. National and International Partnerships

The Institute's collaborative activity spans educational and research partnerships at both national and international levels. These links strengthen its contribution to integrative food-system science and enhance the global relevance of its analytical and microbiological expertise.



Institute of Nutrition

1. Institute Overview

The Institute of Nutrition addresses the scientific foundations of personalized nutrition, food development, and health-oriented product innovation in a distinctly international academic environment. Its mission is to connect nutrition science, molecular biology, food development, and data-driven analysis in support of healthier and more sustainable food systems.

2. Education

The Institute contributes to the training of future food engineers and nutrition specialists by providing an academically rigorous and multicultural learning environment. Its educational profile reflects the growing need for professionals capable of integrating food chemistry, microbiology, engineering, metabolic regulation, and bioavailability research.

3. Research Areas and Infrastructure

Research is carried out by teams in nutritional genetics and genomics, plant protein science, and big data assessment. Current projects focus on sourdoughs, gemmotherapy extracts, fruits and fruit products, and plant protein sources, with emphasis on phytonutrient profiling, physiological function, nutraceutical development, extraction technologies, and integrative data analysis.

The Institute is actively involved in multiple research projects addressing functional foods, comparative product analysis, postbiotic and nutrient profiling, and novel plant-based ingredients, and nutritional deuteronomics. Its research agenda reflects emerging priorities in postgenomic nutrition science and evidence-based food innovation.

4. National and International Partnerships

The Institute brings together students and scholars from Africa, Asia, Europe, the Middle East, and the Americas in a professional and inclusive environment. This international composition strengthens its potential for globally connected collaborations in nutrition, food development, and translational health research.



Institute of Food Technology

1. Institute Overview

The Institute of Food Technology is the Faculty's youngest institute and serves as a dynamic centre for education, research, and innovation in food and feed technology. Its mission is to develop health-promoting and functional food prototypes, improve conventional and novel processing technologies, and deliver knowledge transfer services to the agri-food sector.

2. Education

The Institute coordinates education and practical training in food and feed technology, integrating applied research with technology-oriented learning. Its teaching environment supports strong links between academic instruction, experimental production, and sector-facing innovation.

3. Research Areas and Infrastructure

Research is carried out by teams in nutritional genetics and genomics, plant protein science, and big data assessment. Current projects focus on sourdoughs, gemmotherapy extracts, fruits and fruit products, and plant protein sources, with emphasis on phytonutrient profiling, physiological function, nutraceutical development, extraction technologies, and integrative data analysis.

The Institute is actively involved in multiple research projects addressing functional foods, comparative product analysis, postbiotics, nutrient profiling, novel plant-based ingredients, and nutritional deuteronomics. Its research agenda reflects emerging priorities in postgenomic nutrition science and evidence-based food innovation.

4. National and International Partnerships

The Institute collaborates with multiple University of Debrecen faculties, including Medicine, Natural Sciences and Technology, and Engineering, to connect clinical testing, molecular identification, biotechnology, machinery development, automation, and energy efficiency. This interdisciplinary model strengthens translational research capacity and broadens the Institute's partnership potential.



Institute of Water and Environmental Management

1. Institute Overview

The Institute of Water and Environmental Management advances education and research in agricultural water management, environmental engineering, climate adaptation, and circular economy solutions. Its mission is to deliver innovative, scientifically grounded responses to water scarcity, excess water, urban hydrology, waste utilization, and environmental sustainability.

2. Education

The Institute offers specialized MSc programmes in Agricultural Water Management Engineering and Agricultural Environmental Management Engineering. Its educational portfolio is reinforced by research-led training in water science, environmental management, and technological innovation relevant to climate-resilient agriculture and environmental systems.

3. Research Areas and Infrastructure

Research is carried out through the Centre for Territorial Water Management and Climate Adaptation and the Organic Material Research Centre, with focus on drought mitigation, inland excess water management, irrigation, urban hydrology, biodegradation, and aerobic and anaerobic fermentation of agricultural by-products. Infrastructure includes climate-controlled aeroponic chambers, a soil physics laboratory, decision-support and large-scale data-processing capacities, field equipment for hydrological and water-quality studies, and specialized environmental technology laboratories equipped with anaerobic and multifunctional bioreactors, GC-MS, CNS analysis, and calorimetric systems.

The Institute contributes to major national and international projects (e.g. Horizon 2020 WATERAGRI, the TKP2021-NKTA-32 projects on precision water management and the Recovery and Resilience Facility Programme) demonstrating strong performance in water-focused research and innovation with clear European relevance.

4. National and International Partnerships

The Institute is embedded in major scientific networks, including Global Water Partnership Central and Eastern Europe, the Network for the Analysis of the Impact of Extreme Climatic Events in Eastern Europe, International Commission on Irrigation and Drainage and EIT Water KIC. Its infrastructure has received national and international recognition, including TOP 50 research infrastructure status in Hungary, ESFRI recognition, and Excellent Research Infrastructure Network status within the Water Science, Water Quality and Aquatic Ecology Research Network.



Central Laboratory of Agricultural and Food Products

1. Institute Overview

The Central Laboratory of Agricultural and Food Products provides essential analytical, diagnostic, and service capacity for research and innovation across agriculture, food science, and environmental management. Its mission is to support cutting-edge scientific discovery and industry-relevant problem solving through accredited, high-quality laboratory services.

2. Education

The Laboratory strengthens the Faculty's educational ecosystem by providing advanced analytical support for student training, research projects, and interdisciplinary scientific work. Its role enhances practical competence in laboratory diagnostics, food and feed safety, and environmental analysis.

3. Research Areas and Infrastructure

The Laboratory specializes in biological control research, microbial alternatives to chemical inputs, plant-pathogen interaction studies, mycotoxin and toxic element tracing, feed and food safety assessment, and physical and chemical analysis of agricultural and environmental samples. Its infrastructure includes accredited analytical systems for protein, oil, fibre, grain quality, rheology, chromatography, amino acid and mycotoxin analysis, as well as ICP-OES and related instrumentation for high-level multi-matrix testing.

The Laboratory's accredited status and integrated service portfolio position it as a key platform for externally funded research, diagnostics, and collaboration. Its contribution to interdisciplinary projects supports both academic competitiveness and practical innovation across the farm-to-fork continuum.

4. National and International Partnerships

Accredited by the National Accreditation Board of Hungary and listed in the national research infrastructure database, the Laboratory serves as a strategic interface between the university and external partners. Its collaborations support both academic research and professional service provision in agriculture, food safety, and environmental quality management. Throughout its connection with the worldwide GLOSOLAN group and the national Mycotoxin Platform, the laboratory is highly integrated into the research and analytical capacities of both groups.



Centre for Agricultural Genomics and Biotechnology

1. Institute Overview

The Centre for Agricultural Genomics and Biotechnology is a leading research and innovation unit in plant and animal genomics, transcriptomics, epigenomics, molecular biology, and biotechnology. Its mission is to advance sustainable agriculture within a One health orientated framework through genome-informed animal breeding, molecular diagnostics, biotechnology innovation, and the training of future researchers in internationally connected research environments. The Centre also applies AI-supported video monitoring and data-driven approaches to support the development of decision-support systems.

2. Education

The Centre contributes to BSc, MSc, and PhD education by involving students in ongoing research and providing specialised training in genomics, molecular diagnostics, and biotechnology, including advanced modules in molecular and animal genetics and genomics, bird genetics.

3. Research Areas and Infrastructure

Research focuses on genomic and genetic mapping of plant and animal species, (livestock and wild animal species) stress tolerance, disease resistance, genome-assisted breeding, embryo diagnostics, molecular marker development, and epigenetic mechanisms of stress adaptation. Infrastructure includes molecular biology, imaging, capillary electrophoresis, microscopy, in vitro plant culture, and controlled-environment facilities, complemented by a patented potato virus-elimination method.

Through continuous involvement in competitive Horizon Europe, COST, national, market-oriented, and bilateral research projects, the Centre contributes to European research networks in plant and animal genomics, biotechnology, livestock phenomics, genetic diversity conservation, and climate-resilient crop epitranscriptomics. The Centre's scientific reputation is further reflected in the inclusion of its Head among the Stanford/Elsevier Top 2% Scientists.

4. National and International Partnerships

The Centre maintains collaborations with more than 50 partner institutions, including Purdue University, the Chinese Academy of Sciences, the University of Lisbon, the University of Veterinary Medicine Hannover, the University of Ciego de Ávila, INRAE institutes across France, and Mohammed V University. These partnerships strengthen global knowledge exchange across Europe, Asia, Africa, and the Americas and reinforce the Centre's international scientific standing.



Center for Complex Systems and Microbiome Innovations

1. Institute Overview

Our institute conducts complex research and development activities in the fields of analytical chemistry and in vitro and in vivo molecular biology. One of the main objectives of our research center is to identify bioactive compounds of natural origin, elucidate their mechanisms of action, and establish the scientific basis for their practical applications.

2. Education

Our center plays a role in teaching courses related to the food industry and bioanalytics to BSc and MSc students in both Hungarian and English. Among other things, students can take courses in Food Toxicology, Assessment of Agrochemicals in the Food Industry, Protein Characterization, Modern Bioanalytical Methods, and Beverage Industry Technology. For students in the PhD program, we offer courses such as "Bioactive Components and Their Analysis in Fruits and Vegetables," "Bioactive Compounds in Fruit Species," and "Specialized Food Technologies."

3. Research Areas and Infrastructure

The primary mission of our analytical laboratory is the extraction, purification, and identification of bioactive components of plant origin, as well as the development and optimization of their large-scale production. The initial assessment of the biological activity of extracts and isolated active compounds is conducted in our in-house cell laboratory, where we perform functional and toxicological experiments using in vitro human cell lines.

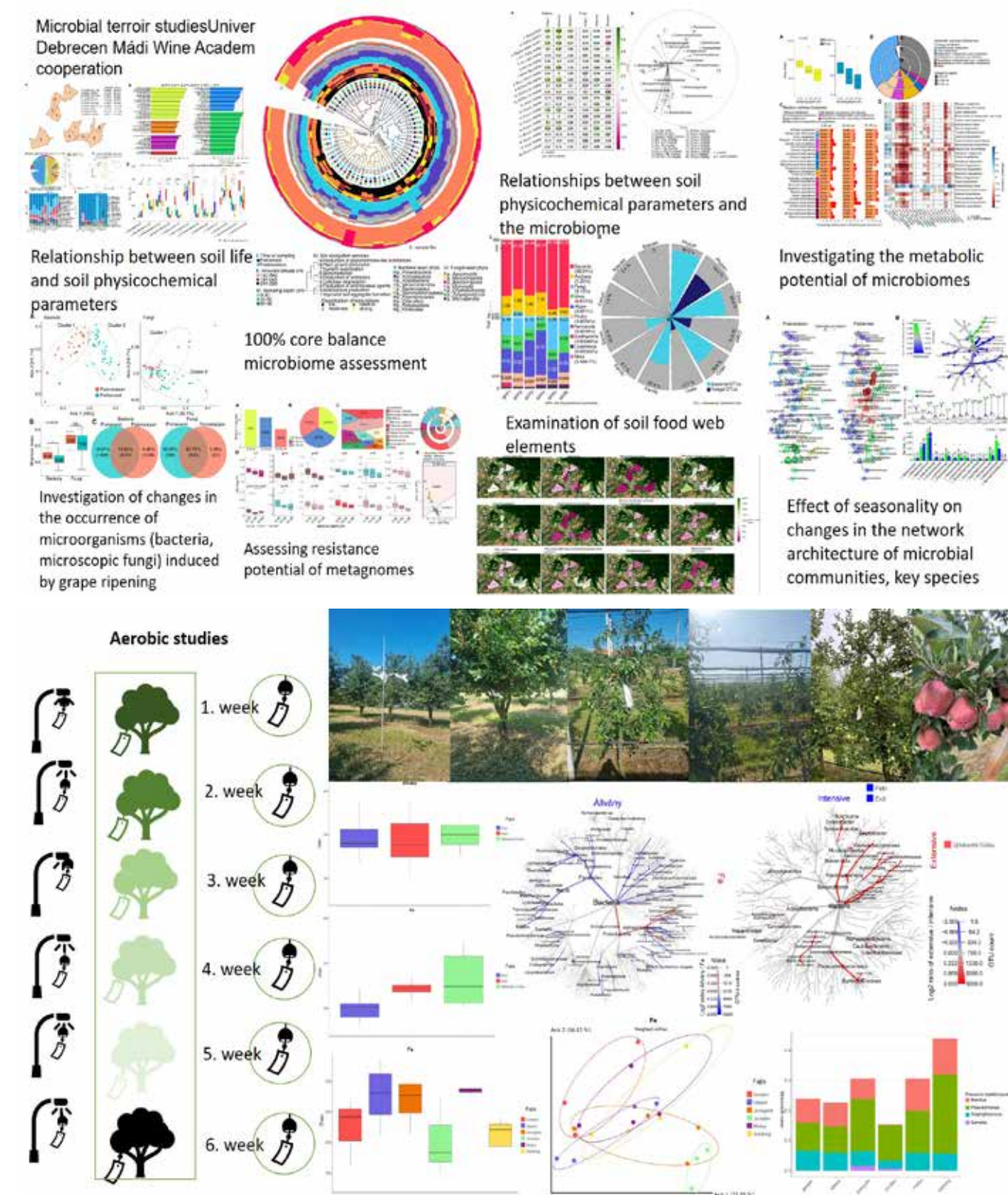
The investigation of promising compounds then continues in in vivo models, including studies in small animals, livestock, and humans. Samples collected during the experiments are analyzed using state-of-the-art analytical and molecular biological methods, enabling a comprehensive understanding of biological processes, the identification of molecular-level relationships, and the development of feed and dietary supplements.

In addition, our institute is actively engaged in research on animal physiology, microbiome studies of farm animals, and the analysis of microbial ecosystems in environmental samples, such as the aerobiome. Our research also includes the study of the metabolic activity of soil microflora, which plays an important role in supporting sustainable agricultural and environmental biology developments.

A relatively new area of our research involves investigating the potential applications of plant extracts as plant conditioners and pesticides, with the aim of developing natural, sustainable alternatives for the agricultural sector.

4. National and International Partnerships

Our center has an extensive national network of partners, which contributes significantly to the success of our research, development, and innovation activities. We collaborate on joint research projects with our national partners, such as NAGISZ Zrt., AKIT, Bálint Analitika, Hungerit Zrt., Permex Vet Kft., and Hajdú Gabona Zrt. Our international partnerships also play a key role in our institute's scientific activities. We have established a collaboration with the Institute of Biosciences and BioResources at the National Research Council of Italy, and we have also conducted joint research with the UK Centre for Ecology & Hydrology.



Precision Crop Production Research and Development Service Centre

1. Centre Overview

The Precision Crop Production Research and Development Service Centre is a practice-oriented research, development and innovation unit of the University of Debrecen. Its current organisational structure was established in 2021, building on the former Agrometeorological and Agroecological Monitoring Centre. The Centre develops and provides precision crop-production technologies, products and services adapted to the environmental and production conditions of the Carpathian Basin.

2. Education and Capacity Building

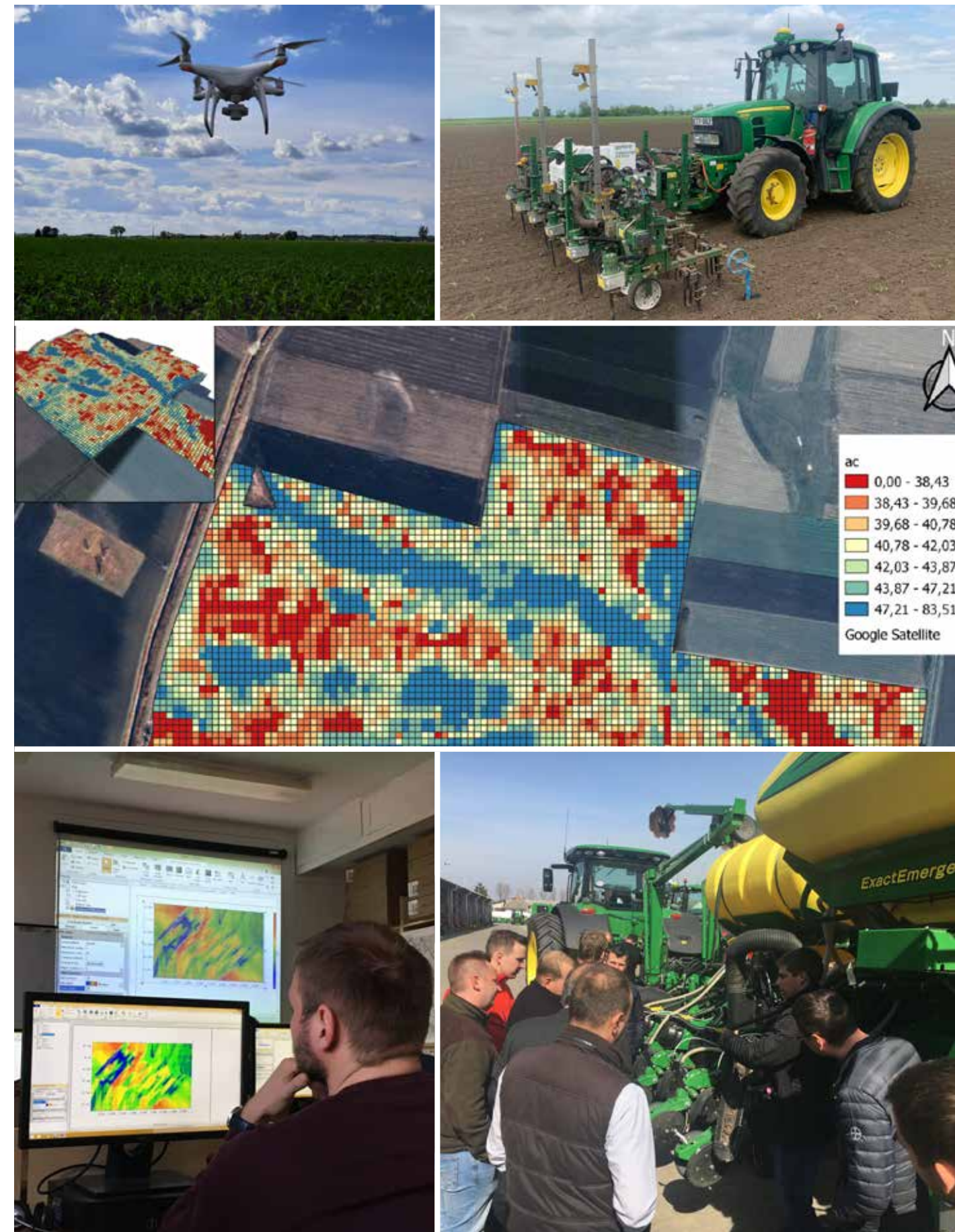
The Centre strengthens the Faculty's education and research-training environment by providing high-quality agrometeorological, soil, plant and geospatial datasets for student theses, PhD research, scientific publications and applied research reports. Its measurement network and field-scale service activities create an applied learning environment in which students and researchers can work with real precision-agriculture data, sampling protocols, remote-sensing interpretation and decision-support methods.

3. Research Areas and Infrastructure

The Centre's distinctive scientific profile is the integrated analysis of the soil-plant-climate system. Research focuses on the spatial heterogeneity of agricultural fields, including climatic and edaphic anomalies, soil fertility zones, crop-development patterns, yield potential, water and nutrient supply, and site-specific production technologies. Main activities include precision soil mapping, georeferenced soil sampling, geophysical and spectral surveys, crop-status assessment, agrometeorological monitoring, crop-growth modelling, irrigation-demand assessment and variable-rate intervention planning. The Centre supports irrigation timing, irrigation dose optimisation, variable-rate irrigation and the reduction of soil-degradation risks associated with irrigation.

4. Services, Partnerships and Strategic Relevance

The Centre's annual research and service activity over approximately 1,500-2,500 hectares provides a substantial farm-scale evidence base for precision crop-production development. Its service portfolio supports agricultural enterprises and technology partners in soil and crop diagnostics, digital mapping, nutrient-management planning, irrigation decision support, remote sensing, yield-zone interpretation and variable-rate technology. The Centre is open to bilateral and multidisciplinary cooperation with farms, companies, research groups and student initiatives. By combining long-term agrometeorological knowledge, precision field diagnostics, geoinformatics and operational service capacity, it acts as a strategic interface between academic research, farm-level innovation and climate-resilient agricultural practice.



Kálmán Kerpely Doctoral School

1. School Overview

The Kálmán Kerpely Doctoral School is the University of Debrecen's leading doctoral training environment in agricultural sciences, established on the foundations of PhD programmes launched in the early 1990s and accredited as a multidisciplinary doctoral school in 2002. Its mission is to advance sustainable and precision agriculture through high-level doctoral research built on internationally distinctive experimental infrastructure.

2. Education

The Doctoral School offers advanced PhD training through programmes in crop production sciences and horticultural sciences, with strong emphasis on interdisciplinary scientific development and individual research progression. Its curriculum equips doctoral candidates to address complex agricultural challenges with robust theoretical and methodological foundations.

3. Research Areas and Infrastructure

Research focuses on sustainable agricultural systems, land use, crop production, horticulture, soil protection, agrometeorology, and agricultural engineering and biotechnology, supported by multifactorial long-term field experiments in Debrecen that are described as unique in Europe. The School's laboratory background enables complex soil science, plant physiology, plant protection, environmental, and quality testing through modern chromatographic, spectrometric, NIR, calorimetric, and related analytical systems.

The Doctoral School's research environment supports internationally competitive doctoral projects with strong relevance to climate adaptation, stress biology, technological innovation, and sustainable production systems. Its infrastructure and scientific networks create favourable conditions for externally funded research and collaborative publication.

4. National and International Partnerships

The Doctoral School maintains extensive domestic and international partnerships with universities and research institutes across Europe, North America, and Asia. These collaborations enhance research quality, strengthen doctoral mobility and supervision, and expand the international experience of PhD candidates.

Doctoral School of Food Sciences

1. School Overview

The Doctoral School of Food Sciences is a preeminent institutional unit for doctoral education and research in agricultural and food sciences. Its mission is to train highly qualified researchers capable of conducting independent, internationally relevant scientific work that addresses the complex challenges of food systems, agriculture, sustainability, and public health.

2. Education

The School provides doctoral training across the full food-chain perspective, following a farm-to-fork approach that spans raw material production, food processing, quality assurance, consumer health, and circular-economy principles. Its flexible elective structure allows doctoral candidates to pursue high-level professional development aligned with their individual research trajectories.

3. Research Areas and Infrastructure

Key research areas include chemistry, biochemistry, biotechnology, food safety, quality assurance, agroecology, and risk assessment, integrating methods from food, agricultural, and environmental sciences. Doctoral research is supported by modern laboratories, advanced analytical tools, and experimental processing capacities within the University's wider research infrastructure.

The School's integrated scientific environment supports research from fundamental discovery to applied innovation, with particular emphasis on circularity, by-product utilization, and evidence-based risk analysis. This profile creates strong potential for participation in interdisciplinary and externally funded food-science projects.

4. National and International Partnerships

The Doctoral School operates within a scientific environment characterized by active national and international collaborations involving renowned faculty members and researchers. These partnerships enhance the visibility, quality, and applied relevance of doctoral research in food sciences.

Doctoral School of Animal Science

1. School Overview

The Doctoral School of Animal Science has offered PhD education since 1994 and has held permanent accreditation since 2002. Its mission is to advance modern animal science by integrating classical disciplinary knowledge with molecular genetics, molecular biology, immunology, molecular nutrition, and informatics in support of safe food production, economically viable livestock systems, and reduced ecological footprint.

2. Education

The School provides structured PhD training through five doctoral programmes: Animal Products; Animal Nutrition and Fish Biology; Reproductive Biology; Genomics; and Animal Breeding, Gene Conservation and Animal Ecology. These programmes offer specialised pathways spanning the full animal-science value chain from genetic resources and reproductive technologies to nutrition, aquaculture, and applied genomics.

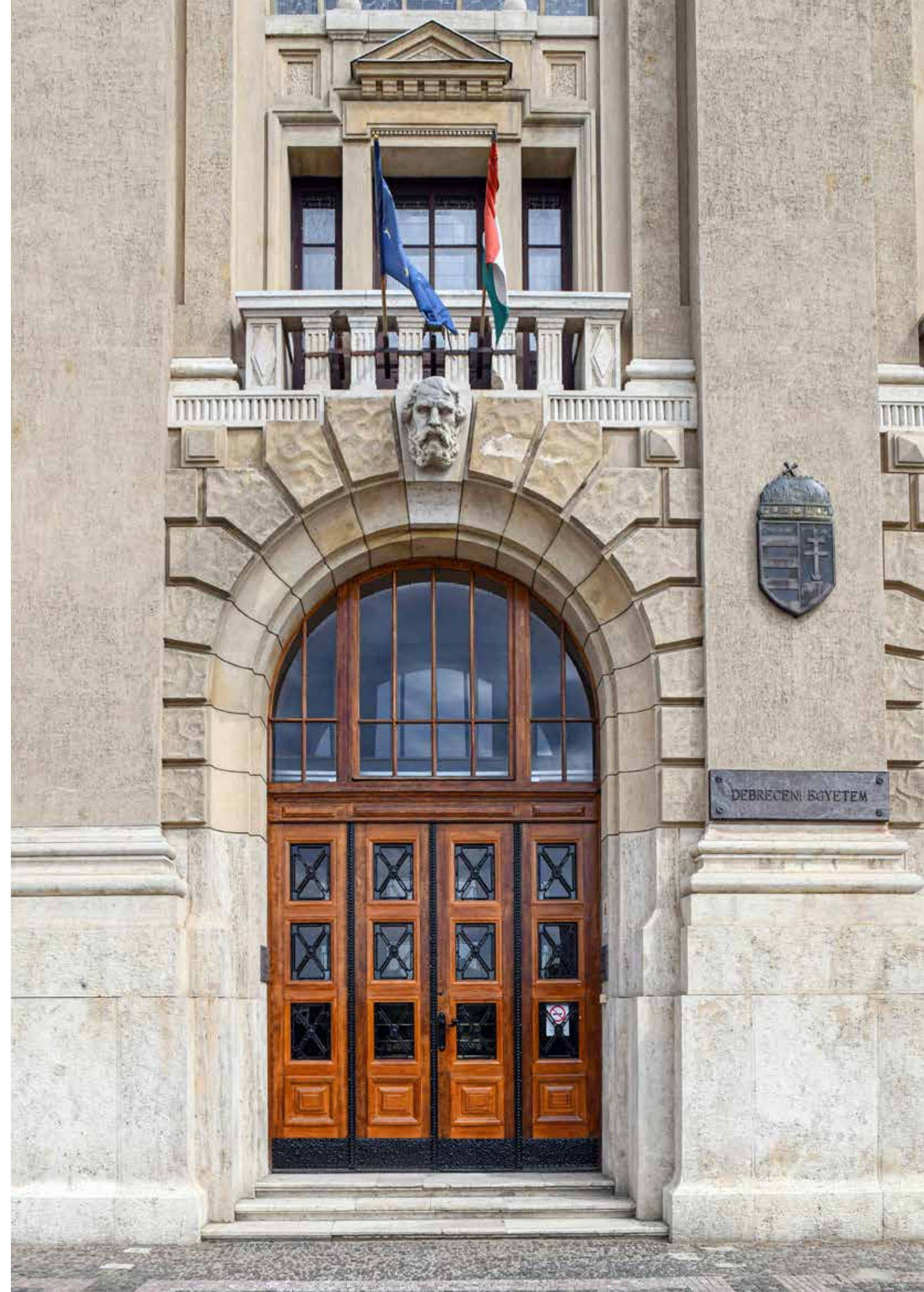
3. Research Areas and Infrastructure

Research reflects major scientific and economic priorities in sheep breeding and feeding, fish biology and freshwater fisheries, pasture-based production, cattle and horse breeding, poultry production, game management, genetics, and breeding, while also supporting conservation of traditional genetic resources. The School's academic capacity is reinforced by staff and infrastructure linked to the Institute of Animal Science, Biotechnology and Nature, the Centre for Agricultural Genomics and Biotechnology, the Institute of Food Science, and the Institute of Food Technology.

The Doctoral School benefits from a research environment shaped by active programmes in applied animal science, genomics, aquaculture, and sustainable production systems. This creates a strong platform for doctoral engagement in competitive national and international projects.

4. National and International Partnerships

The School maintains extensive national links with Hungarian doctoral schools, breeding organizations, conservation bodies, aquaculture stakeholders, and public authorities, and international partnerships with Wageningen University, Purdue University, the Chinese Academy of Agricultural Sciences, the Hebrew University of Jerusalem, INRA, the University of Zaragoza, the University of Palermo, and the University of Zagreb, among others. These collaborations strengthen comparative research, international supervision, and global scientific visibility.





**UNIVERSITY *of*
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