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INSTYTUT OGRODNICTWA

PROPOSAL

The National Institute of Horticultural Research

Skierniewice, July 2025

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The National Institute of Horticultural Research

1. General information about the unit

The National Institute of Horticultural Research (IO-PIB), situated in Skierniewice, is a leading research institution in Poland. For over 70 years, it has supported Polish producers of fruit, vegetables, and ornamental plants by conducting interdisciplinary research in all areas related to horticulture.
It employs 439 people, including 14 professors, 26 postdoctoral degree holders, and 79 PhDs.

2. Historical outline and international position

The National Institute of Horticultural Research was established on January 1, 2011, pursuant to a regulation of the Minister of Agriculture and Rural Development, by merging two research and development units with a long tradition and rich achievements: the Szczepan A. Pieniążek Institute of Pomology and Floriculture and the Emil Chroboczek Institute of Vegetable Crops. By decision of the Council of Ministers, on December 18, 2020, the unit received the status of a National Research Institute.

The Institute is an active member of the European Fruit Research Institutes Network (EUFRIN) and the Scientific Network "Agroengineering for Sustainable Agriculture, Agri-Food Industry, and Rural Areas – AgEngPol", as well as a founder and member of the Polish Food Technology Platform. The Institute actively participates in international

research projects on the Genetic Resources of Vegetable and Fruit Plants, including the creation of the European Core Collection of vegetatively propagated *Allium* species. It also maintains extensive international collaborations with research centers in the European Union, the United States, Canada, the Republic of China, and Eastern European countries. It is a member of numerous organizations and associations: the International Society for Horticultural Science (ISHS), the European Association of Cultivated Mushroom Producers, the European Weed Research Society, and others.

3. Scientific achievements and potential

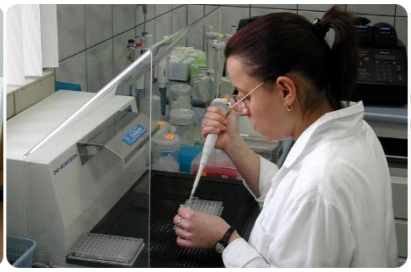
The National Institute of Horticultural Research has developed many innovative solutions on a global scale, significantly contributing to the development of Polish horticulture.

- ✓ Our institution is the country's leading center for fruit plant breeding. It also conducts breeding work on vegetable plants. The national register of varieties currently includes 153 varieties of fruit plants, 34 rootstocks, and 70 varieties of vegetable plants bred by IO-PIB.
- ✓ Thanks to understanding the biology of major pests and pathogens, as well as the genomic structure of numerous viruses and pathogenic fungi, IO-PIB has developed precise methods for their early detection. These methods form the basis for integrated and ecological cultivation methods, which enable the production of high-quality crops without pesticide residues.
- ✓ The institute has developed ecological technologies for producing high-quality propagating material and plants with increased yield potential. The institute is the creator of a technology patented in the Netherlands for improving the sowing value of seeds and protecting them against phytopathogens using pulsed radio waves.

- ✓ IO-PIB effectively combines science with the real needs of modern horticulture, successfully conducting pioneering work on innovative plant protection techniques, crop mechanization (including the use of artificial intelligence), and ecological management of crop residues, while also developing precise, energy-efficient, and environmentally friendly technologies.
- ✓ The computer-controlled irrigation and fertigation systems developed at the institute for plants cultivated under cover enable the rational use of limited water resources while ensuring high yields.
- ✓ The Institute is the only one in Poland conducting research on the use of Dynamically Controlled Atmosphere (DCA) in fruit and vegetable storage, with ongoing monitoring of ripeness using chlorophyll fluorescence (HarvestWatch). VIS/NIR techniques are also used for non-destructive fruit quality assessment.
- ✓ In response to market needs, there is a research underway on the use of fruit and vegetables for the production of functional foods with enhanced nutritional value.
- ✓ The Institute conducts interdisciplinary research in the field of beekeeping, supporting agriculture and food safety. The team develops innovative beekeeping methods and assesses the value of pollinators and the quality of bee products.

Throughout the entire period of its scientific and research and development activities, The National Institute of Horticultural Research has been classified in category A, which confirms the high quality of the scientific research conducted.

In 2024, IO-PIB employees published 98 scientific articles in renowned journals and presented their research results at international and national conferences (scientific and industry-specific): 154 times as oral presentations and 109 times as posters. They published 228 articles and 31 popular science monographs, 5 implementation proposals, and 10 methodologies. They developed 21 industry reports and 4 guidebooks. They delivered 172 lectures during specialized training courses.
They obtained 3 patents for inventions and submitted a further 15 applications for innovative solutions to the Polish Patent Office for consideration.
In 2024, two new apple varieties bred at the National Institute of Horticultural Research were entered into the National Register of Varieties (KR) and the Register of Exclusive Rights (KO), and interesting apple and raspberry genotypes were submitted for COBORU registration tests.


4. Scope of research activities and service potential

Main directions of IO-PIB's research and development activities include:

- conservation of horticultural plant genetic resources,
- breeding and seed production of horticultural plants,
- "clean" and climate- and environmentally neutral plant cultivation technologies,
- development and dissemination of rational fertilization principles,
- plant protection against pests,
- digital technologies and solutions that reduce labour and energy consumption,
- food and nutrition safety,
- beekeeping,
- technologies for commercial-scale organic horticultural plant cultivation,
- dissemination of research results and implementation of innovations.

A key element of the unit's organizational structure are ten research and development departments supported by a number of auxiliary units:

- Department of Agroengineering,
- Food Safety Laboratory,
- Department of Applied Biology,
- Department of Horticultural Crop Breeding,
- Department of Microbiology and Rhizosphere,
- Department of Plant Protection,
- Department of Cultivar Testing, Nursery and Gene Bank Resources,
- Department of Fruit and Vegetable Storage and Processing,
- Department of Apiculture in Puławy,
- Department of Plant Cultivation and Fertilization.

The unit's modern infrastructure includes laboratory facilities, greenhouses, orchards, experimental fields, and apiaries, which enable the conduct of a variety of experimental work under monitored conditions.

Our unit has collected extensive genetic resources of horticultural plants, including over 5,000 orchard plants, 11,300 vegetable plants, 1,210 ornamental plant genotypes, and 243 melliferous plants in Puławy. Passport and valuation data for the collected plants are integrated into a computer database in accordance with international standards and made available to various recipients in Poland and abroad.




IO-PIB systematically expands its research and development resources. In response to practical needs, the unit is establishing innovative R&D CENTERS, places where research is not only conducted but there are also addressed challenges related to modernizing and creating technologies and products that meet the expectations of today's market:

- **HortiFood Processing Centre (CPPO)** conducts research and creates innovations in the design of fruit and vegetable-based food products, on a semi-technical scale, using current and promising technologies that guarantee high quality and safety. The Centre houses a sensory and consumer research laboratory focused on researching consumer preferences for processed fruit and vegetable products.

- **Regional Centre for Horticultural Biodiversity (RCBO)** supports the protection and conservation of unique horticultural plant resources by preserving seeds from a wide range of genotypes – amateur and regional vegetable varieties, generative rootstocks of fruit plants, native shrubs and ornamental perennials, melliferous plants, wild species related to horticultural plants, and companion plants.

- **Centre for Innovative and Sustainable Horticultural Technologies (CIZTO)** brings together interdisciplinary research teams working to solve the most important and crucial economic problems of environmental nature for horticultural production. The CIZTO laboratory complex offers research services based on the latest analytical methods to the horticultural sector.

- **Laboratory of Postharvest Physiology of Horticultural Products (LFPPO)** conducts research on the development and impact of innovative storage technologies on the quality and shelf life of fresh and minimally processed horticultural products. It also conducts research on the use of edible coatings and MAP packaging. Its work is closely related to reducing food losses and waste at all stages of the distribution chain.

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The Institute houses **three accredited research laboratories**:

- **Food Safety Research Laboratory (ZBBŻ)**
  The laboratory conducts scientific research and provides services in the field of determining pesticide residues in food, agricultural products, and environmental samples (water, soil), also for external entities, including: food producers and processors; food exporters to various EU and other countries (e.g., the USA, China, Canada); food importers bringing goods to Polish stores (e.g., tea, bananas, raisins, citrus fruits, etc.); certification bodies, e.g., for organic farms, to confirm the absence of prohibited chemical residues of pesticides; and plant protection product manufacturers for registration purposes at the national and EU levels in accordance with Good Laboratory Practice. In December 2024, the Department moved to a new, modernly designed facility, part of the Green Laboratory Complex. This facility was built as part of the National Recovery and Resilience Plan (KPO) under the "Investment in Expanding Research Potential" initiative. The ZBBŻ was equipped with advanced research equipment and a Laboratory Information Management System (LIMS), significantly expanding the Department's operational capabilities and improving the quality of its research.

- **Horticultural Product Quality Testing Laboratory (LBJPO)**
  conducts scientific research and provides services, including: analyses of agricultural products and food (including fruits, vegetables, mushrooms, cereal products, herbs, pickles, beekeeping products, spices, extracts, juices, nectar, dried fruit) and plant material (leaves, shoots, roots).
  The scope of analyses performed at LBJPO includes the determination of the following: macronutrients (phosphorus, potassium, magnesium, calcium) and micronutrients (boron, copper, zinc, iron, manganese, sodium, molybdenum), nitrates (V) and nitrites (III), fats, sugars, salt, protein, vitamin C, dietary fiber [total

(TDF), soluble (SDF), insoluble (IDF)], and heavy metals (cadmium, lead, mercury, nickel, chromium, and arsenic).
LBJPO also performs analyses necessary to calculate the energy and nutritional value of food products for labelling purposes. This service is aimed at food producers who wish to introduce their products to the Polish and European markets.
In addition, LBJPO offers services in the analysis of:

- soil and horticultural substrates, including: soil pH, salinity, macronutrient and micronutrient content, organic matter, nitrogen, and heavy metals;
- water and nutrient solutions – for irrigation of horticultural crops;
- mineral and organic fertilizers – macronutrient and micronutrient content, and heavy metals.

- **Bee Products Quality Testing Laboratory in Puławy (LBJPP)**
conducts scientific and research activities and provides services in the field of bee product quality testing, including:
  - testing the quality and identification of honey varieties, including determining the dominant pollen and determining the full pollen species composition with confirmation of geographical origin,
  - detecting wax adulteration,
  - testing the quality of commercially available products recommended for bee feeding,
  - testing the health properties of other bee products.

  Like the ZBBŻ, the LBJPP has also moved to a new location, which is the second facility in the Green Laboratory Complex. It has also been equipped with modern equipment and a LIMS system, enabling analyses to be conducted in accordance with the highest quality standards and efficient laboratory data management.




Combined with the expertise of experienced staff with highly specific skills, this facility guarantees the performance of a wide range of tasks essential for planning and implementing state policy, as defined by specific government programs.

Implemented international quality systems

IO-PIB holds:

- **3 accreditation certificates issued by the Polish Centre for Accreditation:**
- international accreditation certificate since 2006 for the Food Safety Laboratory (No. AB 757);
- accreditation certificate since 2006 for the Bee Products Quality Testing Laboratory (No. AB 715);
- accreditation certificate since 2018 for the Laboratory of Quality Investigation of Holticulture Products (No. AB 1688).

All of the above-mentioned laboratories undergo annual evaluations of their performance within their current scope of accreditation and have the option of expanding it.

- certificate of compliance with the principles of Good Laboratory Practice (Statement of GLP Compliance) in the scope of: residue testing (analytical part), registration number 5/2022/DPL valid from 23 May 2022, issued by the Office for Chemical Substances;
- certificate of organic plant production conducted at the Organic Experimental Orchard (Nowy Dwór-Parcela) and at the Organic Experimental Field (Skierniewice) issued by AGRO BIO TEST Sp. z o.o.
- Certificate of organic beekeeping production for the Organic Apiary of the Department of Apiculture in Puławy issued by Ekogwarancja PTRE Sp. z o.o.

Official Testing for Plant Protection Product Residues in Organic Agriculture

The Food Safety Laboratory of the Institute of IO-PIB has held the status of Official Laboratory for Plant Protection Product Residue Testing in Organic Agriculture since 2015. In carrying out its assigned tasks, it collaborates closely with the Organic Agriculture Division of the Department of Plant Breeding and Protection of the Ministry of Agriculture and Rural Development, the Chief Inspectorate of Agricultural and Food Quality, and certification bodies in organic farming.

Authorization of the Chief Inspector of Plant Health and Seed Inspection (GIORiN) to conduct specialized research

The IO-PIB has eight research teams authorized by GIORiN to conduct specialized research to assess:

- **the effectiveness of plant protection products:**
  1. against diseases of vegetable plants;
  2. against diseases of vegetable plants;
  3. against diseases of ornamental plants;
  4. from the group of herbicides and growth regulators;
  5. from the group of growth regulators
- the effectiveness of
  6. bioregulators;
  7. zoocides, nematicides, bioregulators and herbicides;
- 8. and to conduct research and development using quarantine pathogens.

The National Institute of Horticultural Research is an entity authorized by the Decision of the Minister of Agriculture and Rural Development (Journal of Laws of 2020, item 2097) to prepare assessments and reports on the physical, chemical and technical properties of plant protection products, their effectiveness and impact on human and animal health resulting from the use of plant protection products and pesticide residues in food and feed of plant and animal origin, as well as the fate and behavior of the product in the environment.



IO-PIB service proposal

- Analyzing pesticide residues in food, agricultural products, and environmental samples (water, soil) – accredited methods;
- Quality testing, determining the composition and physicochemical properties of bee products, and identifying honey varieties – accredited methods;
- Testing for macro- and micronutrients, nitrates (V) and (III), arsenic, and heavy metals (cadmium, lead, mercury), dry matter, and dietary fiber – accredited methods;
- Evaluating the effectiveness of new fungicides, zoocides, nematicides, herbicides, bioregulators, adjuvants, and plant growth and development regulators that may be approved for use in fruit, vegetable, and ornamental plant production;
- Diagnosing diseases of fruit, vegetable, and ornamental plants caused by fungi, bacteria, viruses, and phytoplasmas (within the Plant Disease Laboratory);
- Developing horticultural plant protection programs;

- Evaluation of the suitability of fertilizers and other horticultural crop cultivation aids marketed in Poland
- Testing the content of macro- and micronutrients in plant material, soil, horticultural substrates, and nutrient solutions;
- Microbiological analyses of soil and substrates;
- Research confirming the varietal identity and genetic stability of selected horticultural plant species using molecular markers;
- Development of consortia of beneficial microorganisms that stimulate plant growth and yield;
- Microscopic and cytological analyses;
- Development of micropropagation procedures for horticultural plants;
- Research and creation of innovations in the design of fruit and vegetable-based food products;
- Analyses and calculations for energy and nutritional value tables for food product labels;
- Consumer preference research for innovative fruit and vegetable products based on the sensory and consumer research department;
- Production of certified propagation material for IO-PIB varieties;
- Functional testing of plant protection equipment;
- Comprehensive film and streaming services – production of educational, instructional, and popular science videos, as well as broadcasts of training courses and events.

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Modern Research Equipment at the National Institute of Horticultural Research
The National Institute of Horticultural Research (IO-PIB) has modern research and analytical facilities and high-quality equipment, enabling comprehensive scientific and implementation work. Detailed information about laboratory equipment and available technical infrastructure can be found on the website: https://www.inhort.pl/wp-content/uploads/2024/02/WYKAZ-INFRASTRUKTURY-BADAWCZEJ-Instytutu-Ogrodnictwa-PIB.pdf

5. Examples of ongoing projects

The National Institute of Horticultural Research actively participates in the implementation of research projects awarded through competitive procedures and funded by domestic and foreign institutions (including the Ministry of Agriculture and Rural Development, the Ministry of Science and Higher Education, the National Science Centre, the National Centre for Research and Development, the Agency for Restructuring and Modernization of Agriculture, as well as from structural funds, including the Smart Growth Operational Programme, the Infrastructure and Environment Operational Programme, the Regional Operational Programme, the Rural Development Programme, and the European Union framework programmes – HORIZON 2020 and HORIZON EUROPE). These include projects such as:

International Projects

- ECONUTRI – "Innovative concepts and technologies for ECOlogically sustainable NUTRIent management in agriculture aiming to prevent, mitigate and eliminate pollution in soils, water and air (HORIZON EUROPE);
- B-THENET – "Best practices and innovations for a sustainable beekeeping" (HORIZON EUROPE);
- HORTIQD – "Automated monitoring in horticulture through spectral analysis with the quantum dot detectors and high resolution optical filters " (HORIZON EUROPE);
- SPIN-FERT – "Innovative practices, tools and products to boost soil fertility and peat substitution in horticultural crops" (HORIZON EUROPE);
- HortiFoodTrends – "Networking for excellence in the development of innovative, consumer-oriented horticultural food products using the Living Lab approach" (HORIZON EUROPE);

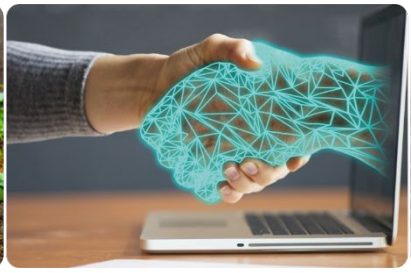
National Projects

- HARVBOT – "An economical, autonomous, modular machine for apple identification and harvesting using artificial intelligence" (INFOSTRATEG IV);
- SELOR – "A selective plant protection system using hyperspectral imaging and neural networks for pest identification and control of a new-generation sprayer" (INFOSTRATEG VI);
- WORZ – "Support for the observation of pollutant distribution in agriculture" (INFOSTRATEG VI).

The National Institute of Horticultural Research ranked second among Polish research institutes in the 2024 Horizon Europe funding effectiveness ranking.

During the 3rd "SCIENCE FOR SOCIETY" Congress (May 25-26, 2025), our staff received three awards for developing:
- "Pantoea Care Microbiological Product Improving the Health of Horticultural Crops" – the result of work carried out as part of the BioSafeFood project (Smart Growth Operational Program) by Laboratory of Phytopathology of the IO-PIB Plant Protection Department in collaboration with Intermag Sp. z o.o.;
- "AGREUS Wireless Irrigation Management System," developed through collaboration between Inventia and the IO-PIB Laboratory od Irrigation, financially supported by the Regional Operational Program of the Mazowieckie Voivodeship (e-Sad project);
- "Internet Platform for Irrigation Decision Support", created by the Irrigation Workshop Team of IO-PIB thanks to funding under the Multiannual Program and the Targeted Subsidy of the Ministry of Agriculture and Rural Development.

During the Medal Gala of the AGROTECH International Fair of Agricultural Technology in Kielce (March 14, 2025), the AGRO IMPULS statuette, awarded by the Main Board of the Scientific and Technical Association of Agricultural Engineers and Technicians, was presented to the team from the IO-PIB Fruit and Vegetable Storage and Processing Department for developing the EcoDryCool system. This system, characterized by high efficiency in both energy savings and an environmentally friendly approach to cooling, was developed as part of the LFFPO project funded by the European Regional Development Fund, as a result of our collaboration with Thermolux Polska.


6. Opportunities for collaboration

The National Institute of Horticultural Research is open to collaboration with:

- research institutions and universities,
- agricultural advisory centers,
- schools supervised by the Minister of Agriculture and Rural Development,
- the processing and horticultural industries,
- producers of plant protection products and fertilizers,
- public administration, including the Polish Chamber of Plant Protection and Inspection (WIORiN) and agricultural chemical stations,
- international partners and industry organizations.

We offer:

- a flexible approach to R&D projects,
- joint implementation of national and international grants,
- pre-registration research and efficacy testing of plant protection products,
- development of fruit and vegetable processing technologies,
- expert opinions and commissioned work,
- full substantive, technological, and analytical support in creating innovative products and processes.

7. Contact details

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