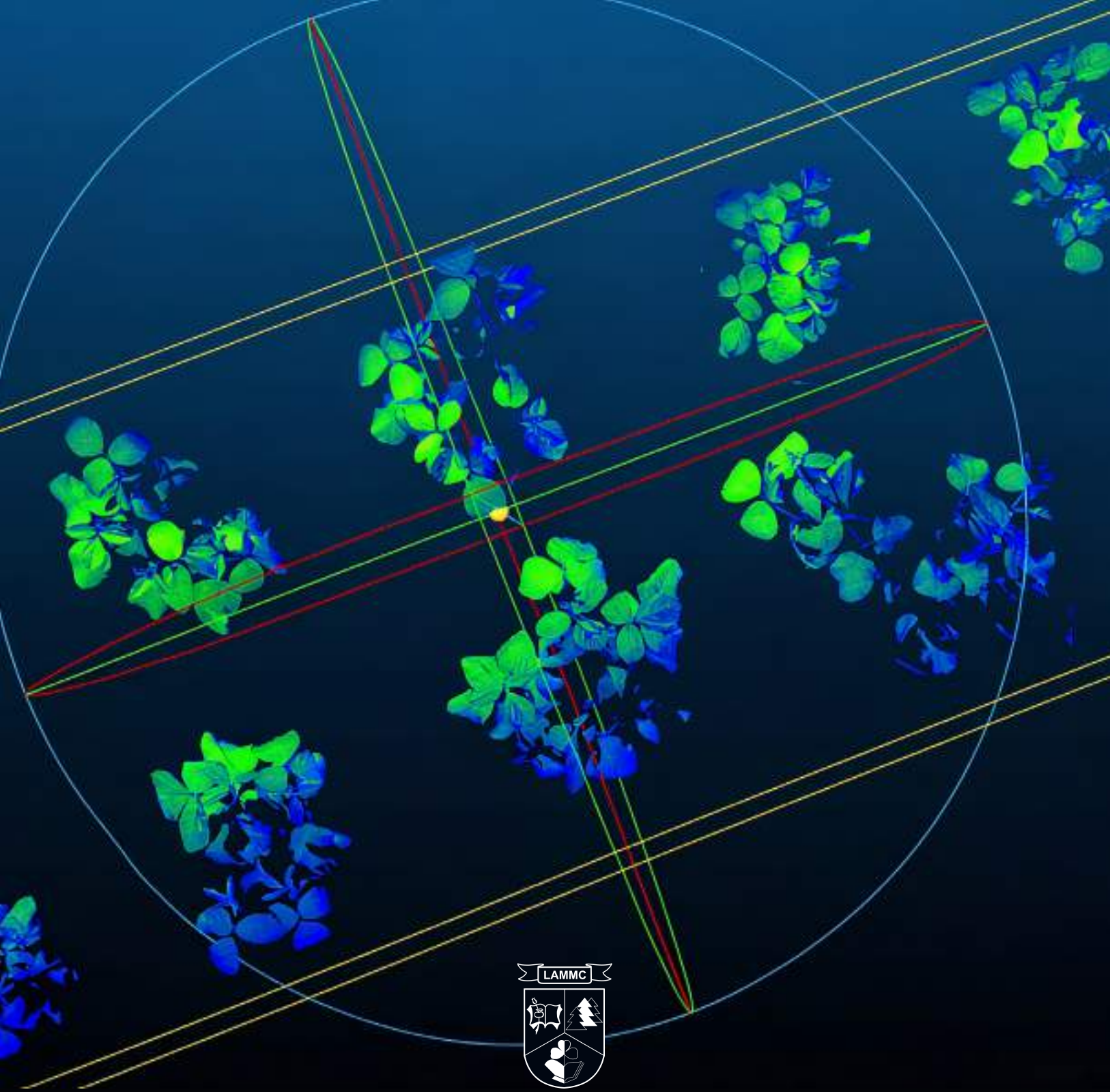

LITHUANIAN
RESEARCH CENTRE
FOR AGRICULTURE
AND FORESTRY

2025

ANNUAL REPORT

TABLE OF CONTENTS

MAIN FACTS OF 2025 4

A LOOK BACK AT 2025 6

1. VISION, MISSION, AND VALUES OF LAMMC 8

2. STRATEGIC DIRECTIONS 10

3. IMPLEMENTATION OF THE STRATEGIC GOALS OF LAMMC 12

4. HUMAN RESOURCES 16

- 4.1. THE RESEARCH COUNCIL 17
- 4.2. THE LABOUR COUNCIL 19
- 4.3. PERSONNEL 19
- 4.4. THE GENDER EQUALITY PLAN IMPLEMENTATION REPORT 21
- 4.5. HUMAN RESOURCES STRATEGY FOR RESEARCHERS (HRS4R) 21

5. DOCTORAL STUDIES 22

- 5.1. DOCTORAL STUDENTS ENROLLED IN 2025 AND THEIR RESEARCH TOPICS 24
- 5.2. DOCTORAL DISSERTATIONS DEFENDED IN 2025 24

6. COLLABORATION WITH FOREIGN PARTNERS 26

7. RESEARCH AND EXPERIMENTAL DEVELOPMENT (R&D) 28

- 7.1. SCIENTIFIC PUBLICATIONS 29
- 7.2. AGRICULTURAL PLANT BREEDING 30
- 7.3. PATENTS REGISTERED BY THE EUROPEAN PATENT OFFICE IN 2025 32
- 7.4. LONG-TERM RESEARCH AND EXPERIMENTAL DEVELOPMENT (R&D) PROGRAMMES 34
- 7.5. PROJECTS 37
  - 7.5.1. Projects launched in 2025 38
  - 7.5.2. Projects completed in 2025 44

8. SCIENTIFIC INTERNSHIPS 56

9. RECONGNITION OF RESEARCH ACTIVITIES 66

10. DISSEMINATION OF SCIENTIFIC KNOWLEDGE 70

- 10.1. INTERNATIONAL CONFERENCES AND SEMINARS 72
- 10.2. NATIONAL CONFERENCES, SEMINARS, AND FIELD DAYS 74
- 10.3. PRINTED AND ELECTRONIC PUBLICATIONS 80

11. FUNDING 82

12. APPENDICES 84

- 12.1. INTERNATIONAL PROJECTS 85
- 12.2. NATIONAL PROJECTS 88
- 12.3. MAIN SCIENTIFIC PUBLICATIONS 94

MAIN FACTS
OF
2025
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In 2025, the Lithuanian Research Centre for Agriculture and Forestry (Lietuvos agrarinių ir miškų mokslų centras, hereinafter LAMMC) had

401 of a total staff — including **162** researchers

70 PhD students — among them **33** from abroad

Implemented

6

long-term institutional research programmes

Conducted

21 international research projects + **104** national research projects

Published

154

scientific publications indexed in the Clarivate Analytics Web of Science (hereinafter CA WoS) database

An article co-authored by Dr Rita Verbylaitė of the Institute of Forestry, LAMMC, and other researchers was published in *Nature* (Impact Factor = 48.5), one of the world's most prestigious scientific journals

11

PhD students of LAMMC defended their dissertations, 6 of which based on publications

2

patents were registered at the European Patent Office

4

plant varieties were included in the Lithuanian National List of Plant Varieties and the EU Common Catalogue of Varieties of Agricultural Plant Species and Vegetable Species

A cooperation agreement was signed with the **Massachusetts Institute of Technology (MIT)**, together with the consortium agreement for Lithuania under the **MIT International Science and Technology Initiatives (MISTI)** programme

In collaboration with **Vytautas Magnus University (VDU)** and the **University of Copenhagen**, LAMMC is establishing the international **PhenoPlantCC Centre of Excellence for Plant Phenotyping for Healthy Food and Sustainable Agrobiological Resources**

LAMMC organised

2 international conferences, **5** international seminars, **10** national conferences, **15** national seminars, and the Ecological Agricultural Technology Exhibition-Forum EKOAgrITech

A LOOK BACK AT 2025

©Vita Arlickienė

The geopolitical situation worldwide remained tense in 2025, further underscoring the importance of securing local raw materials, particularly nutritious and high-quality food. However, achieving this was challenging due to spring frosts and excessive rainfall during the harvest season. Once again, climate change–related factors highlighted the need for innovative solutions to ensure the sustainable production of food and other biological resources.

In 2025, the Lithuanian Research Centre for Agriculture and Forestry (LAMMC) published the results of its research in 154 scientific publications. Although the overall number of publications remained similar to that of 2024, a significant qualitative breakthrough was achieved: for the first time, LAMMC research findings (by Dr Rita Verbylaitė in collaboration with international colleagues) were published in *Nature*, the world's leading scientific journal. It is also important to note that last year was marked not only by scientific publications but also by innovation. In 2025, the European Patent Office granted patent protection to two inventions developed by LAMMC researchers. In addition, four new plant varieties were registered in the European Union Plant Variety Register.

As in previous years, we remained actively engaged in project-based activities, implementing a total of 125 international and national projects. We are particularly pleased that several of these initiatives, undertaken together with our partners, involved the establishment of spin-off companies dedicated to the development and commercialisation of innovative products. Special mention should be made of the 2nd Ecological Agricultural Technology Exhibition-Forum EKOAgrITech, held on 3 July 2025; it is rapidly becoming a key platform for those seeking to farm more sustainably. For visitors to the exhibition, as many as 1,000 demonstration plots were established, each showcasing a different innovation.

The year 2025 also brought exceptional opportunities to celebrate the achievements of our colleagues. Dr Skaidrė Supronienė and Dr Gražina Kadžienė were awarded the Lithuanian Science Prize for their body of work entitled 'Population Changes and Ecological Distribution of Fusarium Head Blight Pathogens under the Influence of Climate Change and Agricultural Practices (2009–2023)'. The doctoral researcher Greta Striganavičiūtė received a prestigious scholarship supporting women scientists pursuing research careers. The competition was organised by the Academies of Sciences of Estonia, Latvia, and Lithuania in cooperation with the national UNESCO commissions, in response to UNESCO's global call to reduce the gender gap in science. We also congratulate Dr Aistė Balčiūnaitienė and Dr Edvinas Misiukevičius on becoming members of the Young Academy of the Lithuanian Academy of Sciences. We believe that these inspiring achievements will serve as an excellent example for our younger colleagues – our doctoral researchers, of whom we had as many as 70 in 2025.

The year 2026 promises to be no less dynamic. Cooperation with the world's leading university, the Massachusetts Institute of Technology (MIT), is being expanded, while the Plant Phenotyping Competence Centre is being established in partnership with Vytautas Magnus University and the University of Copenhagen. These new and evolving partnerships will provide fresh momentum in the search for innovative solutions to the challenges of today and tomorrow.

Dr Gintaras Brazauskas
Director of the Lithuanian Research Centre for Agriculture and Forestry

1

VISION, MISSION, AND VALUES OF LAMMC

©Gintarė Naujokienė

VISION

A leading state research institute in Lithuania and the North European region, whose activities are based on high-level fundamental and applied research, acquisition of novel scientific knowledge, development of technologies and innovations, and their transfer and efficient experimental development. An advanced centre of excellence and competence in agricultural, forestry, and food sciences.

MISION

Generate, accumulate, and disseminate new scientific know-how geared to the awareness of sustainable land, forest, and environmental resources, their competitive development and use, develop innovative technologies and products to meet the needs of the society.

VALUES

- The spirit of a scientific institution, long-standing traditions, and accountability to the society
- Competence, honesty, and transparency of activities
- Proactiveness, creativity, and continuous improvement
- Community-driven open-mindedness

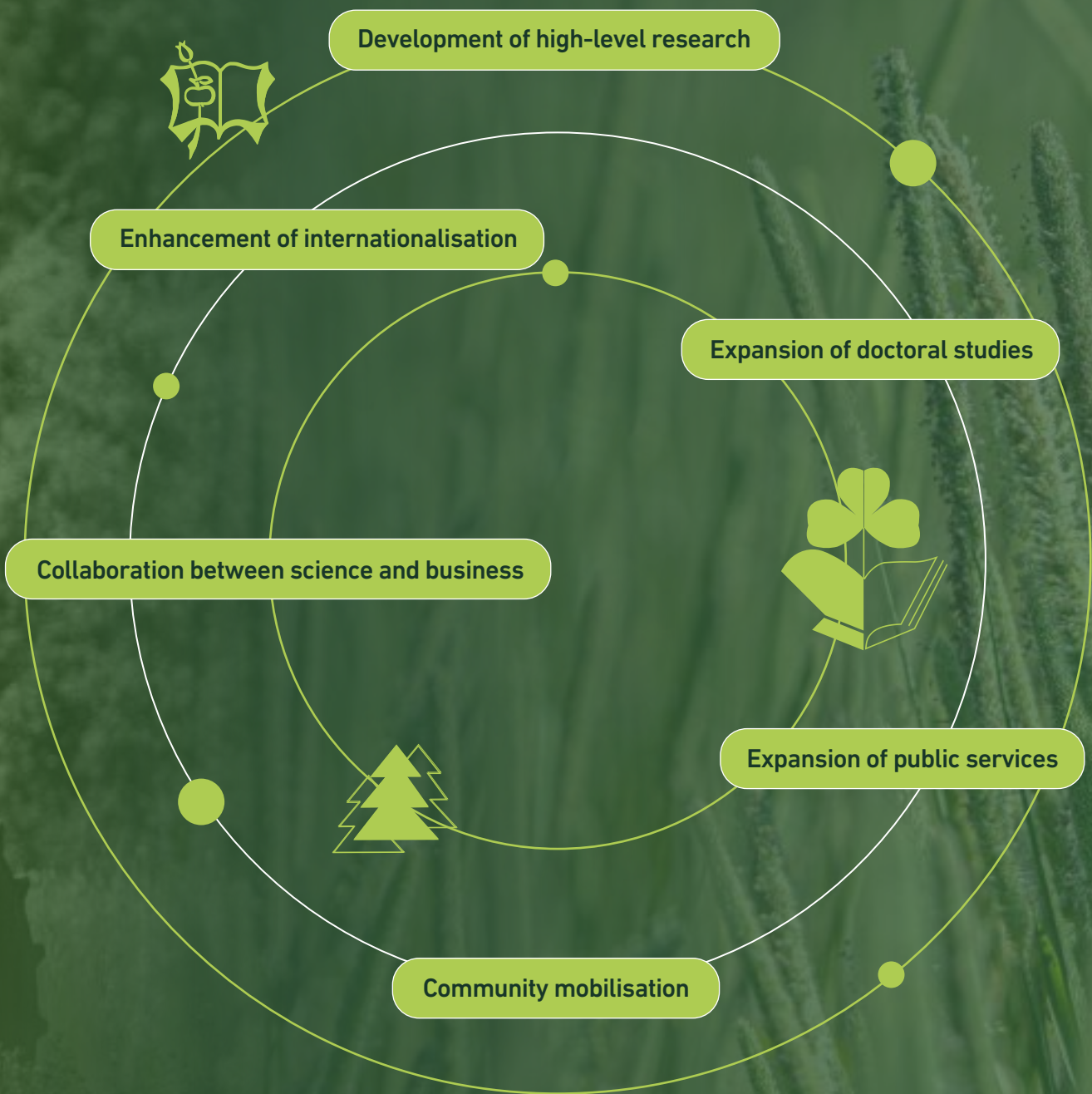
©Rita Armonienė

2

STRATEGIC DIRECTIONS

©Edvinas Misiukevičius

Priorities of LAMMC



3

IMPLEMENTATION OF THE STRATEGIC GOALS OF LAMMC

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As defined in the Statute of the Lithuanian Research Centre for Agriculture and Forestry (LAMMC), its goal is to serve the public interest by carrying out long-term scientific research and experimental development that are of interest to the state, society, international cooperation, and economic entities.

To achieve the operational goals in 2025, the following objectives were defined:

1 developing high-level scientific knowledge to address national and international economic, environmental, and social challenges,

2 increasing the availability of science-based innovations and solutions to domestic and foreign consumers and the general public,

3 raising the prestige of science and ensuring attractive working conditions in the country's regions.

One of the main goals of LAMMC is to generate high-level scientific knowledge to address national and international economic, environmental, and social challenges.

In 2025, the scientists of LAMMC published **154** research publications in journals referenced in the CA WoS database and with an impact factor (IF), **147** of these publications appeared in high-level (Q1 and Q2) international scientific journals.

In 2025, 4 plant varieties developed by LAMMC breeders successfully passed international testing procedures in specialised European centres: the spring wheat 'Baltika DS', the naked oat 'Vainius DS', the cucumber 'Kaunita', and the onion 'Rausviai'.

Two patents were granted by the European Patent Office:
EP4072806 B1 WOOD MODIFICATION METHOD AND MODIFIED WOOD
and
EP4260682 B1 LIGHTING METHOD FOR PROMOTING ACCUMULATION OF SECONDARY METABOLITES IN *CHELIDONIUM MAJUS* PLANTS.

©Edvinas Misiukevičius

The generation of high-level scientific knowledge is directly linked to competitive research funding and the implementation of high-quality national and international research, experimental development, and innovation (R&D&I), and other projects. In 2025, LAMMC researchers submitted R&D&I project proposals the total value of which exceeded EUR 26.8 million. LAMMC scientists actively participated in calls for proposals under the programme HORIZON EUROPE, as well as in LIFE, NordForsk, and other international research funding programmes. In order to strengthen the internationalisation of LAMMC, researcher mobility was encouraged, and investments were made in scientific placements at prestigious foreign research and higher education institutions.

For several years, LAMMC's doctoral programmes in Agronomy and Forestry have been attracting steadily growing interest. In 2025, 15 doctoral candidates were admitted, of whom as many as 47% were foreign nationals. During the year, 11 doctoral dissertations were successfully defended, including five written in English and six prepared in the form of a compilation of scientific publications. This contributes to increasing the visibility and accessibility of research outcomes within the international scientific community.

Objective 1: Developing high-level scientific knowledge to address national and international economic, environmental, and social challenges

Measures of implementation of the operational plan	Criteria for the evaluation of the implementation of the operational plan	Results of 2025
Conducting high-level fundamental and applied research	Number of publications in Q1–Q2 journals	147
	Number of publications co-authored with foreign institutions and/or business entities	77
	Number of scientific monographs published by internationally renowned academic publishers	2
	Number of scientific internships	27
Development of new, innovative products and technologies based on scientific research	Number of plant varieties that successfully passed international testing procedures in specialised European centres	4
	Number of patents granted by the European Patent Office	2
Implementation of high-level national and international R&D and other projects	Funding of project applications, million €	26,8
	Funds generated by R&D&I projects, million €	2,8
Delivery of high-quality international doctoral studies	Number of PhD students	70
	Number of foreign PhD students	11
	Number of doctoral dissertations defended	5
	Number of dissertations in English	6
	Number of publication-based dissertations	33

Science-based decision-making in both public and private sectors is a key driver of national growth. To strengthen the uptake of innovation at both national and international levels, LAMMC focuses not only on the implementation of research projects and the development of innovations but also on their practical application and active dissemination of knowledge. In 2025, LAMMC researchers carried out commissioned work for business entities with a total value of EUR 1.7 million.

For many years, LAMMC researchers have actively contributed to national working groups and served as members of expert panels evaluating projects and strategic policy documents. In recent years, their involvement in international working and expert groups providing recommendations to the European Commission has increased significantly. Researchers also actively disseminate their scientific expertise through participation in national and international conferences.

In 2025, through the implementation of international projects, LAMMC researchers became increasingly engaged in international networks and, in cooperation with foreign colleagues, organised a variety of events, including conferences, seminars, workshops, and working meetings. In order to strengthen public trust in scientists and highlight the importance of scientific research, considerable attention is devoted to communication and outreach through social media platforms, including LinkedIn, X, and Facebook.

Objective 2: Increasing the availability of science-based innovations and solutions to domestic and foreign consumers and the general public		
Measures of implementation of the operational plan	**Criteria for the evaluation of the implementation of the operational plan**	**Results of 2025**
Experimental development and implementation of innovations	Sums of money received from contracts with business entities, million €	2,6
	Sums of money received from licensing agreements, million €	0,33
Developing and presenting of science-based recommendations to decision-makers	Number of experts participating in national and international groups	126
Disseminating new scientific knowledge to the research community and target groups	Number of presentations at international conferences	90
	Number of international events (conferences, exhibitions, seminars, training courses, briefings) organised	7
	Number of national conferences organised	10
	Number of public presentations and events (national seminars, field days, training courses, exhibitions)	16
Dissemination of new scientific knowledge and innovations to the general public	Number of visitors to LAMMC website	2616
	Number of visitors to the LinkedIn social network	3064
	Number of visitors to the X social network	114
	Number of visitors to the Facebook social network	2974

LAMMC conducts its activities in accordance with the principles of sustainability and efficient resource management. Particular emphasis is placed on the implementation of green public procurement practices aimed at acquiring goods, services, and works that have the lowest possible environmental impact at one, several, or all stages of their life cycle.

Objective 3: To enhance the prestige of science and ensure attractive working conditions in the regions of Lithuania		
Measures of implementation of the operational plan	**Criteria for the evaluation of the implementation of the operational plan**	**Results of 2025**
Application of green technologies in the activities of LAMMC	Share of completed Green Procurement, % of total procurement	100
	Proportion of electronic files prepared for archiving, % of total files	51
Creation of favourable working conditions at LAMMC	Increase in average wage of researchers, %	16,9
	Percentage of staff participating in professional development activities per year, %	24

4

HUMAN RESOURCES

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4.1. THE RESEARCH COUNCIL

On 15 September, the newly elected Research Council of LAMMC commenced its term of office. Elected for a five-year term, the Research Council is a collegial management body consisting of 15 members.

The Research Council determines the main directions of scientific activity, considers the plan of educational activities of LAMMC, approves annual reports, sets forth qualification requirements for researchers and other employees, their attestation, and the organisation procedure of tenders for positions. It also approves various documents related to scientific activities and performs other functions laid out in the Statute of LAMMC.

Members of the Research Council

Dr Giedrė Samuolienė
Chair of the Research Council
Chief Researcher,
Head of the Laboratory
of Plant Physiology,
Institute of Horticulture

Dr Karolina Barčauskaitė
Deputy Chair of the Research Council
Senior Researcher,
Head of the Agrobiology
Laboratory,
Institute of Agriculture

Dr Povilas Žemaitis
Deputy Chair of the Research Council
Senior Researcher, Department
of Silviculture and Ecology,
Institute of Forestry

Dr Neringa Rasiukevičiūtė
Secretary of the Research Council
Chief Researcher,
Laboratory of Plant Protection,
Institute of Horticulture

Vidmantas Ašmonas
Advisor, Department
of Sustainable Agricultural
Production and Food Industry,
Crop Production and Green
Technologies Division,
Ministry of Agriculture
of the Republic of Lithuania

Gintas Saulius Cironka
Director
of the Lithuanian
Agricultural Advisory Service

Dr Birutė Frercks
Senior Researcher,
Head of Department
of Orchard Plant Genetics
and Biotechnology,
Institute of Horticulture

Aušra Gribauskienė
Chief Officer, Science Division,
Department of Studies,
Science and Technology,
Lithuanian Ministry of Education,
Science and Sport

Gediminas Jasinevičius
Advisor, Forest Policy Group,
Ministry of Environment
of the Republic of Lithuania

Dr Diana Marčiulynienė
Chief Researcher,
Department of Forest Protection
and Game Management,
Institute of Forestry

Dr Vaida
Sirgedaitė-Polikaitienė
Chief Researcher,
Head of Laboratory
of Forest Plant Biotechnology,
Institute of Forestry

Dr Skaidrė Supronienė
Chief Researcher,
Head of Microbiology Laboratory,
Institute of Agriculture

Karolina Trakšelytė-Rupšienė
Coordinator,
Biotech Lab Division,
Breakthrough Department,
Innovation Agency Lithuania

Dr Rita Verbylaitė
Researcher, Department
of Forest Genetics
and Tree Breeding,
Institute of Forestry

Dr Renaldas Žydelis
Senior Researcher,
Department of Plant Nutrition
and Agroecology,
Institute of Agriculture

4.2. THE LABOUR COUNCIL

The Labour Council of LAMMC is a collegial representative body of employees that defends the professional, employment, economic, and social rights of the employees of LAMMC and its branches and represents their interests.

The Labour Council consists of seven members elected for a three-year term (the current term commenced in 2023). The chair of the Labour Council is Assoc. Prof. Dr Jonas Volungevičius (jonas.volungevicius@lammc.lt), its secretary is Daiva Puidokienė (daiva.puidokiene@lammc.lt). The list of the members of the Labour Council is provided on the website lammc.lt.

4.3. PERSONNEL

As of 31 December 2025, LAMMC employed a total staff of **401**, of which scientific researchers accounted for **44%**, specialists and other employees for **22%**, laboratory assistants and technicians for **24%**, and administration for **10%**.

Among researchers, chief researchers accounted for **18%**, senior researchers for **33%**, researchers for **26%**, and junior researchers for **23%** (*Figure 1*). In 2025, two researchers from other institutions conducted postdoctoral fellowships at LAMMC.

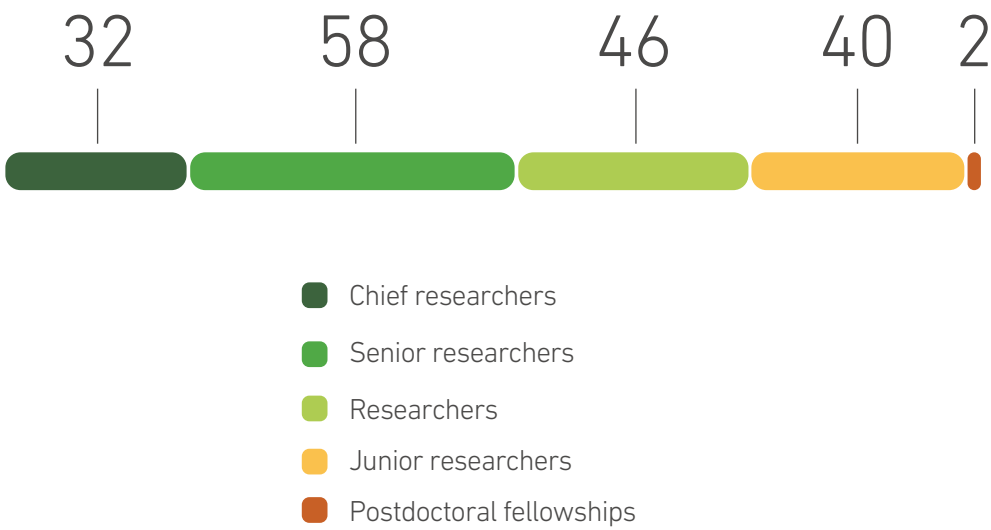

Figure 1. Distribution of scientific researchers by position in 2025

As of 31 December 2025, a total of **70** PhD students in the fields of Agronomy and Forestry were enrolled at LAMMC.

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4.4. THE GENDER EQUALITY PLAN IMPLEMENTATION REPORT

The Gender Equality Plan Implementation Working Group of LAMMC commenced its activities on 17 March 2022. The Working Group is chaired by Marius Aleinikovas. Its members are Vidmantas Bendokas, Deividas Jodenis, Antanas Ronis, Audrius Sasnauskas, and Vita Tilvikienė (former members Gintarė Naujokienė and Odeta Skaisgirienė are no longer employed at LAMMC).

- During 2025, LAMMC received no complaints or reports related to gender equality issues.
- In 2025, LAMMC launched the project 'Strengthening employee well-being at the Lithuanian Research Centre for Agriculture and Forestry through the Application of Gender Equality and Equal Opportunities Principles'. As part of the project, LAMMC Gender Equality Plan is being revised and expanded, with a draft version scheduled for submission to LAMMC Labour Council during the first half of 2026. Additional internal documents related to gender equality are being reviewed and developed, and employee training activities are being implemented.
- At the end of 2025, the UNLOCK Employee Experience Survey was conducted to assess employees' perceptions of workplace conditions in relation to gender equality, equal opportunities, and other organisational aspects. The survey results are planned to be presented to the employees in early 2026. In addition, three training sessions were organised for the employees: 'Prevention of Psychological Violence and Harassment in the Workplace', 'Inclusive Language and Communication', and 'Corruption Prevention and Professional Ethics'.
- In 2026, LAMMC plans to continue the activities envisaged under the project, including the organisation of seven additional employee training sessions, the revision of LAMMC Gender Equality Plan, and the updating and refinement of other internal documents required to strengthen gender equality and non-discrimination practices within the institution.

4.5. HUMAN RESOURCES STRATEGY FOR RESEARCHERS (HRS4R)

In 2025, LAMMC decided to implement the Human Resources Strategy for Researchers (HRS4R), which is based on the principles of the European Charter for Researchers. The aim of HRS4R is to enhance the quality, attractiveness, and international competitiveness of the research environment.

LAMMC Commitment

As part of the implementation of HRS4R, LAMMC is committed to aligning its human resources policies and practices with the 20 principles of the European Charter for Researchers.

As Lithuania's leading national research institution in the fields of agriculture and forestry, LAMMC seeks to improve working conditions and career development opportunities, ensure transparent recruitment and career progression procedures, promote equality and academic integrity, and increase the attractiveness of research careers at all stages. This process is regarded as a long-term strategic investment in employees, organisational culture, and international competitiveness.

5

DOCTORAL STUDIES

©Milana Šilanskienė

LITHUANIAN RESEARCH CENTRE FOR AGRICULTURE AND FORESTRY

LAMMC pays great attention to increasing the popularity of doctoral studies. Students from Lithuania and abroad are accepted with the aim of preparing scientists capable of developing the country's scientific potential, increasing the visibility of the institution, and establishing partnerships with potential project developers and co-authors of scientific publications.

In 2019, based on the decree of the Minister of Education, Science, and Sport of the Republic of Lithuania, LAMMC was granted the right for doctoral studies in four fields of research:

Agronomy

jointly with Vytautas Magnus University

Forestry

jointly with Vytautas Magnus University

Ecology and Environmental Science

jointly with Vytautas Magnus University

Biochemistry

jointly with Vytautas Magnus University and the Lithuanian University of Health Sciences

VYTAUTAS MAGNUS UNIVERSITY

LITHUANIAN UNIVERSITY OF HEALTH SCIENCES

The four-year doctoral programmes offered by LAMMC conform to the field of issues of contemporary agriculture and forestry. The latest methods are applied during the studies and experiments, and the PhD students are supervised by experienced scientists. The PhD students are given the opportunity to present their research at national and international scientific conferences, deepen their knowledge, learn the ongoing research methods and develop an interest in their application in practice, and undertake internships and scientific expeditions.

5.1. DOCTORAL STUDENTS ENROLLED IN 2025 AND THEIR RESEARCH TOPICS

The opportunities offered by doctoral studies at LAMMC are attracting an increasing number of applicants from Lithuania and abroad. The year 2025 was particularly notable for the largest doctoral admission competition with as many as **350** applicants.

A list of **15** applicants admitted to doctoral studies and the topics of their dissertations are provided below.

Agricultural Sciences, Agronomy (A 001)

1. **Daiga Birzleja**. The effect of essential oils on strawberry phyllosphere microbiome community change and pathogen control. Scientific supervisor Dr Neringa Rasiukevičiūtė.
2. **Samuel Aanuoluwapo Fasusi**. Chemical, behavioral, and genotypic factors influencing the broad bean weevil (*Bruchus ruji.manus* Boh.) – faba bean (*Vicia faba* L.) interaction: towards eco-friendly management strategies. Scientific supervisor Dr Mohammad Almogdad.
3. **Justina Griauzdaitė**. Determination of apple postharvest microbiome composition and pathogens control by propolis extracts. Scientific supervisor Dr Alma Valiuškaitė.
4. **Zarqa Hassan**. Development and investigation of hybrid functional nanostructures. Scientific supervisor Dr Aistė Balčiūnaitienė.
5. **Siddiqua Ilyas**. Analysis of plant abiotic stressrelated protein interaction by affinity purification – mass spectrometry. Scientific supervisor Dr Lina Dėnė.
6. **Raheela Yasi**. Spread and harmfulness of fungal diseases and pests in corn (*Zea mays* L.) crop. Scientific supervisor Dr Antanas Ronis.
7. **Aaqib Javid**. Gene editing to enhance productivity and grain quality in wheat. Scientific supervisor Dr Andrius Aleliūnas.
8. **Ieva Karpavičienė**. Plant-derived exosome-like nanoparticles: the influence of genotype and cultivation environment on their phytochemical diversity. Scientific supervisor Dr Akvilė Viršilė.
9. **Dovilė Motiejauskaitė**. Studies on the migration of microplastics from sewage sludge to deeper soil layers. Scientific supervisor Dr Karolina Barčauskaitė.
10. **Olha Posunko**. Analysis of plant abiotic stress-related protein interaction by affinity purification – mass spectrometry. Scientific supervisor Dr Perttu-Juhani Haimi.
11. **Akin Un**. Development of the Lithuanian soil spectral library: building soil models by combining laboratory Vis-NIR spectral datasets and soil sampling. Scientific supervisor Dr Renaldas Žydelis.
12. **Jurinta Voišvilo**. Agrotechnological and nutritional value potential of anthocyanin winter wheat breeding material in Lithuanian climate conditions. Scientific supervisor Dr Žilvinas Liatukas.

Agricultural Sciences, Forestry (A 004)

1. **Munawar Ali**. The growth, mortality, and regeneration patterns of Scots pine stands affected by root rot. Scientific supervisor Dr Povilas Žemaitis.
2. **Gediminas Jasinevičius**. Nature-based solutions in the forest-based sector for climate change mitigation and carbon market development. Scientific supervisor Dr Marius Aleinikovas.
3. **Abdellah Saoualih**. Forest therapy as a strategic direction for sustainable tourism in Lithuania. Scientific supervisor Dr Mindaugas Škėma.

5.2. DOCTORAL DISSERTATIONS DEFENDED IN 2025

Agricultural Sciences, Agronomy (A 001)

1. **Raminta Antanynienė**. European plum response to *Monilinia* spp. infection at the genomic and transcriptomic levels. Scientific supervisor Dr Birutė Frercks.
2. **Aušra Bakšinskaitė**. Effect of natural resources *Artemisia dubia* and pig manure digestate on the productivity of winter wheat agrophytocenosis. Scientific supervisor Dr Vita Tilvikienė.
3. **Agnė Buivydienė**. The effect of different intensities soil tillage and crop rotations on the agrocenosis. Supervisor Dr Irena Deveikytė, scientific advisor Dr Virginijus Feiza.
4. **Vilma Gudynienė**. The effect of preparation and sowing methods of meadow plant seeds on the formation of flowering grasslands. Scientific supervisor Dr Vaclovas Stukonis, scientific advisor Dr Jonas Šlepetys.
5. **Shervin Hadian**. Identification of endophytic bacteria from *Artemisia* spp. plants and their potential in sustainable agriculture. Scientific supervisor Dr Skaidrė Supronienė.
6. **Arnoldas Jurys**. Effects of organic residues and different micro-organisms on soil properties. Scientific supervisor Dr Dalia Feizienė.
7. **Justina Kaziūnienė**. Selection of competitive and efficient *Rhizobium* spp. strains for different *Pisum sativum* L. cultivars. Scientific supervisor Dr Skaidrė Supronienė, scientific advisor Dr Audrius Gageckas.
8. **Urtė Mečionė**. Valorisation of residual biomass of fibre hemp after harvesting the inflorescences. Scientific supervisor Dr Vita Tilvikienė.
9. **Arman Shamshitov**. The role of microbial consortia in wheat straw decomposition for sustainable crop residue management. Scientific supervisor Dr Skaidrė Supronienė.
10. **Aida Skersienė**. Organic carbon accumulation patterns in soils under swards of different age and composition. Supervisor Dr Alvyra Šlepetienė, scientific advisor Dr Vaclovas Stukonis.

Agricultural sciences, Forestry (A 004)

1. **Greta Striganavičiūtė**. Physiological and biochemical responses of black alder (*Alnus glutinosa* L.) and silver birch (*Betula pendula* Roth.) to polycyclic aromatic hydrocarbons and microorganisms. Supervisor Dr Vaida Sirgedaitė-Polikaitienė.

Raminta Antanynienė

Aušra Bakšinskaitė

Agnė Buivydienė

Vilma Gudynienė

Shervin Hadian

Arnoldas Jurys

Justina Kaziūnienė

Urtė Mečionė

Arman Shamshitov

Aida Skersienė

Greta Striganavičiutė

6

COLLABORATION WITH FOREIGN PARTNERS

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On 28 January 2025, at the Presidential Palace of the Republic of Lithuania, a cooperation agreement was signed with the world leader in science and innovation, the Massachusetts Institute of Technology (MIT, Boston, USA), which consistently ranks first in various world rankings. The cooperation, which opens wide opportunities for Lithuania, was established by a **consortium for the MIT International Science and Technology Initiatives (MISTI) Programme for Lithuania**.

In 2025, the Ministry of Agriculture of the Republic of Lithuania approved the establishment of the **International Centre of Excellence Plant Phenotyping for Healthy Food and Sustainable Agrobiological Resources (PhenoPlantCC).**

The goal of PhenoPlantCC is to leverage the experience, competencies and infrastructure of the University of Copenhagen and other interested parties to bring together the potential of high-level applied research in the field of plant phenomics for the creation and commercialisation of scientific knowledge to meet the needs of society, business, and the public sector. The founder of PhenoPlantCC is the Lithuanian Research Centre for Agriculture and Forestry, in partnership with Vytautas Magnus University and the University of Copenhagen.

LAMMC cooperates with domestic and foreign scientific and business organisations and farmers in carrying out scientific research and experimental development.

Memberships in international organisations are important for active international scientific endeavours. LAMMC is a member of a number of recognised international organisations:

- European Plant Science Organisation (EPSO)
- European Forest Institute (EFI)
- Global Research Alliance on Agricultural Greenhouse Gases (GRA)
- European Vegetable Research Institutes Network (EUVRIN)
- European Fruit Research Institutes Network (EUFRIN)
- International Society for Horticultural Science (ISHS)
- International Union of Food, Science, and Technology (IUFoST)
- International Union of Forest Research Organizations (IUFRO)
- European Association for Research on Plant Breeding (EUCARPIA)
- European Association of Research Managers and Administrators (EARMA)
- Nordic-Baltic Plant Phenotyping Network (NBPPN)

In 2025, LAMMC continued to strengthen its relationships with international institutions with the aim of promoting its scientific achievements abroad and fostering an environment conducive to international cooperation.

7

RESEARCH AND EXPERIMENTAL DEVELOPMENT (R&D)

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7.1. SCIENTIFIC PUBLICATIONS

In 2025, a total of **154** scientific publications were published in journals indexed in the Clarivate Analytics Web of Science (CA WoS) database and carrying an Impact Factor (IF). The highest impact factor of a scientific journal publishing research results generated by LAMMC researchers and their collaborators from international research and higher education institutions reached **48.5** (2024/2025 Journal Citation Reports).

In disseminating their research findings, LAMMC researchers placed considerable emphasis on publishing in high-quality scientific journals. As many as **89.2**% of all publications appeared in **Q1 and Q2 journals**, reflecting not only the productivity of LAMMC researchers but also the high scientific quality of their work and the international recognition of the outcomes of their research.

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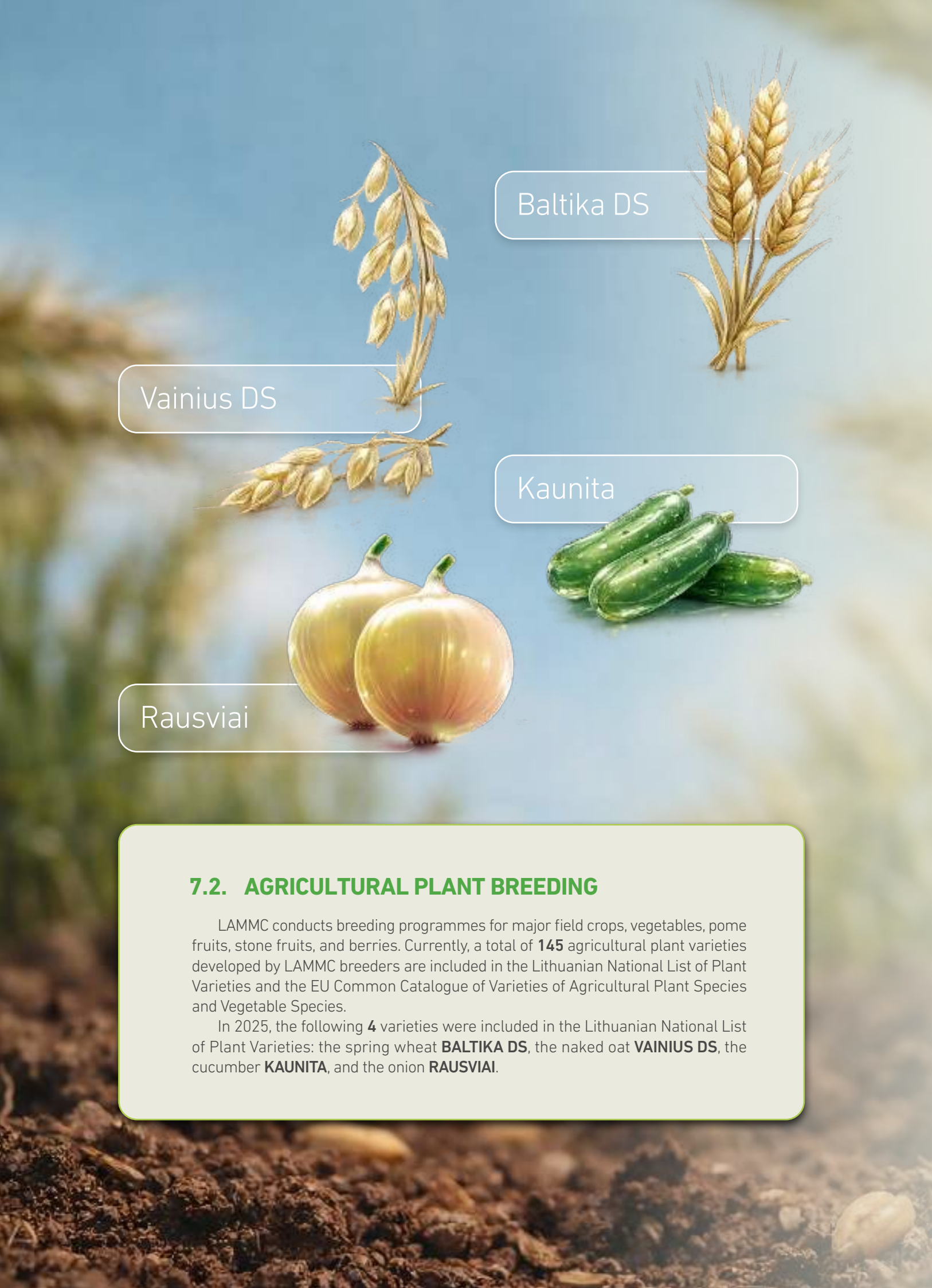
In addition, during 2025, LAMMC researchers authored **two** book chapters published by internationally recognised academic publishers and published **17** articles in peer-reviewed scientific periodicals.

A complete list of scientific publications is provided in the Appendix.

In 2025, the results of the review study by LAMMC researcher Dr Rita Verbylaitė and a large international team of scientists were published in the prestigious scientific journal *Nature*.

A major genetic study involved a team of scientists from Australia, the United Kingdom, Sweden, Poland, Spain, Greece, China, and other countries. Lithuania was represented by Dr **Rita Verbylaitė**, a researcher at the Institute of Forestry of LAMMC. After conducting a comprehensive global analysis of genetic diversity, the international team of scientists found that genetic diversity is declining in two-thirds of the populations analysed worldwide, but that comprehensive efforts, including habitat restoration, animal translocation and population control, species recovery through captive breeding and disease management, are helping to preserve it.

Shaw R. E., Farquharson K. A., Bruford M. W., Coates D. J., Elliott C. P., Mergeay J., Ottewell K. M., Segelbacher G., Hoban S., Hvilsom C., Pérez-Espona S., Ruņģis D., Aravanopoulos F., Bertola L. D., Cotrim H., Cox K., Cubric-Curik V., Ekblom R., Godoy J. A., Konopiński M. K., Laikre L., Russo I.-R. M., Veličković N., Vergeer P., Vila C., Brajkovic V., Field D. L., Goodall-Copestake W. P., Hailer F., Hopley T., Zachos F. E., Alves P. C., Biedrzycka A., Binks R. M., Buiteveld J., Buzan E., Byrne M., Huntley B, Iacolina L., Keehnen N. L. P., Klinga P., Kopatz A., Kurland S., Leonard J. A., Manfrin C., Marchesini A., Millar M. A., Orozco-terWengel P., Jente O., Posledovich D., Spencer P. B., Tourvas N., Nahberger T. U., Hooft P., **Verbylaite R.**, Vernesi C., Grueber C. E. 2025. **Global meta-analysis shows action is needed to halt genetic diversity loss**. Nature, 638: 704–710.



7.2. AGRICULTURAL PLANT BREEDING

LAMMC conducts breeding programmes for major field crops, vegetables, pome fruits, stone fruits, and berries. Currently, a total of **145** agricultural plant varieties developed by LAMMC breeders are included in the Lithuanian National List of Plant Varieties and the EU Common Catalogue of Varieties of Agricultural Plant Species and Vegetable Species.

In 2025, the following **4** varieties were included in the Lithuanian National List of Plant Varieties: the spring wheat **BALTIKA DS**, the naked oat **VAINIUS DS**, the cucumber **KAUNITA**, and the onion **RAUSVIAI**.

Spring wheat BALTIKA DS

Breeders: Dr Andrii Gorash, Dr Žilvinas Liatukas, and Dr Rita Armonienė

The common spring wheat (*Triticum aestivum* L.) variety was developed at the Institute of Agriculture. It was registered in Lithuania in 2025. After economic value studies were conducted in 2023 and 2024 at the Plungė, Kaunas, and Utena Plant Variety Testing Divisions (PVTD), the average yield was 5.1 t ha^{-1}. The highest yield of 8.0 t ha^{-1} was obtained in 2023 at Kaunas PVTD. During test years, wheat of the variety was of average height of 74 cm, resistance to lodging 8.3 points (standard varieties – 7.9 points), and the emergence and maturity time were average. During the testing period, the mass of 1000 grains was low – 35.4 g (due to lack of precipitation), and the mass per hectolitre was high – 799 g L^{-1}. During test years, the following average contents were found in wheat grains: protein 12.8%, gluten 24.3%, starch 68%, sedimentation 41.5 ml, falling number 332 s.

The variety is resistant to brown rust, but only moderately resistant to powdery mildew, septoria leaf spot, and fusarium head blight.

Naked oat VAINIUS DS

Breeder Dr Vida Danytė

The naked oat (*Avena nuda* L.) variety was developed at the Institute of Agriculture. It was registered in Lithuania in 2025. According to economic value studies conducted in 2023–2024 at the Plungė, Kaunas, and Utena PVTDs, the average yield was 3.27 t ha^{-1}. The highest yield of 4.85 t ha^{-1} was in 2023 at the Kaunas PVTD. The average plant height was 89.1 cm (similar to the standard variety 'Milija DS' – 90.1 cm). The average vegetation period was 81.8 days (one day later than the standard variety). The average lodging resistance was assessed at 8.1 points. According to the PVTD data, the grains had an average of 17.7% protein and 8.1% fat. In studies conducted by the Institute of Agriculture of LAMMC in 2024, the protein content of the grains reached 20.7%, and this was not a coincidence, as such grain protein content was determined when growing oats in different places. According to the PVTD data, the hectolitre weight of grains was on average 602 g L^{-1}. The highest hectolitre weight, 660 g L^{-1}, was determined in Kaunas PVTD in 2023. The average weight of 1000 grains reached 24.39 g; hull content was 2.8%.

The variety is resistant to powdery mildew, crown rust, and moderately resistant to powdery mildew and streak.

Cucumber KAUNITA

Breeders: Dr Eugenijus Dambrauskas, Dr Rasa Karklelienė, and Dr Danguolė Juškevičienė

The cucumber (*Cucumis sativus* L.) variety was developed at the Institute of Horticulture. The fruits are 8–10 cm long, medium thick or thicker, green with white stripes up to half the length of the cucumber, large tubercles, white spines. The main stem is short but abundantly branched. The plants are lush, have many shoots with abundant foliage, and overgrow if not harvested for a long time.

The cucumbers are suitable for pickling and fermenting.

Onion RAUSVIAI

Breeders: Dr Rasa Karklelienė and Dr Danguolė Juškevičienė

This onion variety belongs to the sub-species of multi-headed onions (Allium cepa var. aggregatum) and was developed at the Institute of Horticulture. It is a clonal variety, propagated vegetatively by bulbs. The bulbs are planted in spring. Their optimal diameter is 2–3 cm. The foliage of the plants grows to a height of 0.4 m and more. The green of the leaves is of medium intensity. Seven to ten creepers with individual covering shells are formed in one plant nest, but some creepers in the nest may have a common additional covering shell. The creepers are flat-round in shape, the colour of the covering outer shell is brown with a pink tint.

The onions are universal in purpose, resistant to diseases, and keep well during storage.

7.3. PATENTS REGISTERED BY THE EUROPEAN PATENT OFFICE IN 2025

1. EP4072806 B1 WOOD MODIFICATION METHOD AND MODIFIED WOOD

On 24 September 2025, the European Patent Office (EPO) registered the European patent EP4072806 B1 'Wood Modification Method and Modified Wood'.

This invention describes a novel wood modification method that provides wood with new physical and chemical properties, including increased density, enhanced resistance to decay, and improved colour stability throughout the entire wood volume. The method also enables the production of a range of natural colours, from black to blue, violet, or brown. The patent was obtained within the SMART project 'Development of environmentally friendly wood modification technologies providing higher added value to wood products'. This is an important step towards the development of more sustainable, innovative, and higher value-added products.

One of the inventors of the patent is Dr Marius Aleinikovas, a senior researcher at the Department of Forest Resources, Economics and Policy, Institute of Agriculture, and the deputy director for Institute of Forestry Activities.

2. EP4260682 B1 LIGHTING METHOD FOR PROMOTING ACCUMULATION OF SECONDARY METABOLITES IN CHELIDONIUM MAJUS PLANTS

On 29 October 2025, the European Patent Office (EPO) registered the European patent EP4260682 B1 'Lighting Method for Promoting Accumulation of Secondary Metabolites in Chelidonium majus Plants'.

This invention defines an artificial lighting method that, when applied in controlled environment agriculture (CEA) systems, enables *Chelidonium majus* plants to accumulate significantly higher levels of pharmaceutically relevant secondary metabolites, including chelidonine, sanguinarine, berberine, and others. The method contributes to the development of value-added, standardised medicinal plant cultivation technologies and demonstrates the potential of controlled environment agriculture for producing high-value raw materials.

This patent is one of the outcomes of the high-level R&D (SMART) project 'UV-A lighting strategies for controlled environment horticulture: upgrade to sustainable, high-value production' funded by the Research Council of Lithuania (No. 01.2.2-LMT-K-718-01-0049).

The inventors of the patent are researchers from the Institute of Horticulture: Dr Akvilė Viršilė, Dr Giedrė Samuolienė, Dr Aušra Brazaitytė, Dr Jurga Miliauskienė, Dr Rūta Sutulienė, Dr Perttu-Juhani Haimi, Dr Algirdas Novičkovas, and Dr Julė Jankauskienė.

©Daiva Puidokienė

7.4. LONG-TERM RESEARCH AND EXPERIMENTAL DEVELOPMENT (R&D) PROGRAMMES

LAMMC is implementing six long-term research and experimental development programmes for 2022–2026. The purpose of R&D programmes is to ensure consistent, planned, targeted, long-term impact and R&D work necessary to solve urgent problems of the state and society, which requires collective efforts of researchers and is carried out by one institution or with partners.

Biopotential of plants for multifunctional use and sustainability of agroecosystems

Leader Dr Žydrė Kadžiulienė

The **aim** of the programme is to create and improve new scientific knowledge and technologies necessary for addressing agroecosystem sustainability challenges and supporting the sustainable development of diverse farming systems under changing climatic and market conditions.

The programme comprised 11 ongoing research activities aimed at delivering valuable solutions for the effective utilisation of plant potential. In 2025, four of these studies were completed and their final syntheses are currently being prepared. Among the most notable research outcomes are the studies 'Realisation and Stability of Plant Productivity Potential in Farming Systems of Different Intensity' and 'Synthesis and Application of Sustainable, Environmentally Friendly Products with Antimicrobial Properties'.

During the past year, research conducted within the long-term programme resulted in the publication of several scientific papers. Findings were presented at international and national conferences, while practical recommendations were disseminated through seminars, field days, and science popularisation articles.

©Lina Šarūnaitė

Participants and field day organisers of the EIP project

©Virmantas Povilaitis

Experimental fields of the Institute of Agriculture

Sustainable forestry and global changes

Leader Dr Marius Aleinikovas

The **aim** of the programme is to generate and systematise new scientific knowledge required for the sustainable development of forestry in the context of global environmental, economic, and social change and to develop recommendations for the practical application of this knowledge.

In 2025, research activities initiated in previous years were continued, and several new studies were launched. These included investigations into the distribution, abundance, and diversity of insect pests and their natural enemies, as well as harmful and invasive fungal pathogens. Research was also conducted on the impacts of herbivorous animal populations on agricultural and forest ecosystems, taking into account habitat suitability and climate change.

In 2025, the programme's research results were published in 40 articles in scientific journals indexed in the CA WoS database. In addition, the European Patent Office (EPO) granted one patent for the invention 'Wood Modification Method and Modified Wood'.

©Marius Aleinikovas

Samples of modified wood

Harmful organisms in agro- and forest ecosystems

Leader Dr Roma Semaškienė

The **aim** of the programme is to study the functioning of communities of dominant and newly emerging harmful organisms in agricultural and forest ecosystems, and to develop scientific foundations for managing their adverse impacts, thereby balancing economic benefits with environmental protection, human safety, and biodiversity conservation.

In 2025, the programme comprised 17 research projects, two of which were presented as completed studies at the scientific conference held at LAMMC at the beginning of the year. During the same year, three new research methodologies were developed, and three new research projects were initiated.

Research results generated under the programme in 2025 were published in eight scientific articles in journals indexed in the CA WoS database and ranked in the Q1–Q2 quartiles. Three publications were authored by programme researchers as first authors, including publications by Dr Mohamad Almogdad and PhD student Aurimas Sabeckis.

The programme was also actively engaged in the dissemination of research findings. In 2025, researchers delivered 10 conference presentations, including three at international conferences. In addition, two sets of recommendations for practitioners and four articles in popular science and professional publications were prepared.

On 13–14 March 2025, the 16th meeting of the Nordic Baltic Resistance Action Group (NORBARAG) was held in Vilnius. The event was organised by researchers of the Lithuanian Research Centre for Agriculture and Forestry, including participants of the KOMAS programme.

PhD student Aurimas Sabeckis presenting a poster at the 17th European *Fusarium* Seminar in France

Horticulture: agrobiological foundations and technologies

Leader Dr Giedrė Samuolienė

The **aim** of the programme is to develop scientific foundations for agrobiological processes in fruit, berry, and vegetable crops in order to enhance productivity potential and product quality through the application of innovative, environmentally-friendly, and resource-efficient technologies.

In 2025, the programme included 24 ongoing research projects, all aimed at the targeted management of plant growth, development, photosynthesis, and metabolic processes through agrobiological approaches, with the goal of producing higher-quality, higher-value, and more sustainable plant products, as well as developing innovative products.

The long-term programme also involved seven doctoral candidates and six students during 2025. Research outcomes were published in 15 articles in journals indexed in the CA WoS database. In addition, one patent was granted by the European Patent Office (EPO) for the invention 'Application of a Lighting Method for Promoting the Accumulation of Secondary Metabolites in *Chelidonium majus* L. Plants'.

LSMU students Domas Benkunskas, Aneta Urbanovič, and Austėja Vaitkevičiūtė completed their summer internship at the Institute of Horticulture

Productivity and sustainability of agrogenic and forest soils

Leader Dr Gražina Kadžienė

The **aim** of the programme is to investigate agricultural and forest soil resources, identify the factors driving soil degradation, and determine appropriate mea-

Keaton Doubroff (*right*), a student at the AgroParisTech, during his internship at the Department of Soil and Crop Management, Institute of Agriculture, with Dr Agnė Veršulienė (*centre*), the internship supervisor

sures for maintaining the sustainability of mineral and organic soils, optimising carbon cycling, and reducing greenhouse gas emissions and nutrient losses across different pedoclimatic regions of Lithuania.

The programme currently comprises 20 ongoing research projects, of which five were initiated and three completed in 2025.

During the reporting year, three doctoral dissertations were successfully defended. The programme team organised an international conference, several field days and seminars, implemented two summer internship programmes, and hosted four research placements (three international and one domestic trainee). Researchers published more than ten high-quality scientific papers and over twenty science communication articles.

Press releases and contributions for radio and television were prepared, and recommendations for the agricultural sector were developed. Programme participants actively presented research findings and current issues related to sustainable soil management at conferences in Lithuania and abroad.

Genetics, biotechnology and breeding for plant biodiversity and innovative technologies

Leader Dr Vidmantas Bendokas,
deputy leader Dr Eglė Norkevičienė

The **aim** of the programme is to determine biological markers of resistance to abiotic and biotic stress, plant productivity, and quality parameters, and to develop new multifunctional breeding material, plant genotypes, and varieties that support both conventional agricultural production and the objectives of the European Green Deal, while being suitable for conventional and organic farming systems.

Objectives of the programme:

1. to investigate the mechanisms of genetic control underlying the potential, adaptability, and beneficial traits of plant genetic resources, and to develop early diagnostic methods and measures for enhancing plant adaptability,

2. to develop new plant genotypes and varieties that meet competitiveness requirements and support the objectives of the European Green Deal and organic agriculture.

In 2025, the programme resulted in the development and evaluation of 1,388 new breeding lines and varieties of field, fruit, and vegetable crops. Four new plant varieties were registered in the national and European Union catalogues, while seven promising varieties were submitted for official registration testing.

Researchers published 19 articles in journals indexed in the CA WoS database, authored eight science communication articles, and presented research findings in 26 presentations delivered at international and national scientific conferences.

©Eglė Norkevičienė

Field collections of national plant genetic resources

©Urtė Mečionė

7.5. PROJECTS

In 2025, **21** international (*Figure 2*) and **104** national projects were conducted at LAMMC. In total, more than 100 research projects were carried out under contracts with Lithuanian and foreign business entities.

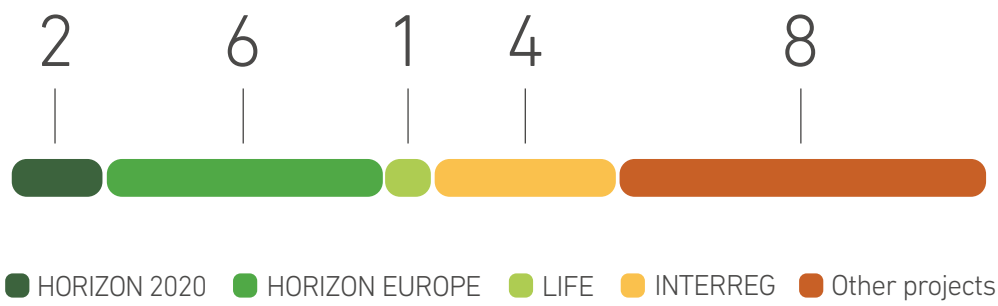


Figure 2. International projects implemented in 2025

The largest part – **33.0%** – of the international projects were financed by the programme HORIZON 2020; other project activities were financed as follows: **21.9%** by HORIZON EUROPE, **18.5%** by INTERREG, **11.9%** by LIFE, **9.3%** by NordForsk, **5.0%** by AGROECOLOGY, and **0.3%** by other programmes.

A total of **104** national research and experimental development (R&D) projects were implemented. Of these, **40.1%** were funded by the Research Council of Lithuania, **19.9%** by the National Paying Agency, **19.7%** by the Central Project Management Agency, **14.0%** by the Ministry of Agriculture, **4.9%** by the Ministry of Environment, and **1.4%** by the association RTO Lithuania (*Figure 3*).

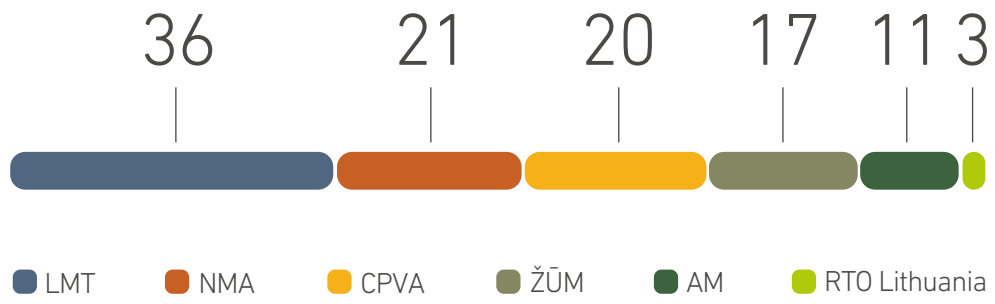


Figure 3. National projects implemented in 2025

7.5.1. Projects launched in 2025

7.5.1.1. International projects

Horizon Agroecology programme projects

CoolFarmLab: CO-creation Of Pathways to foster agroecoLogical transition of FARMs driven by Living LAB approach

Coordinator Dr Monika Toleikienė,
Institute of Agriculture. 2025–2028

The **aim** is to propose, test, and improve innovative agroecological management systems within a network of farms undergoing agroecological transformation, promoting mutual learning mechanisms among participating stakeholders, including farms, service providers, research and education systems, industry actors, and technical support institutions.

The implementation of the Living Lab approach aims to strengthen social and relational capital, which is increasingly recognised as a key driver for the dissemination of ideas and knowledge, and to support the development of innovations shaped within individual farm contexts. Particular attention is given to removing barriers to innovation uptake on farms and fostering collaborative and knowledge-sharing environments that help overcome isolation and individualism, especially in the most disadvantaged rural areas.

Beyond experimentation with innovative cropping systems in the context of agroecological transformation, the project is expected to: (1) promote innovation uptake, (2) optimise resource use by developing more efficient and effective management systems, (3) improve marketing systems through innovative business models, (4) identify new skills that can create employment and retention opportunities, particularly for young people and women, in disadvantaged rural and peripheral regions.

Dr Monika Toleikienė and Dr Aida Skersienė at the meeting of CoolFarmLab project collaborating institutions in Italy

Agroecological transition of the European dairy farming system (TEDY)

Coordinator Dr Gintarė Šidlauskaitė,
Institute of Agriculture. 2025–2028

The **aim** is to promote the agroecological transformation of European dairy production systems by enhancing farm resilience, sustainability, and economic viability while reducing dependence on external inputs, improving environmental performance, and strengthening social aspects within the dairy sector.

The project activities are structured around four main areas: (1) research on grassland biomass productivity and utilisation to improve resource-use efficiency, reduce dependence on external inputs – particularly mineral fertilisers – and strengthen internal nutrient cycling within dairy production systems, (2) development and evaluation of good farming practice measures aimed at improving soil quality and managing species-diverse grasslands, (3) analysis of nationally collected data to assess the economic, social, and environmental impacts of agroecological solutions, and (4) promotion of knowledge dissemination and exchange to support the wider adoption of sustainable dairy production practices.

Presentation of the TEDY project at the exhibition EKOAgrITech

Other projects of EU programmes supporting research

NJK project 'Fimbulwinter wheat – creating a team with a plan to adapt winter wheat for difficult winters'

Coordinator Dr Rita Armonienė,
Institute of Agriculture, 2025–2027

The **aim** is to deepen knowledge on winter hardiness traits in order to increase the stability of winter wheat cultivation in the Nordic and Baltic countries. The network aims to bring together researchers with

a shared interest in winter wheat hardiness, foster collaboration and knowledge exchange, and support the development of ideas for a large-scale research project.

On 28–29 October, the workshop 'Adapting winter wheat for harsh winters' and a partner meeting were held within the framework of a project funded by the Nordic Joint Committee for Agricultural and Food Research (NJF). Both events brought together researchers and plant breeders from the Nordic, Baltic, and Central European countries to discuss challenges and strategies for improving winter wheat cold tolerance and winter survival under changing climatic conditions.

©Rita Armonienė

Project partners meeting at LAMMC

SNS project '**Integrating soil monitoring in forest and other semi-natural land uses in the Nordic and Baltic region' (MoniForSoil)**

Coordinator Dr Iveta Varnagirytė-Kabašinskienė, Institute of Forestry, 2025

The **aim** of the project was to review forest soil monitoring systems applied in the Nordic and Baltic countries in order to harmonise methodologies, improve data comparability, and strengthen interdisciplinary cooperation.

During the project, scientists, researchers, and students from Northern Europe, the Baltic countries, Ukraine, Canada, and Japan analysed the development of soil research with the aim of addressing the main project objective: to assess how the EU Soil Monitoring Law can be applied in boreal and temperate forests and to identify the most suitable indicators of soil health and their practical application for ecosystem assessment.

The project also aimed to strengthen the compatibility of national soil monitoring systems to facilitate comparison of different soil parameters, provide insights into carbon monitoring methods and data use, and analyse methodological differences across countries.

Several thematic online meetings were held during the implementation of the project, while the main results and activities were discussed at a conference-meeting of project partners from 11 countries held in September 2025 in Iceland. During the meeting, key methodological aspects and results of soil research across different countries were presented, along with discussions on joint approaches for developing more sustainable soil protection policies at regional and international levels.

©Iveta Varnagirytė-Kabašinskienė

Participants of the MoniForSoil project at a conference in Iceland

7.5.1.2. National projects

Research funded by the Research Council of Lithuania

RCL
Research Council of Lithuania

Harnessing the multifunctionality of *Artemisia dubia* biomass for sustainable soil health and crop protection in temperate agroecosystems

Leader Dr Modupe Olufemi Doyeni. 2025–2028

Current farming systems still rely heavily on synthetic fertilisers and pesticides, which significantly contribute to soil degradation, biodiversity loss, nutrient imbalance, environmental pollution, and increasing risks associated with climate change. In order to ensure sustainability and maintain existing plant biopotential, it is necessary to use affordable and accessible organic bioresources that promote healthier plant metabolism, deter pests and diseases, improve soil health, enhance carbon sequestration, and contribute to the progress of the green transition. One of the key priorities is to reduce the use of chemical fertilisers and pesticides in agricultural systems.

The **aims** are: (1) to investigate the chemical composition and variability of *Artemisia dubia* biomass and its extracts under different agroecological conditions typical of temperate regions, using Lithuania as a model system, (2) to evaluate the biopesticidal and antimicrobial effectiveness of *A. dubia* against eco-

nomically important temperate-climate pests (such as Colorado potato beetle, pollen beetles and aphids) and pathogens (such as *Fusarium* spp.), (3) to assess the effects of *A. dubia* biomass mulch and extracts on soil biological health indicators, including microbial activity (microbial biomass carbon, enzymatic activity), nutrient dynamics and carbon cycling, and (4) to develop practical recommendations for integrating *A. dubia*-based solutions into organic farming systems in temperate regions, contributing to circular bioeconomy and the green transformation.

Evaluation of cold acclimation efficiency of *Ribes* and *Prunus* genotypes for cryopreservation *in vitro*

Leader Dr Rytis Rugienius. 2025–2028

It is natural that cold acclimation in plants is one of the key processes enabling survival under freezing stress conditions. Hardening is important not only for the survival of shoots *in vitro* but also for their efficient regeneration after cryopreservation. However, the survival rate of some horticultural plant genotypes after cryogenic storage in liquid nitrogen (–196°C) remains below 40%, which is considered the threshold for successful cryopreservation.

The **aim** is to evaluate and improve the hardening of *in vitro* shoot cultures of *Prunus cerasus*, *P. avium*, and *Ribes nigrum*, to assess the impact of endophytic bacteria on *in vitro* shoot hardening and their potential to enhance microshoot survival and regeneration after cryopreservation. In addition, gene expression and proteomic analyses will be used to deepen the understanding of hardening mechanisms and to evaluate their effects on *in vitro* culture survival after cryopreservation. Microshoot survival and regeneration after cryopreservation will serve as the main criteria for selecting optimal hardening conditions, including hardening duration, regime, and culture medium composition. After optimisation of these conditions, molecular analyses characterising hardening will be conducted: changes in dehydrins will be assessed using immunoblot analysis; differentially expressed proteins will be identified using two-dimensional differential gel electrophoresis (DIGE) and mass spectrometry; expression of target genes related to jasmonic acid and ethylene pathways, transcriptional activators, and other hardening-related genes will be analysed. The level of oxidative stress damage will be determined using biochemical assays. In addition, the influence of introduced endobacterial isolates on the above hardening parameters and shoot survival after cryopreservation will be evaluated. The expected outcome is the development of a hardening protocol enabling reliable preservation of *Ribes* and *Prunus* cultures *in vitro* via cryogenic storage, providing valuable knowledge for the conservation of genetic resources for breeding and for maintaining healthy elite planting material for sustainable and organic horticulture.

Contribution of humic substances to the retention and mobility of environmentally hazardous synthetic polymers in soil systems (HUMIPOL)

Leader Dr Alvyra Šlepetienė. 2025–2027

In recent years, the accumulation of synthetic polymers in terrestrial ecosystems has emerged as a complex environmental challenge attracting significant scientific attention. While earlier research focused on aquatic systems, increasing evidence shows that soils, including agricultural, urban, and forest soils, also contain substantial accumulations of micro- and macroplastic particles. These contaminants originate from multiple sources, such as agricultural films, composts, tyre wear particles, urban dust, textile fibres, and atmospheric deposition.

The **aim** is to generate new knowledge on the mechanisms of interaction between humus and polymers, to identify indicators of soil carbon stability, and to assess the role of humic substances in mitigating pollution impacts by systematically investigating their role in retaining, stabilising and potentially inactivating synthetic polymer contaminants in soils under different land uses. The project also aims to quantify how these interactions influence soil organic carbon leaching, microbial activity, and soil carbon sustainability. By comparing chemically stable, biodegradable and rubber-based polymer types, the study seeks both mechanistic understanding and practical indicators for assessing soil vulnerability to polymer pollution. The final outcome of the project is expected to contribute to the development of environmentally sound land management strategies and environmental policy recommendations.

Development of research competence of scientists, other researchers, and students through practical scientific activities funded by the European Union funds

Sub-activity 'Development of students' abilities in scientific research during semesters'

Structural and species composition dynamics of spruce forests and driving factors in strict nature reserves

Supervisor Dr Povilas Žemaitis,
student Ignas Neliubovas. 2025–2026

The **aim** of the project is to assess changes in stand structure, species composition and the factors influencing these changes in the Plokštinė and Rukundžiai strict nature reserves. The **objectives** of the project are: (1) to evaluate changes in stand structure and mortality in the forests of the Plokštinė and Rukundžiai reserves during the period 1998–2025, (2) to assess changes in stand volume and the volume dynamics of its components during 2001–2026, and (3) to evaluate changes in natural regeneration and identify the main factors influencing this process.

Semester research project by the student Ignas Neliubovas

Applied research projects funded by the Ministry of Agriculture of the Republic of Lithuania

MINISTRY OF AGRICULTURE OF THE REPUBLIC OF LITHUANIA

Establishment, verification and testing of a soil quality monitoring point network

Leader Dr Jonas Volungevičius. 2025–2027

The **aim** is to establish a soil quality assessment monitoring network in line with the EU Soil Strategy and the Soil Monitoring and Resilience Directive, collect soil samples and determine their agrochemical and physical properties, and based on these data, to refine the agroclimatic zoning map of Lithuania. The **objectives** of the project are: (1) to critically evaluate the possibilities for integrating existing EU and national monitoring systems, (2) to develop a soil quality monitoring point sample network based on geostatistical methods, (3) to develop and refine a digital soil regionalization model (map) of Lithuania, (4) to verify and revise the compliance of soil quality monitoring points with the requirements of Directive COM(2023) 416 final in relation to Tasks 2 and 3, (5) to test the monitoring network by collecting data on soil organic carbon, pH, nitrogen content, bulk density and particle-size distribution, (6) to refine Lithuania's agroclimatic zoning and develop its digital model based on the collected and calculated data, and (7) to create a digital database and maps, publish them through the Geoportal Lithuania system, and ensure compliance with the requirements of the EU Open Data Directive.

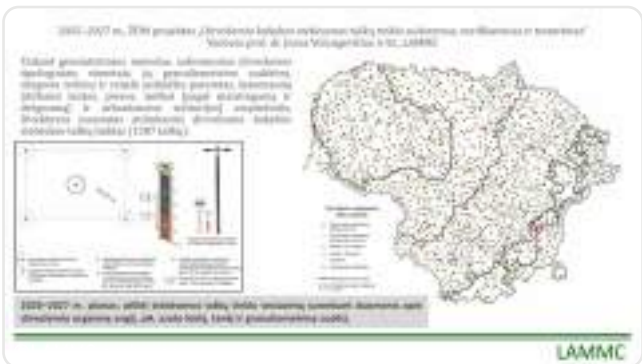


Figure 4. Objectives of the project

EIP activity group projects

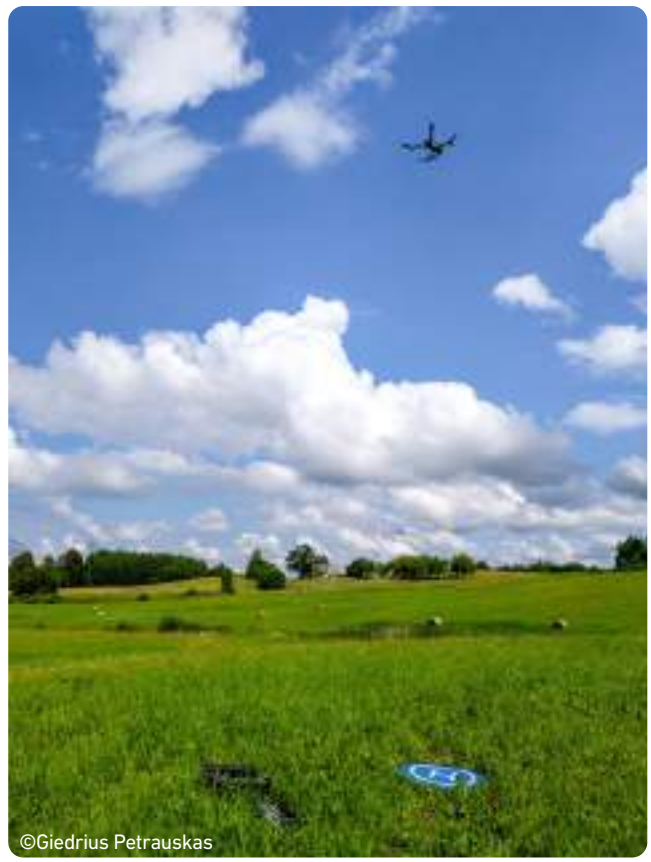
Intervention measure of the Lithuanian Strategic Plan for Agriculture and Rural Development 2023–2027 'European Innovation Partnership for Agricultural Productivity and Sustainability'

Integrated legume grass systems for sustainable protein production and grazing (HarmonyGrass)

Leader Dr Giedrius Petrauskas. 2025–2028

The **aim** is to restore grasslands and pastures and enhance biodiversity through the integration of legume mixtures and the use of unmanned aerial vehicles (UAVs). Seeds will be treated with organic polymers to improve establishment and resilience under adverse conditions, while sowing will be carried out through precision seed distribution, enabling efficient application even in hard-to-reach areas.

The project addresses both environmental and economic challenges. It focuses on sustainable grassland



Field crop monitoring using a drone with a multispectral camera

management, livestock farming, and efficient use of natural resources, contributing to the implementation of EU permanent grassland protection policies, reducing dependence on chemical fertilisers, and lowering CO_2 emissions. At the same time, it promotes the competitiveness of local farms through the application of advanced science-based technologies.

The project combines innovative technologies with approaches tailored to local needs. The use of UAVs for sowing legume-grass mixtures not only enables operations in inaccessible areas but also ensures high precision and efficiency. By integrating grassland flora analysis with digital monitoring tools, plant mixtures can be designed in a targeted manner, ensuring methodological consistency and evidence-based decision-making. Combining agronomic expertise, ecological principles, and technological innovation, this interdisciplinary approach provides solutions to current challenges while ensuring the long-term impact and applicability of project outcomes across different farming systems.

Comparison the effects of long-term sustainable tillage systems and crop rotations management on segetal flora (FLORKONTROLĖ)

Leader Dr Irena Deveikytė. 2025–2028

The **aim** is to identify farms in Central, Eastern, and Western Lithuania that have been applying reduced tillage technologies for different periods of time (up to 5 years, 5–10 years, and more than 10 years) and to assess the changes in segetal flora that have occurred in cultivated fields as a result of their implementation. The project activities focus on evaluating the effects of the duration of reduced tillage practices on the development of cereals, oilseed rape, grain legumes, and segetal flora, changes in plant communities and agroecosystem productivity, as well as assessing the influence of tillage on the formation of aboveground and belowground plant biomass in soils with different particle-size compositions.

Sustainable improvement of crop residue utilization value (BIOCOTECH)

Leader Dr Lina Šarūnaitė. 2025–2027

The **aim** is to develop and practically test a microorganism-based bioconversion technology for crop residues (cereals and oilseed rape), aimed at the efficient processing of lignocellulosic biomass into an organic substrate with enhanced fertilising value. Selected combinations of microorganisms will be screened and tested, the composting technology will be optimised, and the developed approach will be evaluated under different agroclimatic conditions at four locations across Lithuania. The application of the technology is expected to reduce the need for synthetic fertilisers, improve soil fertility, and contribute to the objectives of the circular economy and sustainable agriculture. Project results will be disseminated to farmers and other stakeholders through field days and an international seminar.

Poster of the BIOCOTECH project

Development and improvement of technologies for growing edible oyster fungi

Leader Dr Jūratė Lynikienė. 2025–2028

The **aim** is to prepare a feasibility study on the artificial cultivation of edible oyster mushrooms naturally occurring in Lithuania and their production on farms using developed methodologies and improved cultivation technologies.

Pleurotus sp. – a valuable mushroom with excellent taste and beneficial properties

The **objectives** of the project are: (1) to develop, improve, expand, test and implement a cultivation technology for oyster mushroom species naturally occurring in Lithuania that is suitable and practical for farmers and (2) to disseminate innovative cultivation technologies in rural areas by training land- and forest owners and managers in the establishment, maintenance, and cultivation of local oyster mushroom species.

RTO Lithuania projects

BACTOALGRO: Enhancing bacteria and algae interaction using electroporation and plasma-activated water to stimulate plant growth

Coordinators: Dr Shervin Hadian (LAMMC), Dr Voitech Stankevič (FTMC), and Dr Mindaugas Milieška (LEI). 2025–2026

The **aim** is to evaluate the potential of electroporation and plasma-activated water treatments to enhance key functional mechanisms of endophytic bacteria isolated from *Artemisia* species growing in Lithuania that exhibit plant growth-promoting properties. The study focuses on their effects on phosphate solubilisation and nitrogen fixation, which are essential processes for plant growth, as well as their influence on bacteria–algae consortia and algal biomass production. The project also investigates whether these innovative physical treatment methods can improve consortium functionality, offering a promising approach to more efficient and sustainable nutrient management in agriculture.

Synthesis and application of biofuel ash geopolymers for removal of Zn^{2+} and Cu^{2+} ions from simulated wastewater (BAGEO-HM)

Coordinators: Dr Kristina Bunevičienė (LAMMC), Dr Sandra Stanionytė (FTMC), and Dr Šarūnas Varnagiris (LEI). 2025–2026

The **aim** is to synthesise biofuel ash geopolymers using a rapid hydrothermal alkaline modification method and to evaluate their adsorption capacity for the removal of Zn^{2+} and Cu^{2+} ions from simulated wastewater. The project tasks are: (1) to investigate the chemical composition and structure of biofuel ash using instrumental analytical methods, (2) to synthesise biofuel ash geopolymers employing a rapid hydrothermal alkaline modification approach, (3) to analyse reaction kinetics over time and apply mathematical models to assess adsorption capacity for Zn^{2+} and Cu^{2+} ions, and (4) to confirm the composition and structure of the synthesised materials and adsorption products using instrumental analysis techniques.

The results of the study will provide new knowledge on the composition, structure and adsorption performance of the produced geopolymers for the removal of Zn^{2+} and Cu^{2+} ions from simulated wastewater. The project is also expected to generate insights into the potential utilisation of secondary waste materials for geopolymer synthesis.

Equipment for the synthesis of biofuel ash geopolymers

Modelling microplastic transport in plants using microfluidic systems (PLASTRO)

Coordinators: Dr Gintarė Šidlauskaitė (LAMMC), Dr Justas Šereika (LEI), and Dr Julija Pupeikė (FTMC). 2025–2026

The **aim** is to develop a model of the plant vascular system and investigate the migration of secondary microplastics (MPs) released from textile fibres within plant tissues. The project tasks are: (1) to identify the most suitable technology for collecting microplastics from different textile fibres and to determine their key morphological and chemical characteristics, (2) to develop a microfluidic system that mimics the plant vascular network, and (3) to analyse the migration of microplastic particles in different parts of the plant using both experimental and numerical modelling approaches. The project will contribute to a better understanding of microplastic uptake and transport mechanisms in plants, providing valuable knowledge for assessing the environmental risks associated with microplastic contamination in agricultural ecosystems.

7.5.2. Projects completed in 2025

7.5.2.1. International projects

HORIZON 2020 programme projects

A holistic fire management ecosystem for prevention, detection and restoration of environmental disasters (TREEADS)

Coordinator Dr Vaida Sirgedaitė-Polikaitienė, Institute of Forestry. 2021–2025

The **aim** was to develop and validate an advanced, multi-component forest fire management ecosystem covering all interconnected phases of wildfire events – before, during, and after a fire – under real-life conditions. The project aimed to enhance the effectiveness of wildfire prevention, early detection, response and post-fire restoration while reducing the environmental, social, and economic impacts of extreme wildfire events.

During the implementation of TREEADS, more than 26 advanced technologies were optimised, developed, and validated, including coordinated drone and satellite systems, advanced analytical and modelling tools for wildfire risk assessment, fire spread prediction, and decision support. The project also addressed forest and landscape restoration solutions, as well as innovative fire suppression and protection technologies. TREEADS solutions were integrated into a holistic platform enabling real-time integration of multi-source data, early warning services, wildfire behaviour modelling, and the planning of effective response and restoration strategies. The platform was demonstrated and validated through 15 challenging pilot implementations in Taiwan and seven European countries: Austria, Norway, Spain, Italy, Romania, Greece, and Germany.

Participants of the 7th TREEADS General Assembly in Oslo, Norway

The project also placed strong emphasis on end-user training, assessment of technological impacts, including socio-economic benefits, and the consideration of regulatory, ethical, and standardisation aspects. The outcomes of TREEADS contribute to the protection of human lives, property, and ecosystems, strengthen Europe's preparedness for extreme wildfires, and support the uptake of innovative solutions in forestry and wildfire management.

Towards climate-smart sustainable management of agricultural soils (EJP SOIL)

Coordinator Dr Žydrė Kadžiulienė, deputy coordinator Dr Virginijus Feiza, Institute of Agriculture. 2020–2025

The programme brought together leading researchers from 24 European countries to develop a comprehensive knowledge framework on agricultural soil management and provide solutions for sustainable soil use. Of the 26 internal projects implemented within the programme, LAMMC participated in 15, involving more than 30 LAMMC researchers.

EJP SOIL developed and delivered training and capacity-building activities for early-career researchers, focusing on scientific concepts, research results and methodologies, research activities, and general approaches in soil science. As part of the programme, LAMMC researchers, together with international partners, prepared and submitted a proposal to the COST programme entitled 'Establishment of a Hub for Agroecology Knowledge Co-Creation and Science-Based Knowledge and Innovation Sharing (HUB)', coordinated by Dr Monika Vilkienė of LAMMC.

The EJP SOIL community has been increasingly contributing to European policy development and to the activities of European and national knowledge integration working groups, ensuring the effective use and further enhancement of the knowledge system established by the programme. Although the programme officially concluded at the beginning of 2025, participating countries agreed to continue cooperation on a vol-

Various activities and sub-activities of the EJP SOIL programme

untary basis for an additional year. Future activities will focus on strengthening the partnership to address both short- and long-term soil knowledge needs, contribute to climate change mitigation and adaptation, restore soil biodiversity, and support the production of sufficient healthy food. LAMMC researchers continue to actively support and participate in these joint initiatives.

Are mixed species systems fostering belowground C inputs and C sequestration? (MIXROOT-C)

Coordinator Dr Monika Toleikienė,
Institute of Agriculture. 2022–2025

The project successfully addressed key knowledge gaps regarding the contribution of major agricultural crops and cover crops to soil carbon sequestration through their root systems. A Europe-wide study quantified root biomass and rooting depth across a wide range of crop species and varieties. The results demonstrated that targeted selection of varieties with deeper root systems can significantly enhance soil carbon sequestration while maintaining farm productivity and economic viability.

Drawing on data collected across diverse European soil and climatic regions, the project identified the main drivers of root development and modelled carbon storage potential under different soil conditions. The findings provided new insights into the role of root traits in climate-smart crop production and sustainable soil management. Project outcomes were synthesised into policy recommendations that will support the integration of carbon sequestration criteria into EU-approved crop variety seed catalogues and contribute to the development of future measures under the Common Agricultural Policy (CAP).

Dr Agnė Veršulienė taking samples of grassland roots to determine root biomass

Optimizing roots for sustainable crop production in Europe – pure cultures and cover crops (MaxRoot-C)

Coordinator Dr Monika Toleikienė,
Institute of Agriculture. 2022–2025

The project made significant progress in quantifying belowground carbon dynamics across diverse European agroecosystems. A comprehensive meta-analysis identified the key root traits, such as root tissue density and specific root length, that have the greatest influence on soil organic carbon (SOC) stabilisation in both topsoil and deeper soil layers. Root carbon production was measured across different sites, including cover crop and agroforestry systems. The results demonstrated that mixed-species systems improve root biomass distribution compared with monocultures, resulting in greater carbon inputs to deeper soil horizons.

Using data from long-term field experiments, process-based models were calibrated to assess the contribution of root systems to soil carbon sequestration. Preliminary findings revealed a positive relationship between root diversity and the resilience of soil organic carbon under climate variability. The knowledge generated through the project was synthesised in scientific publications and technical reports, with particular emphasis on the trade-offs between root productivity and competition for soil nutrients.

Dissemination of project results during agricultural exhibitions and field days

Soil samples being taken for testing

HORIZON EUROPE programme projects

A holistic approach to sustainable, digital EU agriculture, forestry, livestock and rural development based on reconfigurable aerial enablers and edge artificial intelligence-on-demand systems (CHAMELEON)

Coordinator Dr Vaida Sirgedaitė-Polikaitienė,
Institute of Forestry. 2022–2025

The **aim** was to develop an advanced decision-support ecosystem based on artificial intelligence and unmanned aerial vehicle (UAV) technologies for the sustainable management of agriculture, forestry, and livestock farming. The project aimed to improve decision-making through the provision of accurate, timely and reliable monitoring data while contributing to climate change mitigation and adaptation.

During the project, a modular reconfigurable UAV platform and AI-driven decision-support bundles were developed, enabling near real-time monitoring of vegetation, soils, livestock, extreme events, and forest fires. By integrating UAV, satellite, and other data sources, the project established the Drone Innovation Platform (DIP), an open digital environment for the deployment of data, algorithms, and analytical solutions. The system was tested under real-life conditions in pilot regions in Spain, Austria, and Greece, covering use cases in vineyards, livestock farming, forestry, and wildfire risk management.

The outcomes of CHAMELEON support the development of smart farming systems, enhance the resilience of rural areas, contribute to the objectives of the European Green Deal, and promote sustainable, data-driven management practices across agriculture and forestry sectors.

Dr Adas Marčiulynas at the CHAMELEON project final event in Chania, Greece

The NUTRI-CHECK NETwork to maximise site-specific precision in managing the nutrition of European arable crops (NUTRICHECK-NET)

Coordinator Dr Dalia Feizienė,
Institute of Agriculture. 2022–2025

The **aim** was to refine the prioritisation process for selecting crop nutrition decision-support tools and to provide a cost-benefit analysis of their application. Based on surveys and consultations with crop nutrition clubs from nine European countries, a shortlist of tools was developed based on specific user needs and preferences. Priority was given to tools supporting decision-making in one of three stages of crop nutrition management: (1) planning, (2) monitoring and adjustment, and (3) review. The project sought to support informed agricultural management practices by identifying the most valuable tools for optimising nutrient management and promoting best practices across European crop production systems. The final shortlist included 50 unique tools.

A further objective of the project was the practical evaluation and demonstration of these tools in order to identify examples of best practice suitable for wider dissemination and adoption.

Final meeting of the NUTRI-CHECK NET project participants in Brussels

Other projects of EU programmes supporting research

ECPGR *Allium* Plant Working Group project 'Genotyping-by-sequencing of the European garlic collection to develop a sustainable ex situ conservation strategy' (GarliCSS)

Coordinator Dr Danguolė Juškevičienė,
Institute of Horticulture. 2023–2025

The **aim** was to develop an efficient European garlic conservation strategy by integrating cryopres-

ervation approaches and improving the accessibility and utilisation of genetic resources of garlic for breeders and growers. The strategy supports more efficient decision-making in gene banks by prioritising garlic cryopreservation and other safety duplication methods, establishing core collections for easier and faster use, identifying duplicate accessions, and strengthening secure back-up conservation activities to improve the long-term usability of plant material. Sequencing data generated within the project contribute to breeding and research activities and complement the phenotypic information available in the EURISCO database.

On 20–22 May 2025, the 4th Symposium of the ECPGR Allium Working Group was held in Germany. During the event, project partners presented ongoing research activities and preliminary results used for the discussion of phenotypic duplicates and plasticity and introduced both the theoretical and practical principles of garlic cryopreservation methods.

In 2025, the analysis of garlic phenotyping and genotyping data and the individual evaluation of genotypes were further continued. In August 2025, whole-genome analysis of two additional garlic subgroups was initiated and is scheduled for completion in 2026.

COST actions

cost
EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

CA20118 **Three-dimensional forest ecosystem monitoring and better understanding by terrestrial-based technologies** (3DForEcoTech)

Coordinator Dr Povilas Žemaitis,
Institute of Forestry. 2021–2025

The **aim** was to motivate and promote the development of European forest inventory, monitoring and management practices in the context of the Fourth Industrial Revolution by implementing new terrestrial technology-based tools and creating the basis for a broader application of these technologies in forest ecology research.

Results achieved during the action:

• best practice protocols and guidelines for harmonised data collection using terrestrial technologies for the generation of three-dimensional (3D) information,

• establishment of an open-access database containing 3D point cloud data and ground-truth data,

• best practice protocols and guidelines for the integration of terrestrial 3D point cloud data with satellite and unmanned aerial vehicle systems data,

• best practice protocols and guidelines for terrestrial 3D point cloud data processing,

• protocols, guidelines and recommendations for collecting forest inventory parameters using terrestrial technologies,

• protocols, guidelines and recommendations for forest ecology research applying 3D terrestrial technologies,

• publications – seven articles published in peer-reviewed scientific journals.

CA20132 **Urban Tree Guard – Safeguarding European urban trees and forests through improved biosecurity (UB3Guard)**

Coordinator Dr Diana Marčiulynienė,
Institute of Forestry. 2021–2025

The UB3Guard COST Action network brought together more than 350 participants from various disciplines and sectors, representing over 180 institutions, and promoted knowledge exchange through 11 working group meetings and workshops, five training schools, 30 short-term scientific missions (STSMs), and eight virtual mobility activities, as well as participation in conferences supported through DCG and ITC funding schemes. UB3Guard provided early-career researchers with real responsibilities, international collaboration experience, and opportunities for scientific and professional development in a respectful and inclusive environment.

Participants linked urban tree inventory data from 29 countries and developed a database containing information on more than 8 million trees, which became an important resource for scientific research and decision-making. During the action, COST Innovators Grant funding was secured to complete an open-access decision-support system particularly valuable for small and medium-sized cities. Training materials, technical guidelines, and educational games were also developed and are already being integrated into study programmes and practical activities. Significant synthesis outputs were produced, including the One Health White Paper, the summary of which was translated into 14 languages, and the practitioner-oriented publication 'Urban Tree Biosecurity'.

Although several challenges remain unresolved, UB3Guard established a sustainable framework, data resources and partnerships that will support more effective and evidence-based responses to urban tree health threats across Europe.

Participants of the UB3Guard project workshop 'Nature-based solutions for urban tree biosecurity' in Malmö, Sweden

Research funded by the Research Council of Lithuania

Biodiversification of plant species and explication of corresponding precision agriculture technologies within nutrition-based approach (DiverCEA)

Leader Dr Giedrė Samuolienė. 2022–2025

The project follows European and global strategies aimed at sustainable and efficient resource use and climate-neutral modern precision horticulture while promoting the consumption of healthy, socio-culturally acceptable, and economically accessible plant-based food.

Following the evaluation of agronomic, nutritional, and organoleptic properties of various leafy vegetable species, several promising crops for controlled environment agriculture (CEA) were selected: *Amaranthus tricolor*, *Barbarea verna*, *Chrysanthemum coronarium*, *Mesembryanthemum crystallinum*, *Plantago coronopus*, *Perilla frutescens*, *Portulaca oleracea*, and *Salsola komarovii*. It was determined that light intensity of 200–250 µmol m^{-2} s^{-1} was optimal considering biomass accumulation, nutritional value, and economic aspects of rarely cultivated leafy vegetables. For the development of optimal cultivation technologies under production conditions, red and blue light with a specific contribution of far-red light or broad-spectrum lighting proved most suitable, positively affecting productivity and nutritional quality parameters of many investigated crops, although genotype-specific spectral requirements had also to be considered. It was established that, without causing significant negative effects on plant productivity and taking into account metabolite, vitamin and mineral element changes, economic aspects, and species-specific photoperiodic requirements, a 16-hour photoperiod was most appropriate for indoor cultivation systems.

Evaluation of agronomic and physiological responses of rarely cultivated leafy vegetables showed that minor fluctuations (0.5 pH units) in hydroponic solution pH had no significant effect on productivity. Therefore, nutrient solution pH variations within the optimal 5.5–6.5 range are acceptable in practical applications, although continuous monitoring of pH and EC in hydroponic systems remains essential due to their significant influence on plant nutrient uptake. It was also determined that halophytic plant species tolerated higher salinity levels in nutrient solutions without negative effects on biomass productivity up to 100 mM L^{-1} NaCl, while nutritional quality indicators remained unaffected up to 200 mM L^{-1} NaCl concentrations.

The obtained results are being used as the basis for developing cultivation methodologies for various underutilised leafy vegetables in controlled environment agriculture systems.

Cellular redox balance and protein expression based phenotyping of plant-endophyte interactions for development of plant biostimulant consortia ((REDOXENDO)

Leader Dr Danas Baniulis. 2022–2025

The **aim** was to investigate the patterns of reactive oxygen species (ROS) accumulation and protein expression regulated by endophytic bacteria using a cell culture-based plant–microorganism interaction assessment system and to evaluate the potential of bacteria for restoring the microbiological diversity of endophytes in *in vitro* vegetatively propagated horticultural plants. Endophytic bacterial isolates obtained from apple, tobacco, and strawberry plants were used in the study. The research demonstrated that approximately 80% of the investigated bacterial strains belonging to the class *Bacilli* were less likely to activate plant defence responses and could therefore establish compatible interactions with host plant tissues. Proteomic analysis revealed that the establishment of specific types of endophytic interactions was, in many cases, determined by strain-specific characteristics.

Application of *Bacillus* sp. and *Brevibacterium* sp. inoculants effectively reduced growth inhibition of sweet cherry in vitro shoots after cryopreservation, increasing leaf area from 48% to 75% compared with the control treatment. In addition, the use of *Bacillus* sp. inoculants promoted root growth of apple seedlings by up to 60% and increased biomass accumulation by up to 46% during *ex vitro* adaptation.

The obtained results indicate that the application of plant growth-promoting bacterial inoculants may improve the efficiency of *in vitro* propagation and cryopreservation methods used in the production of horticultural planting material.

Adaptation of *in vitro* propagated apple seedlings using bacterial inoculants

Optimisation of legume nitrogen fixation and use in the organic farming ecosystem (NitroFixation)

Leader Dr Monika Toleikienė. 2022–2025

During the implementation of the project, research focused on optimising nitrogen fixation in legume crops and improving their value in organic farming ecosystems through the use of microorganisms and biostimulants. Beneficial naturally occurring nitrogen-fixing endophytic and epiphytic microorganisms were isolated, cultivated, selected, and investigated. In addition, environmentally friendly biostimulants and rhizobial bacterial strains capable of efficiently enhancing nitrogen fixation in both traditional legumes (peas and faba beans) and non-traditional legumes (lentils and soybeans) were selected.

Using stable isotope tracing methods, the effects of selected microorganisms and biostimulants on nitrogen fixation and accumulation in soybean plants were investigated. The effects of individual microorganisms and their combinations with other biostimulants were evaluated in field experiments conducted at LAMMC and tested on different legume species. The content of nitrogen compounds in various soybean plant tissues was determined, while the origin and quality of nitrogen compounds in legume seeds and residues were evaluated using chemical analyses and modelling experiments of nitrogen compound decomposition.

The project was implemented through collaboration between the Institute of Agriculture and the Chemical Research Laboratory of LAMMC, the Centre for Physical Sciences and Technology, Bioenergy LT Ltd., the State Scientific Research Institute Nature Research Centre, and Aarhus University.

The application of fluorescence microscopy for microplastics characterization

Leader Dr Karolina Barčauskaitė,
student researcher Dovilė Motiejauskaitė. 2024–2025

The **aim** was to adapt fluorescence microscopy methods for the identification of microplastics extracted from organic soil improvement materials. The ability of environmentally safer dyes – coumarin-6, coumarin-153 and curcumin – to stain microplastics of different polymers was investigated, and their efficiency was compared with that of Nile Red, currently the most widely used dye for this purpose. Application of four different fluorescent dyes demonstrated that plastic fluorescence depends on the type and concentration of both polymer and dye, as well as on the excitation wavelength used. The detection and intensity of fluorescence varied when environmentally safer dyes were applied. Under green excitation light, coumarin-6 and coumarin-153 did not emit fluorescence, while curcumin failed to stain polypropylene. It was also determined that, regardless of concentration, coumarin-153 did not stain non-polar polymers such as HDPE, LDPE and PP. This finding suggests the potential use of coumarin-153 for determining polymer polarity.

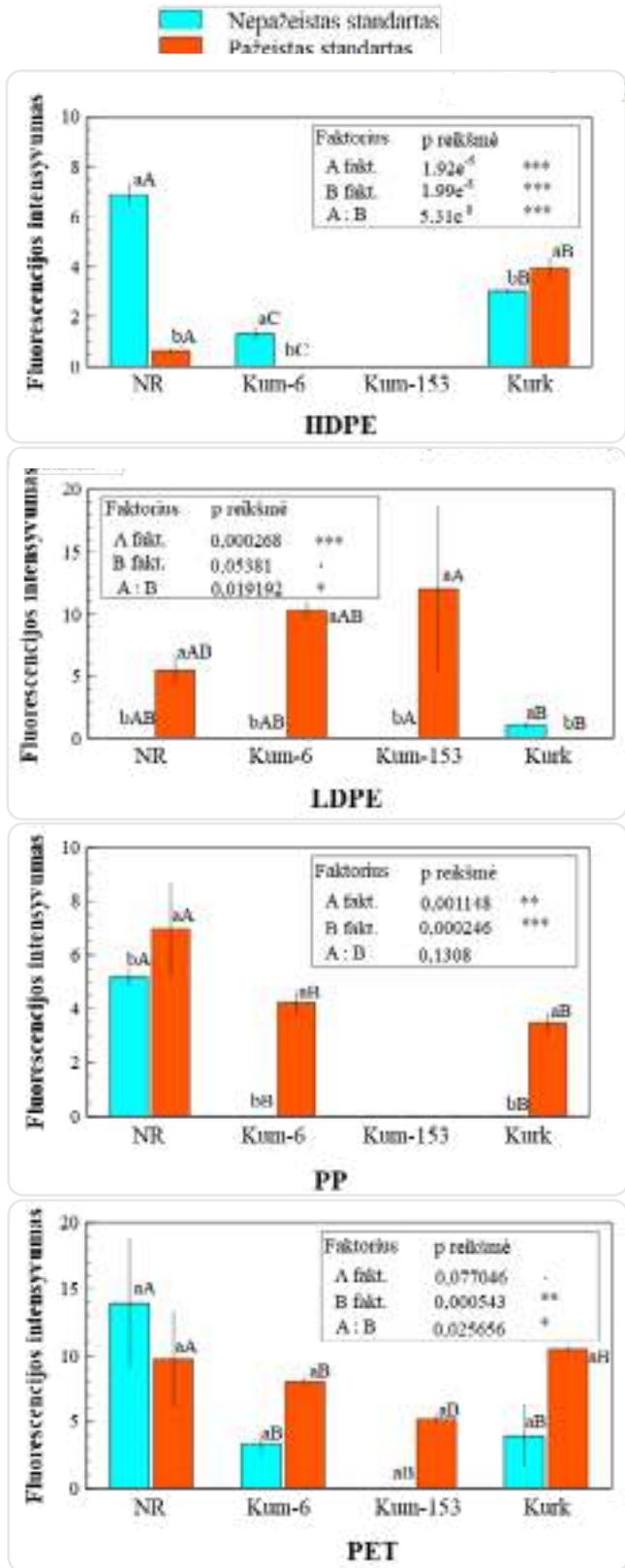


Figure 5. Effect of plastic degradation and the dye applied on fluorescence intensity under UV light (EX 330–380 nm)

Analysis of fluorescence intensity in mechanically and thermally affected microplastics stained with four different dyes revealed a clear trend: irrespective of the dye, polymer type, or excitation wavelength applied, staining intensity increased in damaged polymers.

Applied scientific research funded by the Ministry of Agriculture of the Republic of Lithuania

MINISTRY OF AGRICULTURE OF THE REPUBLIC OF LITHUANIA

EIP activity group projects

Lithuanian Rural Development Programme 2014-2020

The use of the native plant species diversity to create natural landscape elements

Leader Dr Lina Šarūnaitė. 2023–2025

The **aim** was to evaluate the applicability of spontaneous flora communities and herbaceous plant species compositions replicating them for the creation and restoration of high-nature-value landscape elements in farms of varying management intensity and to prepare recommendations for the use of native plant species and locally adapted cultivated plant varieties in intensive and less intensive agroecosystems.

During the project, high-nature-value herbaceous plant composition models were developed and practically tested for different ecological functions and farming intensities. The results demonstrated that integrating native plant species and their combinations into agricultural landscapes increased biodiversity, strengthened ecosystem services, including habitats for pollinators and natural enemies, as well as soil stability, and contributed to the resilience of agroecosystems to climate change. The project findings also showed that restoration of high-value landscape elements not only improved environmental quality, but in the long-term enhanced farm productivity, economic value, and competitiveness, thereby supporting sustainable agricultural development.

©Lina Šarūnaitė

During the project, field days were organised in various regions of Lithuania

R&D projects in agriculture, food, and fisheries funded by the Ministry of Agriculture of the Republic of Lithuania

Identification and assessment of economic benefits of new or improved climate and environment-friendly measures to address soil acidification problems

Leader Dr Regina Repšienė. 2024–2025

The **aim** was to reduce the area of acidic soils, promote the application of environmentally friendly measures, encourage adaptation of agricultural production with regard to soil pH, and evaluate the related economic benefits.

During the project, improved climate- and environment-friendly measures for reducing soil acidification were identified and proposed. Recommendations were prepared for selecting liming materials taking into account their physical form and chemical composition and the degree of soil acidification. Priority criteria for selecting soils requiring liming were defined based on soil acidity, and suitable combinations of liming and fertilisation measures for neutralising soil acidity were identified and recommended. Plant species capable of growing and producing optimal yields in more acidic soils were also identified, together with cultivation recommendations. In addition, new preventive measures against soil acidification were proposed.

Based on the studies conducted by foreign researchers, not only calcium carbonate but also calcium sulphate was recommended for the neutralisation of acidic soils. To evaluate their effectiveness, a precision field experiment will be established, comparative studies of these materials will be carried out, and key questions will be addressed regarding the speed and depth of soil neutralisation. Scientific and economic assessments of soil acidity reduction measures will also be performed.

©Regina Repšienė

Liming experiment at the Vėžaičiai Branch of the Institute of Agriculture

Search for apple cultivars suitable for cultivation with lower pesticide inputs

Leader Dr Juozas Lanauskas. 2023–2025

The **aim** was to evaluate the assortment of apple cultivars grown in commercial orchards in Lithuania from phytosanitary and ecological perspectives and to propose new scab-resistant (immune) cultivars suitable for commercial production in order to increase the sustainability of the horticultural sector.

During field expeditions, it was determined that Lithuanian commercial orchards are predominantly planted with apple cultivars susceptible or moderately susceptible to apple scab, the main disease affecting apple trees, while immune and resistant cultivars occupy only a small share. Even fewer cultivars demonstrated complex resistance to apple scab, powdery mildew and bark diseases. Orchard disease management systems were found to be largely non-differentiated, with more resistant cultivars sprayed as intensively as susceptible ones. Reducing fungicide use was further limited by orchard layouts, where resistant cultivars were planted between rows of susceptible cultivars requiring intensive spraying. The project therefore recommended that future orchard establishment should also consider cultivar susceptibility to diseases, grouping cultivars with similar plant protection requirements together.

Apples of the tested cultivars ‘Scarlet O’Hara’, ‘Blanik’, and ‘WineCrisp’

Based on the two-year project results and previously accumulated research data, the cultivars ‘Flordika’, ‘Melfree’, ‘WineCrisp’, ‘Scarlet O’Hara’, ‘Blanik’, and breeding line DJ-2-90-119 were identified among the 25 evaluated apple genotypes as the most promising and recommended for cultivation in both commercial and amateur orchards.

Study on the relationship between crop development stages and agroclimatic indicators

Leader Dr Renaldas Žydelis. 2023–2025

The **aim** was to develop an algorithm enabling accurate prediction of agricultural crop development stages based on agroclimatic indicators. The research was conducted under precision field experiment conditions in the warm and relatively dry agroclimatic zone of Central Lithuania. The experiments included the main spring and winter crops cultivated in Lithuania: oats, maize, faba beans, spring wheat and barley, spring oilseed rape, peas, as well as winter wheat, barley, rye, and oilseed rape. In total, 274 field experiments were monitored over the three-year period. Plant growth and development stages were periodically recorded according to the BBCH scale, while agroclimatic data included air and soil temperature, precipitation, soil moisture, and the Standardised Precipitation Index (SPI). Based on daily meteorological and soil measurements, growing degree days (GDD) required to reach specific plant development stages were calculated.

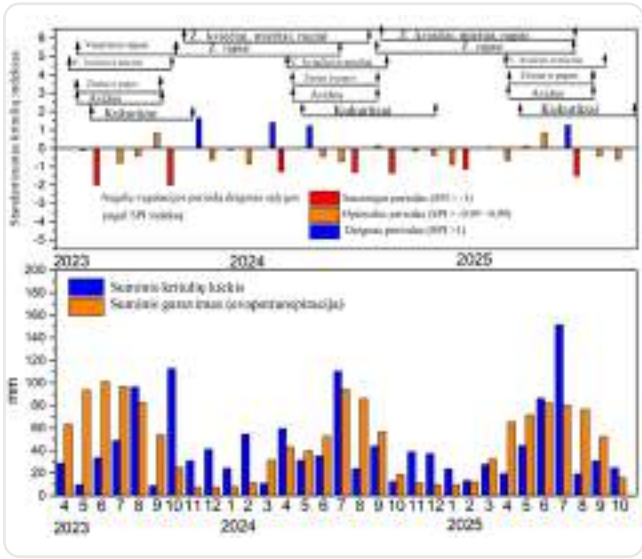


Figure 6. Changes in the Standardised Precipitation Index values, *top*, and precipitation amount and cumulative evaporation, *bottom*

The research results demonstrate that the Gompertz curve model is recommended for predicting plant development stages. Based on observations collected during 2023–2025, the model accurately described crop phenological changes according to accumulated heat units (GDD) and explained 93.1–97.7% of the variation in development stages according to the BBCH scale. However, the study highlighted those adverse environmental conditions such as droughts, heatwaves and prolonged rainy periods had

also to be considered, as they may accelerate or delay plant growth and development.

The compiled database and the forecasting models developed for different crops provide a basis for creating a practical decision-support tool that could be applied for planning fertilisation, plant protection measures, and other agronomic decisions, thereby improving farm management efficiency and contributing to the development of more sustainable agriculture in Lithuania.

Efficacy of plant protection products by reducing their doses

Leader Dr Roma Semaškienė. 2023–2025

The **aim** was to determine the effectiveness of fungicides from different chemical groups (triazoles, carboxamides, and strobilurins) applied at full and reduced rates in wheat, barley and oilseed rape cultivars differing in disease susceptibility.

Regardless of winter wheat cultivar and tillage system, all investigated fungicides applied at different rates effectively reduced the severity of Septoria leaf blotch (*Zymoseptoria tritici*) and tan spot (*Pyrenophora tritici-repentis*) in crops. However, the influence of fungicide application rates on disease control was inconsistent, and in many cases no significant differences were identified between the tested fungicide rates. In most cases, all fungicide rates increased winter wheat yield, although the differences were not statistically significant.

Studies on pathogen sensitivity demonstrated that the effectiveness of the fungicides benzovindiflupyr, fluxapyroxad, and mefentrifluconazole against *Z. tritici* did not decrease.

Symptoms of Septoria leaf blotch on the leaves of winter wheat

Selection of genotypes and technological possibilities of cultivation of non-traditional plants of high nutritional value – lentils (*Lens culinaris*) and millet (*Panicum miliaceum*) in Lithuania

Leader Dr Monika Toleikienė. 2023–2025

The **aim** was to determine the technological feasibility of cultivating non-traditional, high-nutritional value crops – edible lentil (*Lens culinaris* Medik.) and common millet (*Panicum miliaceum* L.) – in Lithuania, to identify genotypes best adapted to local growing conditions, and to develop cultivation recommendations under Lithuanian pedoclimatic conditions.

Due to climate change, modern agriculture is facing numerous sustainability challenges and is increasingly seeking adaptation strategies for crop production systems. Owing to their agronomic, economic, and cultural importance, lentils and millet could become promising crops in Europe. Recent studies suggest that these crops may be better adapted to climate change than traditional local cereals. Newly bred cultivars may show improved adaptation to the Lithuanian climate, local phenological cycles, and soil conditions; however, research on their cultivation potential remains limited.

This study aimed to evaluate the technological feasibility of cultivating different genotypes of lentil (*Lens culinaris* Medik.) and millet (*Panicum miliaceum* L.) in Lithuania, identify the most locally adapted cultivars, and prepare cultivation recommendations tailored to Lithuanian pedoclimatic conditions.

Methodology for accounting of blooming weeds in the crop stands treated with plant protection products

Leader Dr Irena Deveikytė. 2024–2025

The **aim** was to develop a methodology for the assessment of flowering weeds in crop fields treated with plant protection products. Methodological guidelines were prepared for the evaluation of flowering weeds in cereal, potato, sugar beet, oilseed, fibre, forage crop fields, and orchards.

Based on the research results, proposals were developed to supplement Integrated Crop and Weed Management (ICWM) guidelines regarding the abundance of flowering weeds and the protection of bees and other pollinators during the application of plant protection products in agricultural fields.

Projects financed by the Ministry of Environment of the Republic of Lithuania and subordinate state institutions

Investigation of possibilities and preparation of recommendations for the application of *Beauveria bassiana* against *Ips typographus* as a measure to protect Norway spruce trees

Leader Dr Jūratė Lynikienė. 2024–2025

The **aim** was to test two biopreparations based on the fungus *Beauveria bassiana* for controlling one of the most destructive forest pests, the spruce bark beetle (*Ips typographus*). Marketed under the names BotaniGard 22 WP and BotaniGard OD, the biopreparations were tested under both laboratory and field conditions.

The results were presented in the project report, and practical recommendations for the use of the biological insecticides BotaniGard 22 WP and BotaniGard OD in forestry were prepared. These recommendations are publicly available on the website of the Ministry of Environment of the Republic of Lithuania: https://am.lrv.lt/lt/veiklos-sritys-1/misku-politika1/bendruju-misku-ukio-reikmiu-finansavimo-programos-lesomis-finansuojami-misku-mokslo-darbai/

Ips typographus beetles infected with the fungus *Beauveria bassiana* (a view through a binocular microscope, 10×)

Recovery assessment of the sessile oak in the Trakas forest sessile oak genetic reserve

Leader Dr Girmantė Jurkšienė. 2024–2025

Trakas Forest near Seirijai, Lazdijai district, covers an area of approximately 600 ha. The Pedunculate Oak Genetic Reserve within this forest (code 03AbGD001 in the Forest Genetic Resources Information System) occupies 5.8 ha. It is the only site in Lithuania where pedunculate oak (*Quercus robur* var. *pedunculiflora*) occurs naturally. Its loss would represent not only the disappearance of a tree species from its natural range in Lithuania but also an irreversible loss of local genetic resources.

Compared to some other native tree species, pedunculate oak is more resistant to drought and warmer climatic conditions; therefore, its natural population in Lithuania may serve as an important genetic resource for future forest adaptation to climate change. The conservation of this population enables assessment of the species' potential for expansion under changing environmental conditions.

The **aim** was to identify pedunculate oak individuals and their hybrids in the Trakas Forest genetic reserve (code 03AbGD001) using DNA markers, to assess tree condition and regeneration potential, and to map individual trees and hybrids *in situ*. Complex analyses showed that oaks in the reserve are in good condition, maintain relatively high genetic diversity, and demonstrate promising adaptive potential. However, successful natural regeneration depends on targeted forest management measures. DNA marker-based identification provided a reliable scientific basis for assessing population structure and condition.

The results form a solid foundation for long-term conservation of pedunculate oak, preservation of genetic resources, and sustainable management of the genetic reserve, particularly under climate change conditions.

Dr Raimundas Petrokas, Dr Aušra Juškauskaitė, and Dr Virgilijus Baliuckas, researchers from the Institute of Forestry, in the Trakas Forest Reserve

Beaver as bioindicator for assessing contamination of riparian forest buffer

Leader Dr Olgirda Belova. 2022–2025

The growing global concern regarding environmental pollution and the need to support policy-making prompted the development of scientific data to enable monitoring based on a key indicator species within the broader food chain. The dissemination of the obtained knowledge was carried out through four scientific articles and a comprehensive project report.

CO_2 emissions from drained and undrained forested peatlands and deadwood left in forests with different degrees of decay

Leader Dr Kęstutis Armolaitis. 2022–2025

The **aim** was to determine CO_2 emissions from drained and undrained forest peat soils and from deadwood of varying decay stages left in forest ecosystems. Measurements of CO_2 emissions in deadwood of different decay classes of Norway spruce (*Picea abies*), silver birch (*Betula pendula*), and black alder (*Alnus glutinosa*) showed that the highest emissions occurred in decay class 3 (moderately decomposed) and class 4 (strongly decomposed). These classes provide favourable conditions for wood-decomposing microorganisms as the wood becomes less dense and its moisture content increases, thus enhancing decomposition processes.

Freshly fallen wood as well as highly decomposed wood generally showed little to no CO_2 emissions due either to high wood density or excessive moisture content. Across all decay classes (from freshly fallen to fully decomposed wood), the lowest CO_2 emissions were

recorded in decaying spruce wood, intermediate emissions in birch, and the highest in alder.

Two-year measurements of CO_2-C emissions (soil autotrophic and heterotrophic respiration) in drained forest lowland peat soils (Pcn), transitional peat soils (Pbn), and undrained lowland (Pc) and raised bog (Pa) peat soils showed that emissions were highest during the vegetation period. In drained peat soils, emissions during the vegetation period accounted for 60–70% of total annual emissions, while in undrained peat soils this share exceeded 80%.

Among drained lowland peat soils, the highest emissions were observed in black alder and birch stands, while the lowest were in spruce stands. Overall, drained peat soils (Pcn and Pbn) showed the highest average annual CO_2-C emissions, while undrained Pc and Pa peat soils exhibited emissions that were 20–30% lower.

The results were published in a Q1 scientific journal.

Data analysis for the National Greenhouse Gas Emissions Inventory Report (2026) of the agriculture and forestry sectors

Leader Dr Žydrė Kadžiulienė. 2025

The **aim** was to prepare an expert data analysis and provide recommendations on the use of indicators required for greenhouse gas accounting in the Land Use, Land-Use Change and Forestry (LULUCF) sector.

During the project, reports from Lithuanian peat extraction companies on the organic carbon concentration, bulk density, and moisture content of extracted peat were analysed. Through a survey, data on peat sample bulk density and moisture content (n = 722) covering the period 2016–2025 were obtained. In addition, several protocols containing organic carbon concentration measurements of extracted peat (n = 3) were collected from peat extraction companies. Most organic carbon analyses of peat samples (n = 26) were carried out in laboratories of LAMMC.

Based on the data collected, the following average values are recommended for use in the Lithuanian national greenhouse gas inventory report: peat moisture content – 57.84% (n = 722), peat bulk density – 309.86 kg m^{-3} (n = 722), and organic carbon concentration – 47.49%.

To compile data on restored (rewetted) wetland areas in Lithuania and construct a time series for 1990–2024, information was obtained from the State Service for Protected Areas under the Ministry of Environment and the NGO 'Wetlands Restoration and Protection Fund'. According to these data and officially approved management plans, degraded and drained wetlands in Lithuania have been restored since 1994, with a total of 17,275.3 ha rewet across all wetland types. Restoration was most extensive in raised bogs (84%), followed by fens (11.6%), and transitional mires (4.2%). A detailed annual sequence of restored wetland areas from 1994 to 2024 was compiled.

Additionally, based on the data from the Latvian State Forest Research Institute 'Silava' and projects implemented by the Institute of Forestry of LAMMC under the Ministry of Environment, the National Paying Agency, and the LIFE programme, regional Tier 2 emission factors for CO_2 and CH_4 were established for fens, transitional mires, and raised bogs.

A final report was prepared and presented to the Climate Change Policy Group of the Ministry of Environment of the Republic of Lithuania and the State Forest Service. The institutions confirmed that the results would be incorporated into the National Greenhouse Gas Inventory Report.

Implementation of Level II intensive forest condition monitoring

Leader Dr Vidas Stakėnas. 2025

The **aim** was to collect, systematise, and analyse data on the condition of the most widespread forest ecosystems and their individual components (stand, air, soil, etc.) and to provide objective information to EU institutions, the public, policymakers, and scientists working on forest ecosystem condition and its changes.

The European Commission Resolution (EC, 1995) of 29 April 1994 mandated EU Member States to implement Level II forest monitoring, which became known as intensive forest ecosystem monitoring. This monitoring scheme was developed to better assess the impact of air pollution and other stress factors on the most widespread forest ecosystems.

In 2025, intensive forest ecosystem (Level II) monitoring was carried out according to a long-established scheme aligned with the ICP Forests programme requirements and methodology. In nine intensive monitoring plots (IMPs), tree condition and vulnerability were visually assessed using morphological indicators. Measurements included air pollution by sulphur and nitrogen compounds, chemical composition of soil solution, atmospheric deposition under forest canopy and in open areas, litterfall mass analysis, frequency and intensity of ozone-induced leaf damage, vegetation cover assessment, and tree growth measurements.

Long-term forest monitoring data are used to assess forest condition and its changes over time. The data also support international-level scientific publications. In cooperation between the Institute of Forestry and scientists from other EU countries, six scientific articles have been published in high-impact journals since 2018.

Study of the origin and genetic diversity of sycamore maple (*Acer pseudoplatanus* L.) spreading spontaneously in the forests of Lithuania and the application of breeding measures

Leader Dr Virgilijus Baliuckas. 2022–2025

Due to climate warming, naturally spreading tree species are supplementing forest ecosystems and occupying ecological niches of species that are less adapted to changing climatic conditions. This is a natural ecosystem transition process that ensures forest ecosystem sustainability and enhances biodiversity. Species whose natural distribution range is close to Lithuania are considered to pose a lower risk to native forest tree species.

Sycamore maple (*Acer pseudoplatanus* L.) occurs naturally in continental Central and Western Europe. It is expected that within the next decade the natural distribution range of sycamore maple will extend into Lithuania, where currently existing small stands may form the basis of the sycamore maple gene pool in the country. However, it remains unclear how stable this gene pool is, i.e., what the genetic diversity and origin of naturally regenerating populations are.

During the study, stands with sycamore maple admixture were selected in western Lithuania. Geographic origin analyses showed that Lithuanian sycamore maple populations originate from two distinct geographic regions: north-eastern Poland and a broad region of western Germany. Genetic diversity analysis based on DNA markers showed that the genetic diversity of Lithuanian populations is heterogeneous and depends on their region of origin.

Populations in Lithuania originating from the western German genetic cluster did not significantly differ in allelic diversity and inbreeding level from naturally occurring populations in Germany. In contrast, populations originating from north-eastern Poland showed significantly lower allelic diversity and a significantly lower inbreeding coefficient compared to the other Lithuanian populations.

Shoots of *Acer pseudoplatanus* ready for grafting

Maintenance and renewal of field collections of national plant genetic resources

Leader Dr Eglė Norkevičienė. 2025

The **objective** was to investigate plant genetic resources and select the most valuable propagation material, prepare the required quantities, and transfer them to the State Forest Service storage facility for long-term conservation; to ensure that the phytosanitary condition of plants in LAMMC field collections of national plant genetic resources remains good and that they are suitable for use in breeding, genetic, and other scientific research, as well as serving as seed sources.

National plant genetic resources maintained in field collections of agricultural crops (perennial grasses, cereals of the *Poaceae* and *Fabaceae* families, buckwheat, lupins, potatoes), as well as horticultural and vegetable crops, were evaluated, renewed, and multiplied. Based on plant biological characteristics, accessions in poor condition, at risk of loss due to short lifespan or reduced seed germination were propagated. Appropriate management and protection measures ensured good phytosanitary status in the collections, making the material suitable for breeding, genetic, and other scientific research, educational activities, and as sources for seed or *in vitro* (meristem) propagation.

In forest plant collections, labelling of accessions was updated, and sanitary and preventive maintenance measures were applied in designated sites. In field, horticultural, and vegetable collections, cultivars, lines, and populations were evaluated using scientific methodologies, and the most valuable forms were selected. Their seeds were transferred to the State Forest Service storage facility for long-term conservation.

Breeding plots of *Poaceae* grasses in field collection of national plant genetic resources

The list of all international and national research projects carried out in 2025 is provided in the Appendices.

8

SCIENTIFIC INTERNSHIPS

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In 2025, researchers and doctoral students of LAMMC undertook **27** scientific internships in foreign countries.

Ondokuz Mayıs University, Türkiye

1–30 January, **Yaqoob Sultan**, a PhD student at the Department of Grass Breeding of the Institute of Agriculture, had an internship at the Department of Agricultural Biotechnology of Ondokuz Mayıs University, Türkiye. The **aim** was to investigate the integrated physiological, biochemical, and molecular responses of bird's-foot trefoil (*Lotus corniculatus* L.) to aluminium (Al)-induced stress, with particular focus on: (1) antioxidant defence mechanisms under aluminium toxicity, (2) seedling growth parameters under heavy metal stress conditions, (3) identification of cultivar-specific tolerance mechanisms for breeding aluminium-tolerant forage legume varieties, and (4) promotion of sustainable forage production in acidic and contaminated soils.

Significant differences in cultivar morphological traits, antioxidant responses, and aluminium accumulation were identified, enabling the selection of aluminium-tolerant cultivars characterised by stable growth dynamics, efficient defence systems, and limited metal translocation. The internship also strengthened technical competencies in plant stress analysis.

The internship was funded by the COST Action CA22134 'FoodWaStop'.

PhD student Yaqoob Sultan (*left*) at the Ondokuz Mayıs University, Türkiye

Wageningen University & Research, the Netherlands

1 February–30 July, **Simas Borkertas**, a PhD student at the Laboratory of Biochemistry and Technology of the Institute of Horticulture, had an internship at Wageningen University, the Netherlands. The **aim** was to acquire analytical and research methods for investigating the fermentation processes of plant-based raw materials to obtain alternative flavours to animal-origin products. The objectives were to acquire: (1) sample preparation and analytical methods for investigating plant raw materials and processing by-products as alternative fermentation substrates, (2) analytical methods for evaluating the physical and chemical properties of substrates (pH, moisture content, texture, etc.) and their biochemical composition (total sugar content, polyphenolic compounds, etc.), (3) analytical methods for investigating biologically active compounds in fermentation products, including phenolic, volatile, flavour, and other compounds, and (4) analytical methods for investigating and determining the yield and quality of biologically valuable fractions using traditional and innovative extraction methods.

During the academic internship, the doctoral research was expanded through large-scale fermentation experiments. The scientific data obtained during the internship broadened the dissertation research and provided wider opportunities to evaluate broader application of fermented plant-based raw materials in the functional food, cosmetics, and/or pharmaceutical industries. The experiments carried out during the academic visit also enabled the evaluation of the most effective fermentation technology.

The internship was funded by LAMMC internship programme.

PhD student Simas Borkertas at the Wageningen University, the Netherlands

Institute of BioEconomy, Italy

1–14 February, **26 June–11 July**, and **11–18 November**, Dr **Julija Konstantinavičienė**, a junior researcher at the Department of Forest Resources, Economics, and Policy of the Institute of Forestry, had internships at the Institute of BioEconomy in Sesto Fiorentino, Italy. The **aim** was to strengthen skills and scientific competence in preparing international R&D project proposals, while the objective was to acquire new knowledge through research activities and collaboration with potential partners.

Firewood production chipper for determining biofuel particle fractions

During the internships, knowledge of advanced forestry technologies and forest biomass processing solutions oriented towards a sustainable bioeconomy was acquired and deepened. Practical testing of forest biomass processing equipment improved the understanding of technological processes. Connections were established with research institutions and forest biomass associations in Italy, thus creating a basis for long-term cooperation.

All three internships were carried out within the framework of the project 'Cultivation and efficient use of short rotation plantations in the transition to a sustainable bioeconomy' (No. 10-038-T-0190).

University of Life Sciences in Lublin, Poland

10–28 February, Dr **Vida Danytė**, a researcher at the Department of Cereal Breeding of the Institute of Agriculture, had an internship at the Institute of Plant Genetics, Breeding, and Biotechnology of the University of Life Sciences in Lublin, Poland. The **aim** of the internship was to investigate the resistance to fungal diseases of more than 100 oat genotypes developed at LAMMC Institute of Agriculture and to assess the genetic diversity of Lithuanian oat cultivars and breeding lines. The acquired methods will continue to be applied in oat and other cereal breeding programmes.

The internship was funded by LAMMC support fund for academic internships.

Dr Vida Danytė (*right*) during her internship at the University of Life Sciences in Lublin

Swiss Federal Institute for Forest, Snow and Landscape Research (WSL)

16 March–5 April, Dr **Diana Marčiulynienė**, a chief researcher at the Department of Forest Protection and Game Management of the Institute of Forestry, undertook an internship at the Swiss Federal Institute for Forest, Snow, and Landscape Research (WSL). The **aim** was to conduct data analysis for a review paper and initiate manuscript preparation, organise a core 'Horizon scanning' working group meeting focused on selecting the most innovative biosecurity measures, technologies, and methods, discuss further stages of manuscript preparation, and discuss participation in the conference 'IUFRO Division 7 Working Parties Conference: Tree Health – from Cities to Forests' (Zurich, Switzerland, 2025).

A comprehensive analysis of technologies and measures aimed at reducing non-native pests in urban areas was carried out: (1) review of available and emerging urban biosecurity measures and technologies – data analysis and manuscript preparation, and (2) organisation of the core 'Horizon scanning' group meeting.

Data analysis for the review paper was completed, and manuscript preparation was initiated. A core 'Horizon scanning' working group meeting was organised, during which the most innovative biosecurity measures, technologies, and methods were selected, further stages of manuscript preparation were discussed, and participation in the conference 'IUFRO Division 7 Working Parties Conference: Tree Health – from Cities to Forests' (Zurich, Switzerland, 2025) was addressed.

The internship was funded by the COST Action CA20132 'Urban Tree Guard – Safeguarding European urban trees and forests through improved biosecurity' (UB3Guard).

A moment from Dr Diana Marčiulynienė's internship at the Swiss Federal Research Institute WSL

University of Latvia

31 March–4 April, Dr **Aurelija Liatukienė**, a researcher at the Department of Grass Breeding of the Institute of Agriculture, and Dr **Milda Muraškienė**, a researcher at the Department of Silviculture and Ecology of the Institute of Forestry, visited the Laboratory of Chemical and Physical Research of Plant Nutrients at the Institute of Biology of the University of Latvia. During the internship, methodologies for evaluating nutrients in soil and different plant parts were acquired. Research was carried out in the laboratory using the study material collected. Further directions for cooperation were also discussed.

The internship was funded by the Recovery and Resilience Facility plan 'New Generation Lithuania' (NextGenerationEU).

Dr Aurelija Liatukienė (*right)* and Dr Milda Muraškienė (*left*), at the University of Latvia

Bavarian Office for Forest Genetics, Germany

5–26 April, **Ilona Kavaliauskienė**, a PhD student at the Department of Forest Genetics and Tree Breeding of the Institute of Forestry, undertook an internship at the Bavarian Office for Forest Genetics (AWG), Germany. The **aim** was to acquire practical skills and strengthen competencies in applying advanced forest tree DNA research methodologies in order to improve the quality of genetic research data and apply the acquired knowledge to doctoral dissertation research.

During the internship, doctoral dissertation research was presented and ongoing projects were discussed, which enabled targeted discussions with researchers of the Bavarian AWG regarding opportunities for future cooperation and the preparation of joint project initiatives. During the internship activities, the doctoral student acquired advanced DNA extraction, PCR and genotyping methodologies and applied them in practice and participated in an inter-laboratory comparative study (ring test). In this process, identical biological samples and/or standardised analytical procedures were provided to different laboratories, and the obtained data were compared in order to assess the accuracy of the applied methods, reproducibility of results and inter-laboratory comparability. This experience highlighted the importance of quality assurance measures and method standardisation, particularly in international genetic research requiring reliable data comparability between different research groups.

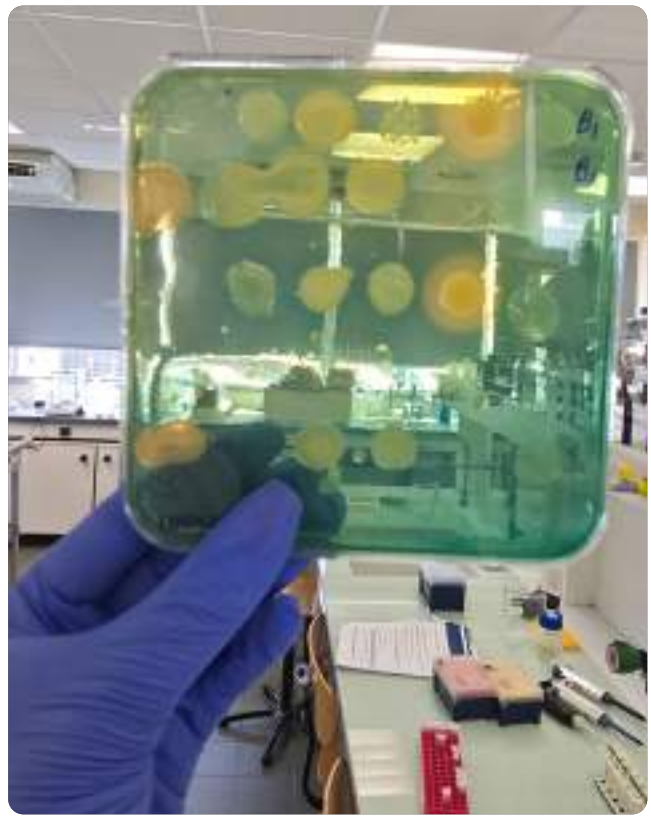
The internship was funded by LAMMC support fund for academic internships.

PhD student Ilona Kavaliauskienė (*centre*) at the Bavarian Office for Forest Genetics (AWG)

INRAE – National Research Institute for Agriculture, Food and the Environment (France)

7–11 April, **Neringa Matelionienė**, a PhD student and junior researcher at the Microbiology Laboratory of the Institute of Agriculture, had an internship at the French National Research Institute for Agriculture, Food, and the Environment (INRAE). During the internship, training focused on proper sample collection, isolation and functional assessment of microorganisms, identification of beneficial soil fungi AMF, their monospore inoculation *in vitro*, genetic modification of bacteria, microscopy applications for labelled and stained microorganisms, and staining methods for AMF and rhizobia. Training also included DNA and RNA extraction methods, metabarcoding and metagenomics analyses, as well as methodologies for studying plant root and microorganism interactions.

The internship was funded by the COST Action CA22142 'Root-Benefit'.



Screening of bacterial isolates based on siderophore production using Chrome Azurol S (CAS) agar was performed during the internship at the INRAE, France

University of Silesia in Katowice, Poland

7–11 April, **Yaqoob Sultan**, a PhD student at the Department of Grass Breeding of the Institute of Agriculture, undertook an internship at the University of Silesia in Katowice, Poland. The aim was to gain knowledge in microbiome research and antimicrobial peptides (AMPs), learn to apply microscopy methods (SEM, TEM, confocal microscopy, micro-CT), develop bioinformatics and machine learning skills for biological research, deepen the understanding of bacterial resistance mechanisms and novel microbial metabolites, and investigate plant–microbe interactions and fungal endophytes.

During the internship, comprehensive knowledge was acquired in microbiome research and its clinical applications, antimicrobial resistance mechanisms, and horizontal gene transfer. Skills were also gained in applying AI tools for biological data analysis, knowledge of advanced microscopy techniques was expanded, the skills of literature analysis using AI tools were improved, and professional connections were established with specialists in microbiology, bioinformatics, and microscopy.

The internship was funded by the 'Transfor4Europe' and NAWA projects supported by the Polish government.

Swedish University of Agricultural Sciences (SLU)

20 April–4 May, **Yanal A. Al-Kuddsi**, a PhD student at the Department of Forest Resources, Economics, and Policy of the Institute of Forestry, had an internship at the Department of Energy and Technology of the Swedish University of Agricultural Sciences (SLU).

The **aim** was to evaluate the life cycle for environmental assessment. Objectives: (1) to participate in a specialised course on life cycle assessment (LCA) in forestry and forest products, (2) to participate in joint discussions with SLU researchers and lecturers, (3) to analyse potential research synergies and develop partnerships for future collaboration, (4) to expand understanding of European bioenergy production and sustainability methodologies, and (5) to gather insights that could complement ongoing research activities at the institution.

The scientific visit was highly valuable both academically and personally. The main outcomes included improved technical skills in the environmental assessment of forest products using LCA; enhanced understanding of Sweden's sustainable biomass utilisation strategies; initiation of discussions on joint research projects related to bioenergy production from broadleaved trees; exchange of research materials, methodologies, and data sources with SLU teams; a discussion of funding opportunities for future joint research proposals (e.g., Horizon Europe, Erasmus+).

During the visit, the participant also became familiar with the SLU research environment characterised by an interdisciplinary approach, strong research infrastructure, and a commitment to sustainability.

The internship was funded from LAMMC PhD fund.

PhD student Yanal A. Al-Kuddsi at the SLU

Aristotle University of Thessaloniki, Greece

20 May–5 June, Dr **Rita Verbylaitė**, a researcher at the Department of Forest Genetics and Tree Breeding of the Institute of Forestry, had a scientific internship at the Aristotle University of Thessaloniki (AUTH), Greece.

The **aim** was to learn about the research carried out at the Aristotle University of Thessaloniki in the fields of ecology and environmental sciences, biology and forestry, with particular attention to forest genetic diversity research, and to establish contacts with university researchers. During the internship, to the researcher visited the Department of Forestry and Natural Environment of the Faculty of Agriculture, Forestry and Natural Environment, established contacts with department researchers conducting genetic diversity studies, and delivered a presentation on Lithuanian forestry, forestry-related research conducted at LAMMC, and genetic diversity studies to the department staff. Opportunities for cooperation and joint applications for international projects were discussed, and an agreement was reached to continue active collaboration in developing forest genetic monitoring research and preparing joint scientific publications.

The internship was funded by the project 'Testing the idea of R&D monitoring and protection of genetic diversity of habitats' (No. 10-038-T-0196).

Dr Rita Verbylaitė and Prof. Filippos Aravanopoulos at the permanent European beech genetic monitoring plot in Greece

KU Leuven, Belgium

2–6 June, **Neringa Matelionienė**, a PhD student and junior researcher at the Microbiology Laboratory of the Institute of Agriculture, undertook an internship at the Mycology Laboratory of the Earth and Life Institute of KU Leuven, Belgium. During the internship, training focused on methodologies for isolating beneficial arbuscular mycorrhizal fungi (AMF) from soil and plants, obtaining transformed plant roots, disinfection of roots and spores, inoculation techniques, and the formation of AMF–root associations. The possibilities of applying spore propagation and research methods in closed and semi-closed plant growing systems were also presented, and the MDP (Mycorrhizal Donor Plant) and HAM-P (Half-closed

A moment from Neringa Matelionienė's internship at KU Leuven, Belgium

Arbuscular Mycorrhizal-Plant) systems were discussed. In addition, training included an introduction to *Glomeromycota* classification and pot-based spore propagation technologies. During practical sessions, work was carried out with AMF in both *in vitro* and *in vivo* systems in order to deepen their application in various scientific studies.

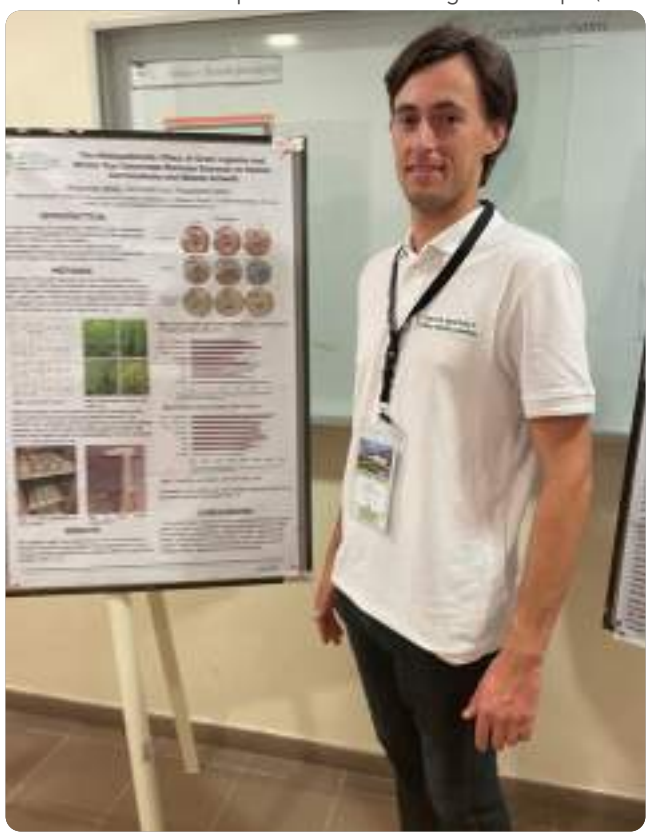
The internship was funded by the Recovery and Resilience Facility plan 'New Generation Lithuania' (NextGenerationEU, No. 10-038-T-0159).

Natural Resources Institute Finland (Luke), Finland

8–21 June, **Rokas Antanynas**, a PhD student at the Department of Plant Nutrition and Agroecology of the Institute of Agriculture, had an internship at the Luke.

The **aim** was to establish field experiments, apply isotopic labelling methods and conduct related research, learn and adopt the applied research methodologies, and discuss the stages of preparing a proposal under the main research direction 'Management of agroecological niches with multi-species and intercrops'.

During the first week of the visit, together with Dr Monika Toleikienė, Dr Agnė Veršulienė, and PhD student Aida Skersienė, colleagues from LAMMC Institute of Agriculture, the doctoral student participated in the AgroMixNorth project meeting, where planned project activities were discussed. During the visit, an isotope-labelling experiment was established together with partners in the Luke experimental fields in Hyvinkää. The experiment was set up in 18 treatment plots using plastic rings intended for subsequent isotope labelling. During the internship, the doctoral student deepened his knowledge of isotope (carbon and nitrogen) migration monitoring methods in plants and soil. These methods enable precise determination of isotope distribution in plant organs and soil layers. In experimental multi-species crop fields, chlorophyll content measurements were carried out in plant leaves using the SPAD-502Plus device, and pest damage in bean and pea leaves was assessed. A botanical weed assessment and preparation of samples for chemical composition (nutrient) analysis were also conducted.



PhD student Rokas Antanynas at Luke, Finland

The internship also included a visit to the Luke Piikkiö research infrastructure, where research is carried out under open-field and controlled-environment conditions, as well as visits to experimental fields and discussions of ongoing activities. Throughout the internship, the doctoral student was supervised by Dr Ansa Palojärvi and Alma Lehti, who ensured the smooth implementation of research and provided methodological support.

The internship provided valuable experience in planning, implementing, and analysing experimental research, strengthened international collaboration, and significantly contributed to the preparation of an international project proposal.

The internship was funded by the Recovery and Resilience Facility plan 'New Generation Lithuania' (NextGenerationEU, No. 10-038-T-0054).

University of La Laguna, Spain

9–13 June, **Skaistė Dreskinienė**, a PhD student at the Agrobiology Laboratory of the Institute of Agriculture, visited the Polymer Analysis and Research Laboratory (PolAR) of the Department of Chemistry at the Faculty of Natural Sciences of the University of La Laguna, Spain. During the visit, she had the opportunity to learn about the laboratory infrastructure and operating principles complying with ISO 6 standard requirements. The internship focused primarily on microplastics analysis in various samples, ranging from beach sand to table salt, and provided advanced training in the application of pyrolysis-gas chromatography-mass spectrometry methods.

The internship was funded by the project 'Preparation of a quality application for the call HORIZON-MISS-2024-SOIL-01-01' (NextGenerationEU, No. 10-038-T-0131).

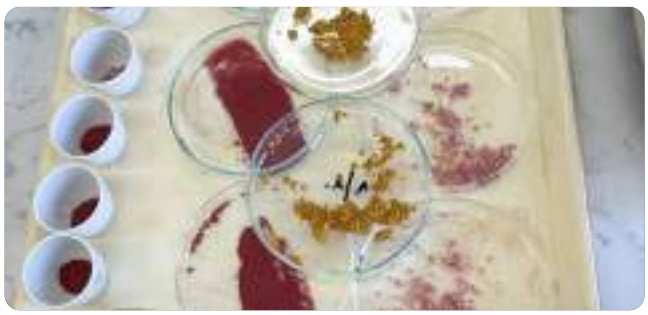
PhD student Skaistė Dreskinienė (*front right*) at the University of La Laguna, Spain

University of Debrecen, Hungary

10 June–31 July, **Khadija Ramzan**, a PhD student and junior researcher at the Laboratory of Biochemistry and Technology of the Institute of Horticulture, completed an internship at the Department of Food Science of the University of Debrecen, Hungary. The internship dealt with valorisation of fruit and vegetable processing waste: extraction and analysis of pigments and bioactive compounds. The aim was to investigate bioactive compounds in fruit and vegetable processing by-products (beetroot, raspberries, and sea buckthorn) in order to contribute to the sustainable utilisation of agro-industrial side streams in the food, nutraceutical and pharmaceutical sectors.

Freeze-dried powders were analysed, and extraction was carried out using ultrasound-assisted extraction (UAE) with 70% ethanol. To optimise the extraction of phenolic and flavonoid compounds, different extraction parameters (temperature, duration, and ultrasound power) were evaluated. Nine samples delivered from the Lithuanian Research Centre for Agriculture and Forestry were investigated. It was determined that the optimal extraction parameters (35°C, 30 min, 700 W) resulted in the highest levels of phenolic and flavonoid compounds in beetroot and raspberry samples, while lower levels of these compounds were detected in sea buckthorn samples. During the internship, bioactive compounds were extracted and characterised, optimal UAE parameters were identified, and competencies in applying advanced analytical methods were strengthened. Additional antioxidant activity studies (DPPH, ABTS, FRAP), physicochemical analyses, and preparation of a scientific publication are planned.

The internship was funded by COST Action CA22134 'FoodWaStop'.



Fruit and vegetable processing waste prepared for analysis

Marche Polytechnic University, Italy

20 June–26 July, **Syeda Hijab Zehra**, a PhD student and junior researcher at the Laboratory of Biochemistry and Technology of the Institute of Horticulture, had an internship at the Department of Agricultural, Food, and Environmental Sciences of Marche Polytechnic University, Italy. The topic of the internship was the application of nanoparticles for the control of postharvest decay in fresh fruit through the development of edible coatings. The **aim** was to control postharvest decay of fresh fruit using natural approaches and various green waste materials, extracting valuable compounds that could contribute to waste reduction. To evaluate the suitability of six different freeze-dried powders obtained from LAMMC, natural grape treatment methods were applied using chitosan, sea buckthorn, onion skins, linden flowers and leaves, linden bark and stems, and nettles.

The results demonstrated that fruit waste materials may have a positive effect in controlling *Botrytis cinerea* fungal infection in grapes. By investigating the application of natural phenolic compounds derived from plant processing waste, the study contributed to the objectives of the COST Action programme 'FoodWaStop' in promoting sustainable agricultural practices and zero-waste strategies. These findings may support the development of new approaches for reducing postharvest grape losses, with potential application to other fruits as well.

The internship was funded by the COST Action CA22134 'FoodWaStop'.

PhD student Syeda Hijab Zehra delivering a research-based poster presentation at an international conference

University of Udine, Italy

1–30 July, **Sana Ullah**, a PhD student and junior researcher at the Agrobiology Laboratory of the Institute of Agriculture, had a scientific internship at the University of Udine, Italy, under the supervision of Prof. Elisa Pellegrini from the Department of Agricultural, Food, Environmental, and Animal Sciences. The **aim** of the internship was to carry out experimental work related to doctoral research on the effect of compost in reducing copper and zinc toxicity in maize plants grown in Italian soils with different pH levels. The study aimed to understand how compost reduces metal concentrations in soil, their uptake and toxicity in plants, thereby mitigating their associated risks.

The internship provided valuable laboratory experience in determining plant-available metal concentrations in soil using the ICP-AES method. The internship at the foreign institution also strengthened collaboration between researchers of LAMMC and the University of Udine and contributed to soil remediation research conducted at LAMMC.

The internship was funded by the Research Council of Lithuania (P-DAK-25-80).

PhD student Sana Ullah (*right*) at the University of Udine, Italy

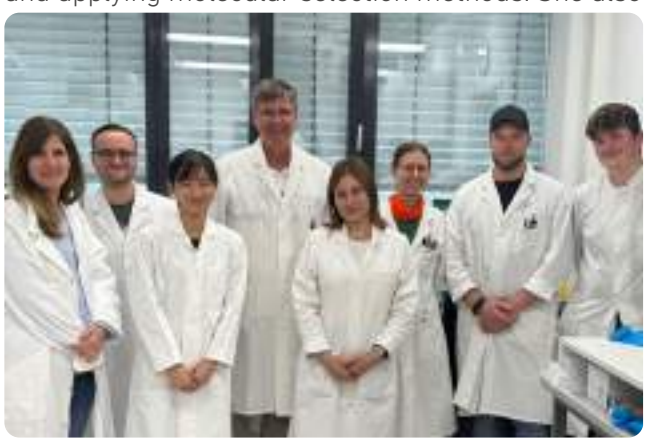
Heinrich Heine University Düsseldorf, Germany

18 July–1 August, **Shervin Hadian**, a PhD student and junior researcher at the Microbiology Laboratory of the Institute of Agriculture, visited the Centre for Plant Genome Engineering (CPGE) at Heinrich Heine University (HHU), Germany. This centre is internationally recognised for its expertise in plant genome editing through the application of both classical transgenic methods and advanced CRISPR/Cas technologies. CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) is a bacterial defence system against bacteriophages and plasmid DNA, which functions similarly to the immune system of eukaryotic organisms. The CRISPR/Cas (CRISPR-associated) system consists of a specific DNA sequence called the CRISPR locus and Cas genes, from which Cas proteins are synthesised.

The research group mainly focuses on developing innovative genome-editing strategies for cereals, particularly barley, in order to improve important agronomic traits.

During the visit, the doctoral student gained practical experience in analysing transgenic barley transformation processes, designing gene constructs, and applying molecular selection methods. She also had an opportunity to participate in in-depth scientific discussions, particularly on the application of CRISPR technologies in studying endophyte–plant interactions. The visit contributed to establishing new professional contacts and opened opportunities for future collaborative projects between LAMMC and Heinrich Heine University Düsseldorf.

The visit was funded by the Recovery and Resilience Facility plan 'New Generation Lithuania' (NextGenerationEU, No. 10-038-T-0160).



PhD student Shervin Hadian (*left*) at the Heinrich Heine University Düsseldorf

Selçuk University, Türkiye

2**5 August–10 September**, **Khadija Ramzan**, a PhD student and junior researcher student at the Laboratory of Biochemistry and Technology of the Institute of Horticulture, undertook an internship at Selçuk University, Türkiye. The internship was focused on the extraction of natural pigments from fruit and vegetable processing by-products for industrial polymers and food packaging applications. The **aim** was to extract natural pigments from fruit and vegetable processing side streams: beetroot (betalains), raspberries and elderberries (anthocyanins), linden flowers (chlorophyll), and sea buckthorn (carotenoids), in order to promote the sustainable utilisation of agro-industrial waste as an alternative to synthetic dyes in the polymer, food packaging, food and nutraceutical sectors. Freeze-dried and milled samples (5 × ~200 g) obtained from LAMMC were delivered for extraction experiments. The research was carried out in cooperation with Selçuk University and industrial partners.

During the internship, extraction protocols for betalains, anthocyanins, carotenoids and chlorophyll were developed, preliminary HPLC and spectrophotometric data were obtained, academic and industrial collaboration was strengthened, and practical experience with industrial-scale extraction technologies was gained. The internship contributed to the development of sustainable pigment extraction methods and the valorisation of fruit and vegetable waste.

The internship was funded by COST Action CA20101 'PRIORITY'.

PhD student Khadija Ramzan at Selçuk University in Türkiye

Pavol Jozef Šafárik University in Košice, Slovakia

5–30 September, **Yaqoob Sultan**, a PhD student at the Department of Grass Breeding of the Institute of Agriculture, had an internship at Pavol Jozef Šafárik University in Košice, Slovakia. The **aim** was to investigate the integrated physiological, biochemical and molecular responses of bird's-foot trefoil (*Lotus corniculatus* L.) to drought stress, with particular attention to: (1) the accumulation of phenolic compounds under water deficit conditions, (2) the therapeutic potential of these compounds for cattle health, (3) the advancement of doctoral research through the application of advanced molecular and biochemical analyses, and (4) conducting experimental work related to the doctoral research analysing the responses of bird's-foot trefoil to drought stress and improving understanding of how environmental conditions affect the biochemical and molecular processes of this plant.

The internship provided valuable practical experience in applying advanced molecular and biochemical methods and contributed to LAMMC research aimed at increasing the resilience of forage plants to climate change and improving their nutritional value.

The internship was funded by COST Action CA22109 Short-Term Scientific Missions (STSM).

PhD student Yaqoob Sultan (*left*) at Pavol Jozef Šafárik University in Košice, Slovakia

Julius Kühn Institute, Germany

12 October–11 November, Dr **Modupe Doyeni**, a senior researcher of the Agrobiology Laboratory of the Institute of Agriculture, undertook a scientific internship at the Julius Kühn Institute (JKI), Institute for Epidemiology and Pathogen Diagnostics, in Braunschweig, Germany. The **aim** was to conduct soil–plant–microorganism interaction experiments, rhizosphere analysis, and soil microbiome studies, as well as to carry out root and soil sampling, sequencing preparation, and data quality control together with JKI researchers. The internship also included a three-day training course on metagenomic data analysis and bioinformatics. A presentation entitled 'From waste to soil amendments: the biocyclic approach of LAMMC Agrobiology Laboratory to sustainable soil health and pollution mitigation' was delivered to JKI staff, generating active discussions on the use of circular bioresources and monitoring of soil-borne pathogens.

The internship opened opportunities for further collaboration with JKI, including joint initiatives on microbial consortia research and potential reciprocal scientific visits.

The scientific visit was funded by the project 'R&D Idea Verification - Evaluating the Role of Soil Microorganisms in Changing Soil Health' (NextGenerationEU, No. 10-038-T-0302).

Dr Modupe Doyeni (third left) at Julius Kühn Institute, Germany

Aarhus University, Denmark

1–15 November, **Ardas Kavaliauskas**, a PhD student at the Department of Plant Nutrition and Agroecology of the Institute of Agriculture, had a scientific internship at the Department of Soil Physics and Hydropedology of the Agroecology Institute at Aarhus University, Denmark. The internship was coordinated by researchers Lucas de Carvalho Gomes and Prof. Mogens Humlekrog Greve, whose group specialises in precision agriculture, remote sensing, and soil–plant interaction analysis.

The **aim** of the internship was to deepen knowledge in developing machine learning models for predicting maize yield, biomass, and nitrogen uptake by integrating UAV multispectral and RGB data with ground-based measurements (SPAD, Fv/Fm, plant height, and biomass indicators). The internship involved data preparation, application of regression algorithms, model optimisation and error analysis. Discussions were also held with Aarhus University researchers on plant stress assessment

PhD student Ardas Kavaliauskas (*right*) at Aarhus University, Denmark

methods, the integration of remote sensing technologies, and advanced prediction strategies in the context of climate change. Opportunities for collaboration on joint scientific publications were discussed as well.

The internship strengthened the PhD student's methodological competences in applying artificial intelligence in agronomy. The acquired knowledge will be directly applied in research on maize productivity and nutrient uptake.

The internship was funded by LAMMC support fund for academic internships.

University of Warmia and Mazury in Olsztyn, Poland

15 November–7 December and **14–23 December**, Dr **Gintarė Šidlauskaitė**, a senior researcher at the Department of Plant Nutrition and Agroecology of the Institute of Agriculture, undertook an internship at the Department of Plant Physiology and Biotechnology of the Faculty of Biology and Biotechnology at the University of Warmia and Mazury in Olsztyn, Poland. The internship focused on the extraction of genomic DNA from soil microbial communities using the DNeasy PowerSoil Pro Kit. The **aim** was to extract high-quality genomic DNA from soil samples using the DNeasy PowerSoil Pro Kit methodology, suitable for further molecular and microbiological analyses in order to better understand the structure and potential of soil microbial communities. The objectives were: (1) to prepare soil samples for molecular analyses in accordance with biosafety and good laboratory practice requirements, (2) to perform DNA extraction of soil microbial communities using the DNeasy PowerSoil Pro Kit and optimised laboratory procedures, (3) to evaluate the quality and concentration of the extracted DNA, ensuring its suitability for further genetic analyses, and (4) to gain practical competences in the application of soil molecular analysis methods and their integration into environmental and agroecological research.

During the internship, high-quality genomic DNA fractions were successfully extracted from soil samples, and practical competences were gained in applying molecular methods for soil microorganism research and integrating them into agroecological and environmental studies.

The internship was funded by the Research Council of Lithuania (LMTLT), contract No. S-PD-24-171.

Dr Gintarė Šidlauskaitė at the University of Warmia and Mazury, Poland

INRAE – National Research Institute for Agriculture, Food, and Environment, France

20 November–11 December, Dr **Renaldas Žydelis**, a senior researcher at the Department of Plant Nutrition and Agroecology of the Institute of Agriculture, completed an internship at the French National Research Institute for Agriculture, Food, and Environment (INRAE). The **aim** of the internship was to develop collaboration in applying remote sensing methods for soil research under nemoral climate zone conditions within the projects 'AgroSens' and 'Melicertes'.

The collaboration between LAMMC and the INRAE in the field of remote sensing for soil indicator prediction began in 2021 with the launch of the EJP Soil project STEROPES, which was successfully completed in 2024.

During the internship, part of the work initiated within the EJP Soil STEROPES project was further developed. The potential application of satellite imagery for predicting soil organic carbon content and granulometric composition in the Nevėžis basin was evaluated. This study is unique because these soil indicators are predicted over a large-scale area covering approximately 4,000 km^2 while achieving very high spatial resolution, where one pixel corresponds to one are.

The internship also included the presentation of preliminary field research and modelling data from the Research Council of Lithuania-funded project 'Integration of Digital Sensors for Predicting Soil Properties in Lithuanian Agroclimatic Zones'. Discussions focused not only on the prediction of various soil indicators, such as heavy metal content, granulometric composition, and bulk density, but also on crop yield prediction and the assessment of quantitative and qualitative yield parameters using UAV and satellite imagery.

French researchers presented their national project 'Melicertes', which evaluates spatial reliability of soil organic carbon predictions and the uncertainty factors affecting these predictions. As these activities are closely related, further collaboration between LAMMC and the INRAE is planned.

The internship was funded by the Research Council of Lithuania project 'Integration of Digital Sensors for Predicting Soil Properties in Lithuanian Agroclimatic Zones'.

Dr Renaldas Žydelis at the INRAE, France

9

RECONGNITION OF RESEARCH ACTIVITIES

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In 2025, LAMMC researchers and PhD students actively participated in scientific activities and received recognition in the form of orders, awards, acknowledgements, certificates of appreciation, and scholarships. Awards were granted for individual achievements, initiatives, conducted scientific research, and implemented projects.

Lithuanian Science Prize 2024

The 2024 Lithuanian Science Prize was awarded to LAMMC researchers Dr **Skaidrė Supronienė** and Dr **Gražina Kadžienė** for the series of works 'Population changes and ecological distribution of fusarium head blight pathogens under the impact of climate change and agricultural practices (2009–2023)'.

Dr Gražina Kadžienė and Dr Skaidrė Supronienė, the laureates of the Lithuanian Science Prize

The Knight's Cross of the Order of the Lithuanian Grand Duke Gediminas

On 6 July, on the occasion of the Statehood Day, President of the Republic of Lithuania awarded the Knight's Cross of the Order of the Lithuanian Grand Duke Gediminas to Prof. Dr habil. **Pavelas Duchovskis**, a LAMMC researcher, for his outstanding achievements in scientific activity, active training of researchers, and his contribution to the implementation of science policy in Lithuania.

Prof. Dr Habil. Pavelas Duchovskis and President of the Republic of Lithuania Gitanas Nausėda

Members of the Young Academy of the Lithuanian Academy of Sciences

In 2025, Dr **Aistė Balčiūnaitienė**, a senior researcher at the Laboratory of Biochemistry and Technology of the Institute of Horticulture, and Dr **Edvinas Misiukevičius**, a researcher at the Department of Orchard Plant Genetics and Biotechnology, were elected to the Young Academy of the Lithuanian Academy of Sciences in the fields of food science and agronomy, respectively.

Dr Aistė Balčiūnaitienė

Dr Edvinas Misiukevičius

Prizes and Certificates of Merit

In 2025, the Lithuanian Academy of Sciences awarded prizes and certificates of merit to students, PhD students, and young researchers.

In the Section of Agricultural and Forestry Sciences, LAMMC researchers received two prizes and one certificate of appreciation in the Young Scientist and Doctoral Student Research Competition organised by the Lithuanian Academy of Sciences:

- Dr **Dorotėja Vaitiekūnaitė** for her research 'Microbial allies: their potential in forestry'
- Dr **Vytautas Čėsna** for his research 'The potential of the biological product 'Foray 76B' and natural plant hormones for enhancing the defensive response and resistance of Scots Pine and Norway Spruce to insect pests and pathogens'.

A certificate of appreciation was awarded to Dr **Viktorija Puzerytė** for her research 'Biochemical profile of plant raw materials and the functionality of enzymatic extraction and fermentation processes'.

Laureates of the Young Scientist and Doctoral Student Research Competition of the Lithuanian Academy of Sciences

In the Competition of Research by Students in Higher Education, organised by the Lithuanian Academy of Sciences, the PhD student **Algimanta Kundrotaitė** received an award for her research 'Quantitative determination of secondary metabolites in hemp (*Cannabis sativa* L.) using various instrumental analysis methods' (supervisor Dr Karolina Barčauskaitė).

PhD student Algimanta Kundrotaitė

Scholarships

The Young Scientist Scholarship for 2025–2026 of the Lithuanian Academy of Sciences was awarded to LAMMC researcher Dr **Ieva Čėsnienė** for her scientific work 'Multifunctional biotechnological solutions for enhancing tree adaptation and developing sustainable products'.

In 2025, the Research Council of Lithuania awarded scholarships to four PhD students of LAMMC in the field of agricultural sciences: **Oleg Beriozov**, **Shervin Hadian**, **Greta Striganavičiūtė**, and **Milana Šilanskienė**.

Dr Ieva Čėsnienė

Recipients of the scholarships of the Research Council of Lithuania in agricultural sciences

The Research Council of Lithuania awarded additional funding for study achievements in 2025 to three PhD students of LAMMC: **Emilis Armoška** (Institute of Forestry), **Vaida Čepulienė** (Institute of Horticulture), and **Sana Ullah** (Institute of Agriculture).

Emilis Armoška

Vaida Čepulienė

Sana Ullah

Other awards and achievements

Dr **Greta Striganavičiūtė**, a junior researcher at the Laboratory Forest Plant Biotechnology of the Institute of Forestry, became the Lithuanian winner of 'For Women in Science Baltic Fellowship 2025' competition and received a prestigious scholarship awarded to women scientists pursuing a research career.

Dr Greta Striganavičiūtė

PhD student Skaistė Dreskinienė

Skaistė Dreskinienė, a PhD student at the Agrobiology Laboratory of the Institute of Agriculture, received funding from the European Inventor Network for the educational initiative 'Workshops on microplastics and sustainability in agriculture'. The initiative aims to raise students' awareness of environmental pollution, the impact of microplastics on agriculture and human health, and to promote responsible consumption, creativity, and sustainable lifestyle ideas.

The work of PhD student Nasim Safari was recognised as the best in the Horticulture session

The work of PhD student Yaqoob Sultan was recognised as the best in the Forestry session

At the 14th International Conference 'The Young Scientists for Advance of Agriculture' (AGRISCI2025), held at the Lithuanian Academy of Sciences, the presentation 'Analysis of productivity variation patterns in Lithuanian bird's-foot trefoil under ecological and management contexts' by **Yaqoob Sultan**, a PhD student at the Department of Grass Breeding of the Institute of Agriculture, was recognised as the best in the Forestry session. The work of **Nasim Safari,** a PhD student at the Laboratory of Plant Physiology of the Institute of Horticulture, analysing the possibilities of cultivating valuable medicinal and aromatic *Lamiaceae* species under controlled environment conditions, was recognised as the best in the Horticulture session.

Six LAMMC projects secured funding from the Research Council of Lithuania for commercialisation activities:
• 'Green biocomposite substrate' (leader Dr Aistė Balčiūnaitienė)
• 'Microorganism starter culture collection for the food production sector' (leader Dr Viktorija Puzerytė)
• 'Nanoparticle fertilisers for leguminous plants' (leader Dr Rūta Sutulienė)
• 'Sustainable compostable packaging materials from mycelium and biomass' (leader PhD student Simas Borkertas)
• 'Advanced dry food rations' (leader Edvinas Genys)
• 'Functional food supplement' (leader Dr Šarūnas Paškevičius).

The winners of **LAMMC Innovation Team Idea Competition** were awarded cash prizes of €1,000 each and received the opportunity to jointly prepare an application and obtain funding of up to €150,000:
• Dr **Viktorija Puzerytė** for the idea 'Symbiotic bacterial cultures for food fermentation'
• Dr **Shervin Hadian** for the idea 'ArtemiProBio – natural plant probiotic'
• Dr **Rūta Sutulienė** for the concept 'LAMMC and nanofertilisers'.

©Daiva Puidokienė
Winners of LAMMC Innovation Competition

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10

DISSEMINATION OF SCIENTIFIC KNOWLEDGE

©Ardas Kavaliauskas

In 2025, LAMMC organised in-person and virtual international and national events, including conferences, seminars, and training workshops, and prepared publications for the scientific community and the general public.

Organised:

2 international conferences

5 international seminars

10 national conferences

15 national seminars

Ecological Agricultural Technology
Exhibition-Forum „EKOAgrITech“

EKO AgrITech

10.1. INTERNATIONAL CONFERENCES AND SEMINARS

In 2025, **2** international conferences
and **5** seminars were organised.

6 March

Seminar **Alternative Plant Protection Measures for Strawberry** at the Institute of Horticulture.

13–14 March

The **16th NORBARAG** (Nordic Baltic Resistance Action Group) **meeting** in Vilnius brought together specialists investigating pesticide resistance and evaluating efficacy, researchers, members of registration committees, and business representatives to exchange information and experience.

29 May

NJF virtual international ongoing scientific conference **Environmental sustainability in a climate change context: challenges and adaptation**, section 7: **Sustainable land management to reduce the risk of climate change: soil, water and food**, and three presentations delivered by LAMMC scientists attracted the interest of over 50 participants.

7 July

The 1st online seminar of the XTRACT project **Novel phytoremediation solution and concurrent metal phytomining using trees and plants as part of the circular economy**, during which participants shared insights into innovative phytoremediation and phytomining strategies that are transforming approaches to environmental remediation.

16–17 September

ECONUT project meeting and seminar **Technological features for preparing and utilising biomass to transform soil quality** in Klaipėda.

13 October

Conference **Soil management for a sustainable future: the importance of soil in sustainable agriculture and healthy food production**, dedicated to the 90th anniversary of the Vėžaičiai Branch, Institute of Agriculture, was held in Vilnius.

28 October

NJF hybrid workshop **Adapting winter wheat for harsh winters** and the **project partners' meeting** at the Institute of Agriculture, LAMMC, brought together scientists and plant breeders from Northern, Baltic, and Central European countries.

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10.2. NATIONAL CONFERENCES, SEMINARS, AND FIELD DAYS

In 2025, the Ecological Agricultural Technology Exhibition-Forum EKOAgrITech, **10** conferences, and **15** seminars, discussions, field days, and training events were organised.

14, 16, 21, 23, 28, and 30 January

Virtual conferences were organised, during which research results of long-term scientific programmes implemented at LAMMC were presented.

28 January

Roundtable discussion **Sustainable soil – the foundation of today's agriculture** was organised by the Vėžaičiai Branch, Institute of Agriculture.

11 February

Scientific reporting conference **Science-based solutions for sustainable agriculture and forestry** and discussion **What will determine the country's decisions in agriculture and forestry – opinions or numbers?** attracted interest of over 250 participants.

7 March

Seminar **Sustainable farming: innovative solutions for fertilisation and nitrogen loss reduction**, organised at LAMMC, focused on the opportunities to reduce fertilisation impacts and nitrogen losses.

14 March

Seminar **Use of liming materials for neutralising acidic soils**, presenting activities of the project 'Identification and economic evaluation of new or improved climate- and environment-friendly measures addressing soil acidification problems' was organised by the Vėžaičiai Branch, Institute of Agriculture.

2 April

Roundtable discussion **The importance of soil reaction and use of biomaterials in agroecosystem management** for the farmers in the Rokiškis district was organised by the Vėžaičiai Branch, Institute of Agriculture.

9 April

Seminar-discussion **Implementation of EU requirements for pollinator protection in crop fields: theory and practice**, organised at the Institute of Agriculture in hybrid format, interested over 60 participants.

13 May

Conference-discussion **Sustainable agriculture: new technologies and alternative raw materials**, featuring four presentations, was combined with the **Orchard Bloom Festival** at the Institute of Horticulture.

2–20 June

Annual **grass breeders and seed producers** (farmers and companies) **meetings** were organised to support sustainable grass seed production in Lithuania.

4 June

Field days **How to choose flowering plants for field margins and buffer strips** and **Selection of grass species for field margins and wetlands: practical solutions** were organised for the farmers in the Joniškėlis and Pasvalys districts by the researchers of the Institute of Agriculture.

20 June

Practical conference **Native plant diversity: solutions for creating landscape elements and strengthening biodiversity**, focused on the use of native plants for biodiversity enhancement and sustainable landscape design, was organised at the Institute of Agriculture.

3 July

The 2nd **Ecological Agricultural Technology and Innovation Exhibition EKOAgrITech** and discussion **The role of the latest technologies (physical methods, GPS, robotics and artificial intelligence) in the sustainability of Lithuanian farms**. LAMMC researchers established 1,000 experimental field plots.

4 July

Event **Sustainable farming: precision fertilisation and nitrogen loss reduction – theoretical and practical training** was organised for the farmers in Akmenė district.

25 August

Field day **Selection of niche crops for Lithuanian agriculture** focused on the genetics and cultivation of less commonly grown crops such as soybeans, lentils, sorghum, millet, coriander, flax, oats, and others.

14 October

Field day **The impact of conservation tillage on agroecosystems** was organised at the Institute of Agriculture.

14 October

Seminar **The role of organic and liming materials in developing sustainable agriculture in acidic soils under climate change conditions** was organised at the Vėžaičiai Branch, Institute of Agriculture.

24 October

Seminar/training workshop **Precision fertilisation and environmentally friendly practices in the Dovinė Basin** was organised in Simnas, Alytus district.

6 November

Field days **Sustainable composting of various plant residues using microorganisms** and **From residues to fertile soil: sustainable on-farm composting** were organised for the farmers in Pasvalys and Pakruojis districts.

28 November

LIFE SIP Water project training workshop **Advanced agronomic solutions and practices** and a presentation by Dr Jonas Volungevičius were organised for the farmers in Kėdainiai district.

4 December

LIFE SIP Water project event **Crop production day: from soil risks to sowing technologies: solutions for sustainable farming** and the presentation 'Lithuanian soil condition: potential risks' by Dr Jonas Volungevičius were organised in Kėdainiai district.

©Edvinas Misiukevičius

In 2025, the representatives of LAMMC actively participated in the events organised by national institutions, while events of other institutions were hosted at LAMMC divisions

26 February

At **Career Day** 2025, organised by Vytautas Magnus University Agriculture Academy, LAMMC presented opportunities for doctoral studies, internships, and career paths.

9 April

At **Career Days Contact Fair**, organised by Vilnius University, LAMMC presented career opportunities, internships, and doctoral studies.

10 May

An **open day series 'UžmESk akį'** (Take a Look), organised by the Central Project Management Agency at LAMMC Open Access Centre for Modelling of Fruits and Vegetables Processing Technologies featured presentations of laboratory activities, successful national and international projects, guided tours, and tasting of innovative products.

15 May

The Young Academy of the Lithuanian Academy of Sciences held its **annual off-site meeting** at the Institute of Horticulture. The meeting included presentations of ongoing research and visits to laboratories and experimental orchards.

16 July

A **commemorative event honouring professors of the 1924–1940 Agricultural Academy** was held and memorial plaques were unveiled on the Agronomists' Day.

18 July

At the **Night of Fragrances 2025** in the Botanical Garden of Vytautas Magnus University, LAMMC presented the educational activity **A Wreath of Grasses** along with freeze-dried berry tasting and demonstrations of drying technology.

29–30 August

Dr **Vidmantas Bendokas**, a senior researcher and deputy director of the Institute of Horticulture, participated in the discussion **Safe food: from conspiracy to science** in the **discussion festival 'Būtent!'** (Exactly!) in Vilnius.

16–17 September

Dr **Skaidrė Supronienė**, a senior researcher and head of the Microbiology Laboratory of the Institute of Agriculture, participated in the event **European Research and Innovation Days**, organised by the European Commission and held at the Brussels convention centre SQUARE.

9–10 October

Dr **Gintaras Brazauskas**, director of LAMMC, delivered the presentation **Genetically modified crops: how genomics and phenotyping drive progress in the agriculture and food sector** in session 3 'Using Synthetic Biology and Genomics for Biological Responses to Climate Change and Future Health' of the international conference **Innovating Technologies for Coexistence** in Vilnius. It was organised by Massachusetts Institute of Technology (MIT). Dr Vidmantas Bendokas, deputy director of the Institute of Horticulture, took part in the discussion.

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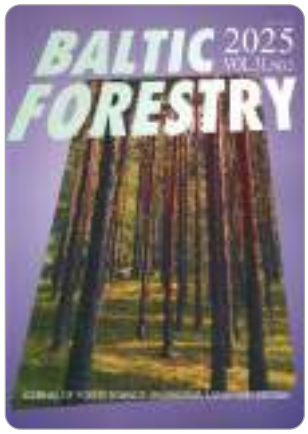
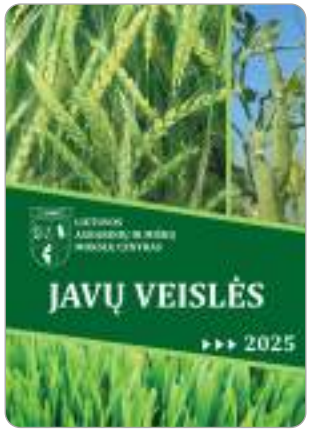
10.3. PRINTED AND ELECTRONIC PUBLICATIONS

Together with partners, LAMMC publishes two scientific journals: **Baltic Forestry** (IF 2024/2025 – 0.6) and **Agronomy Research**.

In 2025, various publications, including reports, technologies, recommendations, and guidelines (all publications are in Lithuanian, except for the Annual Report) and intended for both the scientific community and the general public, were prepared:

- **2024 metų veiklos ataskaita / Annual Report 2024**,
- **LĘŠIŲ auginimo technologija** (*Technology of Lentil Cultivation*),
- **SORŲ auginimo technologija** (*Technology of Millet Cultivation*),
- publication '**Vietinių augalų rūšių parinkimas kraštovaizdžio elementų žolynams**' (*Selection of Native Plant Species for Landscape Grassland Elements*), including **separate cards for each herbaceous species**,
- brochures **Javų veislės** (*Crop Varieties*) and **Žolių veislės** (*Varieties of Legumes and Grasses*),
- brochure **Tvarus pasėlių likučių panaudojimo vertės didinimas (BIOCOTECH)** (*Sustainable Valorisation of Crop Residues*),
- 13 IPM guidelines: Winter rye, Winter triticale, Winter wheat, Spring wheat, Spring barley, Oats, Maize, Winter oilseed rape, Spring oilseed rape, Buckwheat, Faba beans, Peas, Potatoes.





Integruotos
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2024 m.

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2-as leidimas
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Integruotos
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Integruotos
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(IKOK) gairės
BULVĖS
2-as leidimas
2024 m.

11

FUNDING

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The budget of LAMMC consists of state budget appropriations, project funding income (received from the implementation of national and international projects), funds received from performing commissioned work by Lithuanian and foreign business entities, and other operating income (sales of agricultural products, property rental, etc.) (*Figure 7*).

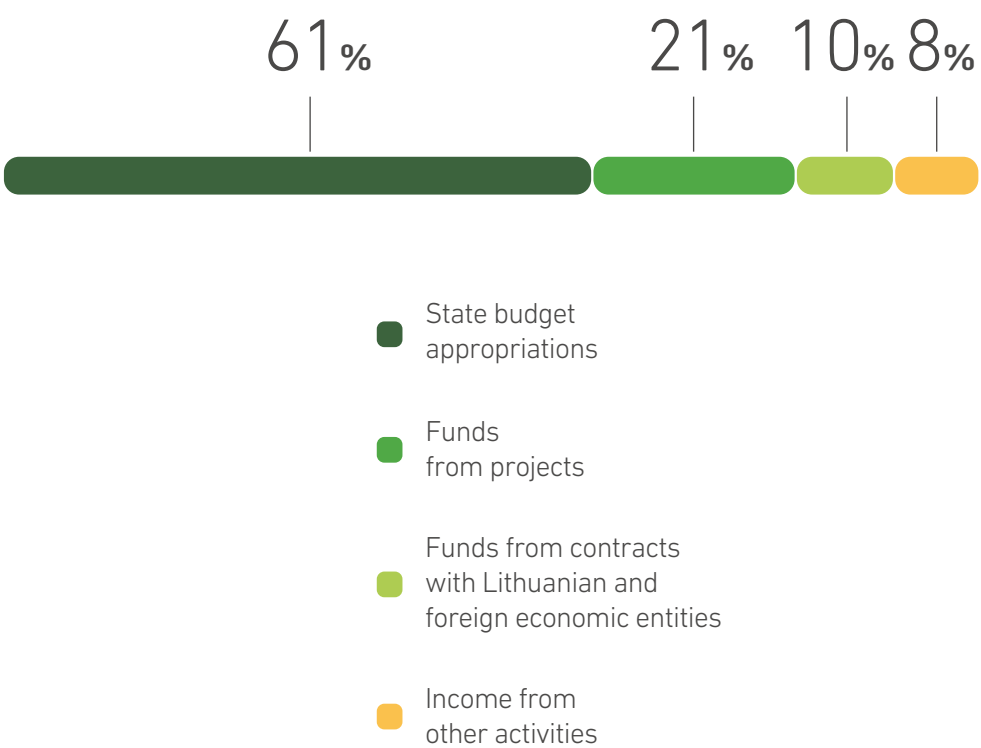

Figure 7. LAMMC funding sources for 2025

In 2025, the revenue of LAMMC totalled €18,414.5.

The main expenditures in 2025 were wages and social insurance contributions (69.1%), goods and services (12.1%), and doctoral scholarships (5.3%). The remaining costs were allocated to business trips, utilities and communications, long-term assets, royalties, professional development, and other operational needs.

12

APPENDICES

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12.1. INTERNATIONAL PROJECTS

HORIZON EUROPE programme projects

1. Organic Farming Innovations Network in Europe (OH-FINE). Coordinator in the Institute of Agriculture Dr Lina Šarūnaitė. 2024–2028.
2. GREEN NUDGEs for sustainable FORESTry and AGRIcultural practices post 2027 (ForestAgriGreenNudge). Coordinator in the Institute of Agriculture Dr Roma Semaškienė. 2024–2027.
3. A sustainable ecosystem for the innovative resource recovery and complex ore extraction (XTRACT). Coordinator in the Institute of Forestry Dr Vaida Sirgedaitė-Polikaitienė. 2023–2026.
4. Breeding European Legumes for Increased Sustainability (BELIS). Coordinator in the Institute of Agriculture Dr Rita Armonienė. 2023–2027.
5. A holistic approach to sustainable, digital EU agriculture, forestry, livestock and rural development based on reconfigurable aerial enablers and edge artificial intelligence-on-demand systems (CHAMELEON). Coordinator in the Institute of Forestry Dr Vaida Sirgedaitė-Polikaitienė. 2022–2025.
6. The NUTRI-CHECK NETwork to maximise site-specific precision in managing the nutrition of European arable crops (NUTRICHECK-NET). Coordinator in the Institute of Agriculture Dr Dalia Feizienė. 2022–2025.

HORIZON 2020 programme projects

1. A holistic fire management ecosystem for prevention, detection and restoration of environmental disasters (TREEADS). Coordinator in the Institute of Forestry Dr Vaida Sirgedaitė-Polikaitienė. 2021–2025.
2. Towards climate-smart sustainable management of agricultural soils (EJP SOIL). Coordinator in the Institute of Agriculture Dr Žydrė Kadžiulienė, deputy coordinator Dr Virginijus Feiza. 2020–2025.

INTERREG programme projects

1. Policies to promote the competitiveness of forest-based SMEs in resource-efficient European regions (FBI4EU) (Interreg Europe). Coordinator in the Institute of Forestry Dr Diana Lukminė. 2024–2028.
2. Innovative solutions for sewage sludge management in small wastewater treatment plants (ISMA) (South Baltic Interreg). Coordinator in the Institute of Agriculture Dr Karolina Barčauskaitė. 2024–2027.
3. Eco-designing for the coastal zone nutrient's circularity (ECONUT) (South Baltic Interreg). Coordinator in the Institute of Agriculture (Vėžaičiai Branch) Dr Danutė Karčauskienė. 2023–2026.
4. Tackling agricultural phosphorus load by soil amendments (GYPREG) (Interreg Baltic Sea Region). Coordinator in the Institute of Agriculture (Vėžaičiai Branch) Dr Danutė Karčauskienė. 2023–2026.

LIFE programme project

1. Integrated water management in Lithuania (LIFE SIP Vanduo). Coordinator in the Institute of Agriculture Dr Lina Šarūnaitė. 2024–2033.

Projects supported by other European Union research programmes

1. AGROECOLOGY partnership project 'Agroecological transition of the European dairy farming system' (TEDY). Coordinator in the Institute of Agriculture Dr Gintarė Šidlauskaitė. 2025–2028.
2. AGROECOLOGY partnership project 'CoolFarmLab: CO-creation Of Pathways to foster agroecoLogical transition of FARMs driven by Living LAB approach'. Coordinator in the Institute of Agriculture Dr Monika Toleikienė. 2025–2028.
3. NordForsk project 'Green nitrogen transition: the potential of legumes in control environment agriculture' (GreeNTrans). Coordinator in the Institute of Horticulture Dr Aušra Brazaitytė. 2024–2028.
4. NJK (The Nordic Joint Committee for Agricultural and Food Research) project 'Fimbulwinter wheat – creating a team with a plan to adapt winter wheat for difficult winters'. Coordinator in the Institute of Agriculture Dr Rita Armonienė. 2025–2027 m.
5. NordForsk project 'Innovative sustainable Nordic-Baltic horticulture' (InNoBaHort). Coordinator in the Institute of Horticulture Dr Neringa Rasiukevičiūtė. 2023–2026.
6. NordForsk project 'Climate-smart resilience through diversified cropping systems – Identifying springboards in Nordic and Baltic agriculture' (AgroMixNorth). Coordinator in the Institute of Agriculture Dr Monika Toleikienė. 2023–2026.

7. NordForsk project 'Upscaling crop performance monitoring by linking satellite and field biosignatures' (UPSCALE). Coordinator in the Institute of Agriculture Dr Rita Armonienė. 2023–2026.
8. SNS (Nordic Forest Research Co-operation Committee) project 'Integrating soil monitoring in forest and other semi-natural land uses in the Nordic and Baltic region' (MoniForSoil). Coordinator in the Institute of Forestry Dr Iveta Varnagirytė-Kabašinskienė. 2025.
9. Swedish Institute (SI) Baltic Sea Neighbourhood Programme project 'SORG4NOBAL: Introduction of climate-resilient sorghum for the mitigation of eutrophication and pesticide pollution in the Baltic Sea region'. Coordinator in the Institute of Agriculture Dr Rita Armonienė. 2023–2026.
10. ECPGR Allium Plant Working Group project 'Genotyping-by-sequencing of the European garlic collection to develop a sustainable ex situ conservation strategy' (GarliCSS). Coordinator in the Institute of Horticulture Dr Danguolė Juškevičienė. 2023–2025.
11. SNS (Nordic Forest Research Co-operation Committee) project 'Development of ash reproductive material for forestry and nature conservation'. Coordinator in the Institute of Forestry Dr Diana Marčiulynienė. 2022–2026.

COST actions

1. CA23121. Genetic Nature Observation and Action (GENOA). Coordinator in the Institute of Forestry Dr Rita Verbylaitė. 2024–2028.
2. CA23148. European Network for the Integrative Approach of Urban Forestry (INTUF). Coordinator in the Institute of Forestry Dr Povilas Žemaitis. 2024–2028.
3. CA22136. Pan-European Network of Green Deal Agriculture and Forestry Earth Observation Science (PANGEOS). Coordinator in the Institute of Agriculture Dr Rita Armonienė. 2023–2027.
4. CA22158. Exploiting Plant-Microbiomes Networks and Synthetic Communities to improve Crops Fitness (MiCropBiomes). Coordinator in the Institute of Horticulture Dr Inga Tamošiūnė. 2023–2027.
5. CA22166. Safety in the Game Meat Chain (SafeGameMeat). Coordinator in the Institute of Forestry Dr Olgirda Belova. 2023–2027.
6. CA21138. Joint effects of CLimate Extremes and Atmospheric depositioN on European FORESTs (CLEANFOREST). Coordinators in the Institute of Forestry Dr Valda Gudynaitė-Franckevičienė and Dr Valda Araminienė. 2022–2026.
7. CA20118. Three-dimensional forest ecosystem monitoring and better understanding by terrestrial-based technologies (3DForEcoTech). Coordinator in the Institute of Forestry Dr Povilas Žemaitis. 2021–2025.
8. CA20132. Urban Tree Guard – Safeguarding European urban trees and forests through improved biosecurity (UB3Guard). Coordinator in the Institute of Forestry, Management committee member and leader of WG2 Innovations Dr Diana Marčiulynienė. 2021–2025.
9. CA20138. Network on water-energy-food nexus for a low-carbon economy in Europe and beyond (NEXUSNET). Coordinator in the Institute of Forestry Dr Diana Lukminė. 2021–2025.

Continuous projects

1. European Food Safety Authority (EFSA) project 'European Network of Wildlife' (ENETWILD). Coordinator in the Institute of Forestry Dr Olgirda Belova. 2017–2027.
2. The European Forest Genetic Resources Programme (EUFORGEN), Phase VI. Coordinator in the Institute of Forestry Dr Darius Kavaliauskas. Since 2010.
3. Nordic Forest Research Co-operation Committee (SNS) project 'Northern European database of long-term forest experiments'. Coordinator in the Institute of Forestry Dr Marius Aleinikovas. Since 2008.
4. Winter wheat breeding, variety testing and marketing in Estonia. Leader in the Institute of Agriculture Dr Žilvinas Liatukas. Since 2000.
5. European Plant Genetic Resources Conservation Programme. Coordinators in the Institute of Agriculture Dr Žilvinas Liatukas and Dr Eglė Norkevičienė. Since 1998.

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12.2. NATIONAL PROJECTS

Research funded by the Research Council of Lithuania

Researcher Groups projects

1. Evaluation of cold acclimation efficiency of *Ribes* and *Prunus* genotypes for cryopreservation *in vitro*. Leader Dr Rytis Rugienius. 2025–2028.
2. Harnessing the multifunctionality of *Artemisia dubia* biomass for sustainable soil health and crop protection in temperate agroecosystems. Leader Dr Modupe Olufemi Doyeni. 2025–2028.
3. Contribution of humic substances to the retention and mobility of environmentally hazardous synthetic polymers in soil systems (HUMIPOL). Leader Dr Alvyra Šlepetienė. 2025–2027.
4. Kefir-fermented herbs in Alzheimer's disease and its associated gut dysbiosis. Leader Dr Paulina Štreimikytė. 2024–2027.
5. Development and study of functional nanoparticles. Leader Dr Aistė Balčiūnaitienė. 2024–2027.
6. Brassicaceae cover crop fungistatic effect on diversity of soil microbial community and its function in nutrient uptake in wheat. Leader Dr Skaidrė Supronienė. 2024–2027.
7. Sensor data for enhanced soil properties prediction in Lithuanian agroclimatic zones. Leader Dr Renaldas Žydelis. 2024–2027.
8. *Tilia cordata* Mill. and associated wild insect pollinators: diversity, abundance and genetic monitoring in protected forest areas. Leader Dr Virgilijus Baliuckas. 2023–2026.
9. From waste to resources: shrimp waste regeneration to sustainable antimicrobial products applied in agriculture. Leader Dr Karolina Barčauskaitė. 2023–2026.
10. The management of mineral nutrition to control the quality and safety of post-harvest leafy vegetables (NutriSafe). Leader Dr Viktorija Vaštakaitė-Kairienė. 2023–2026.
11. Development of natural, biodegradable pigments for industrial polymers. Leader Dr Jonas Viškelis. 2023–2026.
12. Optimisation of legume nitrogen fixation and use in the organic farming ecosystem (NitroFixation). Leader Dr Monika Toleikienė. 2022–2025.
13. Biodiversification of plant species and explication of corresponding precision agriculture technologies within nutrition-based approach (DiverCEA). Leader Dr Giedrė Samuolienė. 2022–2025.
14. Cellular redox balance and protein expression based phenotyping of plant-endophyte interactions for development of plant biostimulant consortia ((REDOXENDO). Leader Dr Danas Baniulis. 2022–2025.

Postdoctoral internships in Lithuania funded by the state budget

1. Microbiome dynamics in Lithuanian *Ips typographus* generations. Supervisor Dr Artūras Gedminas, post-doc Dr Goda Mizerienė. 2024–2026.
2. Enhancing sustainable agriculture: Investigating legume-microbial interactions through stable isotopes and amino acid profiling. Supervisor Dr Monika Toleikienė, post-doc Dr Raminta Skipitytė. 2024–2026.

Development of research competence of scientists, other researchers, and students through practical scientific activities funded by the European Union funds

Sub-activity 'Development of students' abilities in scientific research during semesters'

1. Structural and species composition dynamics of spruce forests and driving factors in strict nature reserves. Supervisor Dr Povilas Žemaitis, student Ignas Neliubovas. 2025–2026.

Students' scientific practice during semesters financed by the state budget

Sub-activity 'Student research during the summer, encouraging students to engage in active scientific activities and improve scientific competence'

1. The application of fluorescence microscopy for microplastics characterization. Supervisor Dr Karolina Barčauskaitė, student Dovilė Motiejauskaitė. 2024–2025.

Sub-activity 'Student summer research internship, financed by the state budget' in 2025

1. Application of sensors for predicting the yield of common pea (*Pisum sativum* L.). Supervisor Dr Andrius Aleliūnas, student Mantas Diržinskas (VU).
2. Comparison of productivity and adaptation of different origins of silver birch in experimental stands. Supervisor Dr Aušra Juškauskaitė, student Margarita Žemaitytė (VDU).
3. Effects of deep soil ploughing on carbon and nitrogen dynamics in pine plantations: analysis of chemical and microbial properties. Supervisor Dr Milda Muraškienė, student Deivė Čepskytė (LSMU).
4. Evaluation and testing of apple tree diseases *in vitro*. Supervisor Dr Alma Valiuškaitė, student Kornelija Kondrotaitė (LSMU).
5. Expression of genes involved in hormone synthesis during fruitlets drop in contrast varieties of apple (*Malus domestica*) in terms of flowering abundance. Supervisor Dr Birutė Frercks, student Austėja Vaitkevičiūtė (LSMU).
6. Identification and characterisation of pathogens of grapevine powdery mildew and downy mildew in Lithuania and biocontrol *in vitro*. Supervisor Dr Ingrida Mažeikienė, student Aneta Urbanovič (LSMU).
7. Impact of insect pest outbreaks on the diversity of fungal communities associated with Scots pine (*Pinus sylvestris*). Supervisor Dr Vytautas Čėsna, student Andrius Kazlauskas (LIK).
8. Isolation and identification of beneficial soil arbuscular mycorrhizal fungal spores. Supervisor Neringa Matelionienė, student Shreeram Yeladahalli Kalayya (VDU).
9. Optimisation of legume seed germination using experimental analysis of environmental and biological factors. Supervisor Dr Eglė Norkevičienė, student Rūta Budrevičiūtė (VDU).
10. Plant extracts for environmentally friendly horticultural crops biocontrol. Supervisor Dr Neringa Rasiukevičiūtė, student Klaudija Jasiulionytė (KTU).
11. Quantitative determination of heavy metals in soils of different granulometric composition. Supervisor Dr Karolina Barčauskaitė, student Brigita Senkienė (VDU).
12. Studies on the influence of the composition of biological inputs on plant development in the initial growth stages. Supervisor Dr Audrius Kačergius, student Ugnė Babianskaitė (KTU).
13. Study of the effect of different biofuel ash rates on soil and maize chemical composition using ICP-OES method. Supervisor Dr Kristina Bunevičienė, student Urtė Čegytė (VDU).
14. Study on forest floor and mineral soil pH in Scots pine stands of different ages: from clear cutting to forest maturity. Supervisor Dr Iveta Varnagirytė-Kabašinskienė, student Ugnė Viltrakytė (VDU).
15. Survival and plant regeneration of currants (Ribes) after cryopreservation using vitrification *in vitro*. Supervisor Dr Rytis Rugienius, student Domas Benkunskas (LSMU).

Support for the membership of scientific and business structures in international networks

1. Membership in the European Plant Sciences Association EPSO. Leader Dr Vita Tilvikienė. 2024–2026.
2. Membership in the European Institute of Innovation and Technology. Leader Dr Aistė Balčiūnaitienė. 2024–2026.
3. Membership in the European Association of Research Managers and Administrators. Leader Dr Monika Vilkienė. 2024–2026.

Applied research projects funded by the Ministry of Agriculture of the Republic of Lithuania

R&D projects in agriculture, food, and fisheries

1. Establishment, verification and testing of a soil quality monitoring point network. Leader Dr Jonas Volungevičius. 2025–2027.
2. Organic carbon in the soils of the country's regions – data digitization and modelling, measures for storage of carbon. Leader Dr Žydrė Kadžiulienė. 2024–2026.
3. The state of agricultural crop stands and yield forecasts in Lithuania. Leader Dr Virginijus Feiza. 2024–2026.
4. Identification of the origin of promising wine grape varieties under Lithuanian agroclimatic conditions and introduction of healthy propagating material. Leader Dr Birutė Frercks. 2024–2026.
5. Functional potential of soil microbiota for increasing the productivity of crop farms. Leader Dr Skaidrė Supronienė. 2024–2026.
6. Identification and assessment of economic benefits of new or improved climate and environment-friendly measures to address soil acidification problems. Leader Dr Regina Repšienė. 2024–2025.

7. Methodology for accounting of blooming weeds in the crop stands treated with plant protection products. Leader Dr Irena Deveikytė. 2024–2025.
8. Search for apple cultivars suitable for cultivation with lower pesticide inputs. Leader Dr Juozas Lanauskas. 2023–2025.
9. Selection of genotypes and technological possibilities of cultivation of non-traditional plants of high nutritional value – lentils (*Lens culinaris*) and millet (*Panicum miliaceum*) – in Lithuania. Leader Dr Monika Toleikienė. 2023–2025.
10. Study on the relationship between crop development stages and agroclimatic indicators. Leader Dr Renaldas Žydelis. 2023–2025.
11. Efficacy of plant protection products by reducing their doses. Leader Dr Roma Semaškienė. 2023–2025.

Support for projects of the measure 'Knowledge transfer and information actions' (Lithuanian Rural Development Programme 2014–2020)

1. Consulting service for forest owners. Project leader Dr Benas Šilinskas. 2022–2025.

EIP activity group projects (Lithuanian Rural Development Programme 2014–2020)

1. Implementation of a multipurpose strip till drill prototype for increasing soil sustainability and ecological advantage. Leader Dr Vidas Damanauskas. 2023–2025.
2. The use of the native plant species diversity to create natural landscape elements. Leader Dr Lina Šarūnaitė. 2023–2025.

EIP activity group projects (Strategic Plan for Lithuanian Agriculture and Rural Development 2023–2027)

1. Comparison the effects of long-term sustainable tillage systems and crop rotations management on segetal flora (FLORKONTROLĖ). Leader Dr Irena Deveikytė. 2025–2028.
2. Development and improvement of technologies for growing edible oyster fungi. Leader Dr Jūratė Lynikienė. 2025–2028.
3. Integrated legume grass systems for sustainable protein production and grazing (HarmonyGrass). Leader Dr Giedrius Petrauskas. 2025–2028.
4. Sustainable improvement of crop residue utilization value (BIOCOTECH). Leader Dr Lina Šarūnaitė. 2025–2027.

Applied research projects funded by the Ministry of Environment of the Republic of Lithuania and its subordinate state institutions

1. Delineation of geographical transfer limits for the transferring of forest reproductive material of main forest tree species growing in Lithuania from other European Union and OECD countries, considering environmental conditions and climate change projections. Leader Dr Darius Kavaliauskas. 2024–2027.
2. Analysis of the possibilities for constructing multi-story residential buildings from engineered wood products in Lithuania. Leader Dr Marius Aleinikovas. 2024–2026.
3. Investigation of possibilities and preparation of recommendations for the application of B*eauveria bassiana* against *Ips typographus* as a measure to protect Norway spruce trees. Leader Dr Jūratė Lynikienė. 2024–2025.
4. Recovery assessment of the sessile oak in the Trakas forest sessile oak genetic reserve. Leader Dr Girmantė Jurkšienė. 2024–2025.
5. Beaver as bioindicator for assessing contamination of riparian forest buffer. Leader Dr Olgirda Belova. 2022–2025.
6. Study of the origin and genetic diversity of sycamore maple (*Acer pseudoplatanus* L.) spreading spontaneously in the forests of Lithuania and the application of breeding measures. Leader Dr Virgilijus Baliuckas. 2022–2025.
7. CO_2 emissions from drained and undrained forested peatlands and deadwood left in forests with different degrees of decay. Leader Dr Kęstutis Armolaitis. 2022–2025.
8. Implementation of Level II intensive forest condition monitoring. Leader Dr Vidas Stakėnas. 2025.
9. Data analysis for the National Greenhouse Gas Emissions Inventory Report (2026) of the agriculture and forestry sectors. Leader Dr Žydrė Kadžiulienė. 2025.
10. Maintenance and renewal of national plant genetic resources field collections. Leader Dr Eglė Norkevičienė. 2025.

Projects of the progress measure of the science development programme No. 12-001-01-02-01 'Strengthening innovation ecosystems in science centers' of the Ministry of Education, Science, and Sports of the Republic of Lithuania

Support for activities aimed at implementing the priorities of the European Research Area, aiming at institutional changes

1. Strengthening the competences of Innovation and Technology Transfer Centres. Leader Dr Linas Jurgutis. 2025–2028 m.
2. Strengthening employee well-being at the Lithuanian Research Centre for Agriculture and Forestry. Leader Dr Marius Aleinikovas. 2025–2026 m.
3. Implementation of the Human Resources Management Strategy (HRS4R) at the Lithuanian Research Centre for Agriculture and Forestry. Leader Živilė Ražanskienė. 2025–2026 m.
4. Development of a science assessment system at the Lithuanian Research Centre for Agriculture and Forestry. Leader Dr Vita Tilvikienė. 2024–2025.
5. Development of a strategy for reciprocal international cooperation at the Lithuanian Research Centre for Agriculture and Forestry. Leader Eglė Šidiškienė. 2024–2025.

Support for identified start-up R&D projects

1. Preparation of a roadmap related to the topics of the Horizon Europe programme for the staff of the Lithuanian Centre for Agricultural and Forestry Sciences. Leader Dr Monika Vilkienė. 2025–2026.
2. Assessment of the role of soil microorganisms in enhancing soil health. Leader Dr Modupe Doyeni. 2025–2026.
3. Preparation for an MSCA oostdoctoral fellowship – development of synthetic microbial communities (SynComs). Leader Dr Arman Shamshitov. 2025–2026.
4. Testing the R&D idea: The impact of microplastics on agroecosystems. Leader Skaistė Dreskinienė. 2025–2026.
5. Adaptation of herbaceous plant species compositions for the installation of landscape elements, meeting different ecological function needs. Leader Dr Aušra Arlauskienė. 2024–2025.
6. Application of alfalfa explants in acidic soils to improve soil sustainability, health. Leader Dr Regina Skuodienė. 2024–2025.
7. Capacity building on application preparation of EU projects. Leader Dr Karolina Barčauskaitė. 2024–2025.
8. Consortium formation and preparation for the WIDERA calls. Leader Dr Monika Vilkienė. 2024–2025.
9. Cultivation and efficient use of short rotation plantations in the transition to a sustainable bioeconomy. Leader Dr Julija Konstantinavičienė. 2024–2025.
10. Developing competencies in preparing an international application on the topic of developing the Organic Farming Innovations Network Europe. Leader Dr Lina Šarūnaitė. 2024–2025.
11. EIC Pathfinder Open quality application preparation. Leader Dr Aistė Balčiūnaitienė. 2024–2025.
12. Improving competences in preparing international applications on biodiversity and ecosystem services research topics. Leader Dr Žydrė Kadžiulienė. 2024–2025.
13. Improving technology for the production of good quality fodder legume grasses for a sustainable environment and food system. Leader Dr Aurelija Liatukienė. 2024–2025.
14. Nutritional value, resistance to leaf diseases and mycotoxins of different varieties of durum wheat. Leader Dr Jablonskytė-Raščė. 2024–2025.
15. Preparation for submitting a high-quality application on the topic 'Adaptation of agrotechnical measures to increase the biodiversity of soil microorganisms and improve soil health' under the calls of the Horizon Europe programme in the implementation of an interdisciplinary project. Leader Dr Neringa Matelionienė. 2024–2025.
16. Preparation of a postdoctoral internship application for career development. Leader Dr Lina Šarūnaitė. 2024–2025.
17. Preparation of a quality application for the call HORIZON MISS-2024-SOIL-01-01. Leader Dr Ieva Mockevičienė. 2024–2025.
18. Preparing a quality application for a MSCA postdoctoral fellowship. Leader Dr Shervin Hadian. 2024–2025.
19. Preparing a quality application for a MSCA postdoctoral fellowship. Leader Dr Monika Vilkienė. 2024–2025.
20. Preparing a quality application for a MSCA postdoctoral fellowship. Leader Dr Gintarė Šidlauskaitė. 2024–2025.

21. Preparing an application for a MSCA postdoctoral fellowship. Leader Dr Urtė Mečionė. 2024–2025.
22. Preparing an application for submission according to the invitation of EH programme HORIZON-MISS2024-SOIL-01-08 'Managing forest peat soils'. Leader Dr Olgirda Belova. 2024–2025.
23. Preparing an application for the Horizon Europe project 'Cryopreservation and adaptation enhancement of garden plants'. Leader Dr Rytis Rugienius. 2024–2025.
24. Preparing for a quality application for a MSCA postdoctoral fellowship. Leader Dr Kristina Bunevičienė. 2024–2025.
25. Preparing to submit an application according to the EH program invitation HORIZON-MISS-2024SOIL-01-03 'Towards a dynamic monitoring system to assess status and spatiotemporal changes of soil erosion at European scale'. Leader Dr Alvyra Šlepetienė. 2024–2025.
26. R&D idea testing – forming a unified forest policy, harmonising the activities of private forest owners, implementing climate change and carbon dioxide reduction goals to achieve sustainability. Leader Dr Dalia Perkumienė. 2024–2025.
27. R&D idea testing – monitoring and protection of genetic diversity of habitats. Leader Dr Rita Verbylaitė. 2024–2025.
28. R&D idea testing – project 'Integrating biodiversity into sustainable agriculture'. Leader Dr Viktorija Gecaitė. 2024–2025.
29. R&D idea testing – sorption of pharmaceutical and personal care product residues in the soil-plant system. Leader Dr Donata Drapanauskaitė. 2024–2025.
30. R&D idea testing – sustainable use of energy from biomass in the context of climate change challenges. Primary link. Leader Dr Mindaugas Škėma. 2024–2025.
31. Search for strategic partners for a MSCA postdoctoral fellowship and consortium formation for a Horizon Europe project application to pursue GHG reduction measures. Leader Dr Aušra Brazaitytė. 2024–2025.
32. Search for strategic partners to form a consortium for submitting a project application under the Horizon Europe programme. Leader Dr Giedrė Samuolienė. 2024–2025.
33. Sustainable environmentally friendly plant protection measures determination and application for horticultural plants. Research and innovation. Leader Dr Armina Morkeliūnė. 2024–2025.

RTO Lithuania projects

1. BACTOALGRO: Enhancing bacteria and algae interaction using electroporation and plasma-activated water to stimulate plant growth. Coordinators: Dr Shervin Hadian (LAMMC), Dr Voitech Stankevič (FTMC), and Dr Mindaugas Milieška (LEI). 2025–2026.
2. Synthesis and application of biofuel ash geopolymers for removal of Zn^{2+} and Cu^{2+} ions from simulated wastewater (BAGEO-HM). Coordinators: Dr Kristina Bunevičienė (LAMMC), Dr Sandra Stanionytė (FTMC), and Dr Šarūnas Varnagiris (LEI). 2025–2026.
3. Modelling microplastic transport in plants using microfluidic systems (PLASTRO). Coordinators: Dr Gintarė Šidlauskaitė (LAMMC), Dr Justas Šereika (LEI), and Dr Julija Pupeikė (FTMC). 2025–2026.

Student internships under individual contracts

1. Research internship. Supervisor Dr Birutė Frercks, student Lukas Baranauskis (voluntary internship).
2. Research internship. Supervisor Dr Ingrida Mažeikienė, student Wojciech Makowiski (voluntary internship).
3. Effect of essential oils and extracts on seed germination and pathogen biocontrol. Supervisor Dr Neringa Rasiukevičiūtė, student Gabija Gadeikytė (KTU).
4. Practical learning internship. supervisor Skaistė Dreskinienė, student Modestas Šeputis (KTU).
5. Practical training internship. supervisor Dr Birutė Frercks, student Viktorija Žukauskaitė (LSMU).
6. Effect of catch crops on changes in soil properties. Supervisor Dr Gražina Kadžienė, student Ignotas Ilgutis (Vilniaus kolegija).
7. Study of essential oils and extracts for sustainable biocontrol of horticultural crops. Supervisor Dr Neringa Rasiukevičiūtė, student Rytis Sereika (KTU).
8. Practical learning internship. Supervisor Gintarė Naujokienė, student Karolina Aleliūnaitė (KTU).
9. Effect of essential oils and propolis on horticultural plant pathogens. Supervisor Dr Armina Morkeliūnė, student Aistė Drūtytė (KTU).

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12.3. MAIN SCIENTIFIC PUBLICATIONS

Articles in journals, referred and indexed in the Clarivate Analytics Web of Science database (Impact Factors for 2024/2025)

1. Shaw R. E., Farquharson K. A., Bruford M. W., Coates D. J., Elliott C. P., Mergeay J., Ottewell K. M., Segelbacher G., Hoban S., Hvilsom C., Pérez-Espona S., Ruņģis D., Aravanopoulos F., Bertola L. D., Cotrim H., Cox K., Cubric-Curik V., Ekblom R., Godoy J. A., Konopiński M. K., Laikre L., Russo I.-R. M., Veličković N., Vergeer P., Vila C., Brajkovic V., Field D. L., Goodall-Copestake W. P., Hailer F., Hopley T., Zachos F. E., Alves P. C., Biedrzycka A., Binks R. M., Buiteveld J., Buzan E., Byrne M., Huntley B, Iacolina L., Keehnen N. L. P., Klinga P., Kopatz A., Kurland S., Leonard J. A., Manfrin C., Marchesini A., Millar M. A., Orozco-terWengel P., Jente O., Posledovich D., Spencer P. B., Tourvas N., Nahberger T. U., Hooft P., **Verbylaite R.**, Vernesi C., Grueber C. E. 2025. **Global meta-analysis shows action is needed to halt genetic diversity loss**. Nature, 638: 704–710. **IF – 48,5**
2. **Hussain M.**, Bisht A., Chaudhary M. N., **Ramzan K.**, **Zehra S. H.**, **Viškelis J.**, **Viškelis P.**, **Balčiūnaitienė A.**, Benjakul S. 2025. **Valorization of hemp biomass through green methods: A sustainable approach for next-generation food packaging**. Trends in Food Science & Technology, 165: 105295. **IF – 15,4**
3. Gruda N. S., **Samuolienė G.**, Dong J., Li X. 2025. **Environmental conditions and nutritional quality of vegetables in protected cultivation**. Comprehensive Reviews in Food Science and Food Safety, 124 (2): e70139. **F – 14,1**
4. **Ayaz M.**, **Muntaha S. T.**, Baltrėnaitė-Gedienė E., Kriaučiūnienė Z. 2025. **Biochar and carbon-negative technologies: exploring opportunities for climate change mitigation**. Biochar, 7: 17. **IF – 13,5**
5. Fritze H., Jauhiainen J., Bārdule A., Butlers A., **Čiuldienė D.**, Kamil-Sardar M., Kull A., Laiho R., Lazdiņš A., Samariks V., Schindler T., Soosaar K., **Vigricas E.**, Peltoniemi K. 2025. **Soil trenching – are microbial communities alike in experimental peatland plots measuring total and heterotrophic respiration?** Soil Biology and Biochemistry, 203: 109747. **IF – 10,3**
6. Hussain H., Sohail H., **Misiukevičius E.**, Zhu K., Cao Y., Gu Y., Zhang Q., Xu Y., Bai M., Wang J., Wei G., Feng L. 2025. **Engineering resilient roses: Molecular insights into biotic and abiotic stress adaptation**. Horticulture Research, https://doi.org/10.1093/hr/uhaf332. **IF – 8,5**
7. Samantara K., Ivandi E., Tulva I., Jalakas P., Doust B. K., Ingver A., Kärp M., **Brazauskas G.**, Bleidere M., Tamm I., Hõrak H., Merilo E. 2025. **Higher adaxial stomatal density is associated with lower grain yield in spring wheat**. New Phytologist, 248 (2): 454–460. **IF – 8,1**
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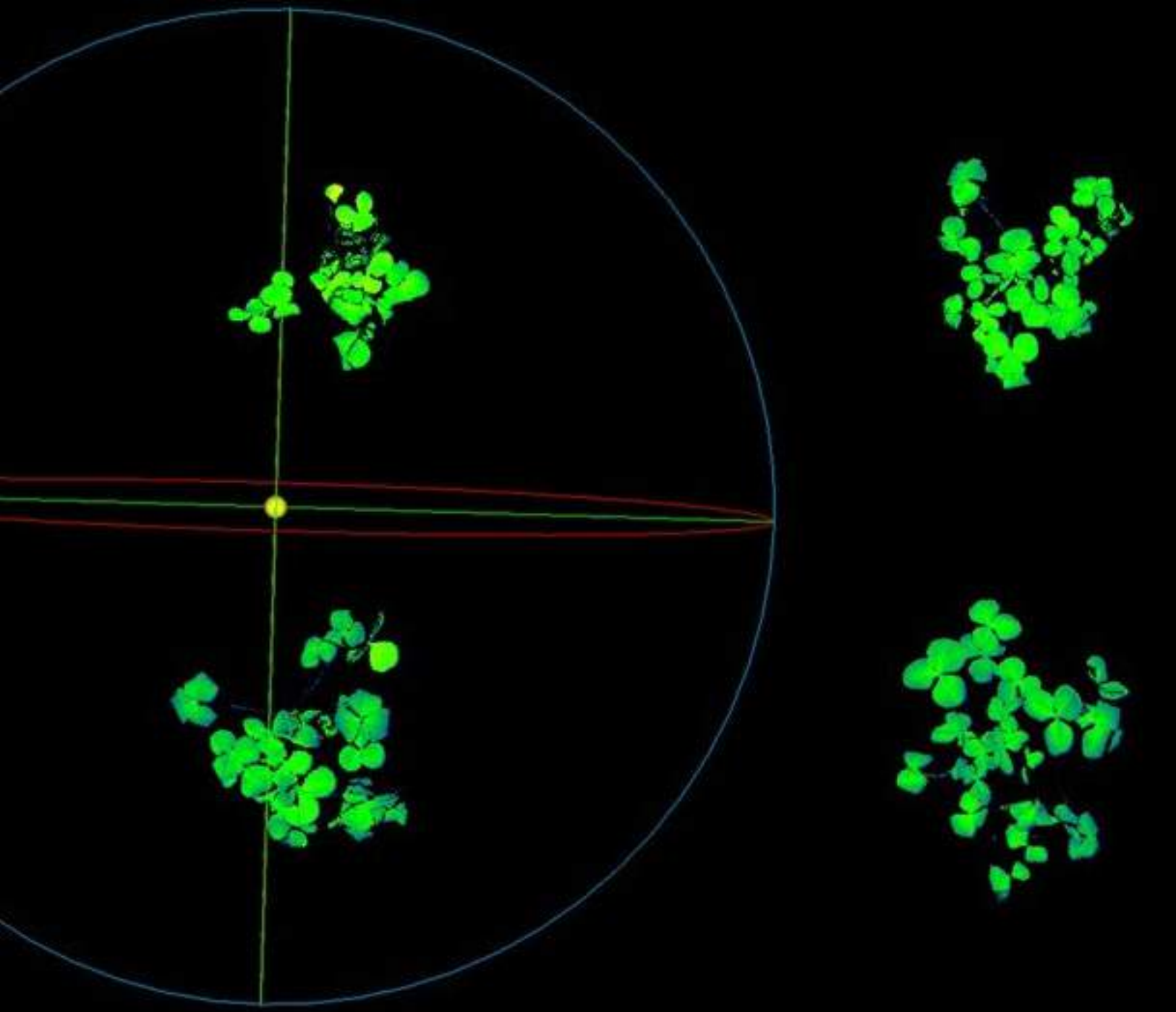

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