



Caroline Wintberger © University of Tours

 Val de Loire
Centre

INRAE



Presentation of the **Val de Loire centre**

October 2024



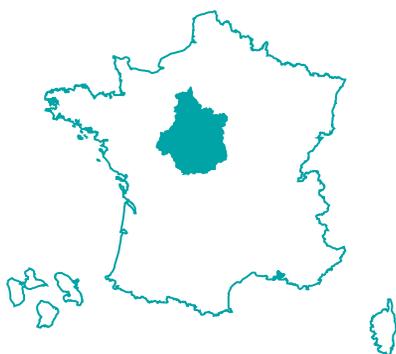
Marc Guérin
President
Val de Loire Research Centre
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"With research units in Orléans, Tours, Nogent-sur-Vernisson, and Bourges, INRAE Val de Loire explores the biology of animals, trees, and their organismal associates as well as animal health and the sustainable management of livestock, forests, and soils."

VAL DE LOIRE RESEARCH CENTRE

INRAE's Val de Loire Research Centre is staffed by 767 people, including 556 permanent employees. It conducts generalised research as well as integrated, multidisciplinary studies, work that fuels innovative approaches for increasing the sustainability of natural resources, agricultural systems, forestry systems, and their concomitant biodiversity. The centre's technological platforms make it possible to carry out analyses across different scales: from molecules and individuals all the way to populations and ecosystems. Its imaging systems allow the visualisation and monitoring of physiological and pathophysiological mechanisms over time. With its 1,500 hectares of experimental facilities, the centre is well equipped to develop new models and study genetic, animal, plant, and microbial resources, resulting in highly original data. This work also lays the foundation for testing new sustainability-oriented solutions, such as the anaerobic digestion of effluent.

The Val de Loire Research Centre focuses on themes that are crucial to the future of agriculture. It runs one of the largest animal health research facilities in Europe and is involved in numerous international collaborations, notably via its coordination of three European projects and its participation in three international associated laboratories (LIAs) with institutes in Argentina, Canada, and China.



A UNIFIED IDENTITY

Over 12% of the scientists found in the region are INRAE Val de Loire employees, positioning the centre at the heart of research in Centre-Val de Loire. Significant numbers of staff work at the centre's sites in Tours and Orléans, helping to foster collaborations with the local universities. These partnerships benefit from the centre's vast array of research programmes, experimental facilities, technological platforms, genetic resources, animal models, and forestry models.

REGIONAL COHESIVENESS

Tackling high-level regional research questions, the centre brings together researchers working on infectious diseases and natural resource management. Its activities are aligned with the region's three tech-focused strategies: developing environmental engineering and metrological methods for managing activities that drain natural resources; constructing biotechnologies and applied health services; and promoting services as well as information and communication technologies around heritage tourism. INRAE Val de Loire's collaborations with private partners are broadly supported by local and regional authorities with a view to fostering economic development.

Our main regional partners



Our research priorities >

1 SOIL DYNAMICS AND ENVIRONMENTAL MANAGEMENT

2 INTEGRATIVE BIOLOGY OF TREES AND ASSOCIATED BIODIVERSITY FOR THE SUSTAINABLE MANAGEMENT OF FOREST ECOSYSTEMS

3 INFECTIOLOGY AND ONE HEALTH

4 INTEGRATIVE ANIMAL BIOLOGY AND THE SUSTAINABILITY OF FARMING SYSTEMS



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Soils are essential to agricultural production and environmental health, and soil research is crucial for sustainable development.

Our researchers study the interactions between the physical properties of soils, soil greenhouse gas emissions, and the quantitative management of water resources. Nationally, our research teams are leading programmes to map and monitor soils as well as programmes to manage soil-focused information systems, environmental research observatories, and cropping system practices.

➤ Research unit:

- Info & Sols

➤ Joint research facilities:

- European Conservatory for Soil Samples (CEES)
- Rain simulator
- LabEx VOLTAIRE
- ANAEE-S project for biology and health infrastructure
- Platform for studying soil-atmosphere exchanges on agricultural soils (PESAA)
- MiDi regional thematic network (Environment and Diversity)

➤ Academic partners:

- French Geological Survey (BRGM)
- University of Orléans
- CNRS

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© Grégoire Maisonneuve

To ensure the sustainability of forest resources and biodiversity, our teams study wood formation mechanisms at different scales, utilising diverse phenotypic and genomic measurements. We are also exploring how forests' genetic resources can boost the sustainability of wood production systems in the face of climate change.

➤ Research units:

- Integrated Biology for the Development of Tree and Forest Diversity–Joint Research Unit (BioForA)
- Forest Ecosystems Research Unit (EFNO), Nogent-sur-Vernisson
- Forest Zoology Research Unit (URZF)
- Laboratory for Physiology, Ecology, and the Environment (P2E)–Research Unit Under Contract

➤ Experimental unit:

- Genetics and Forest Biomass Facility (GBFOR), Orléans

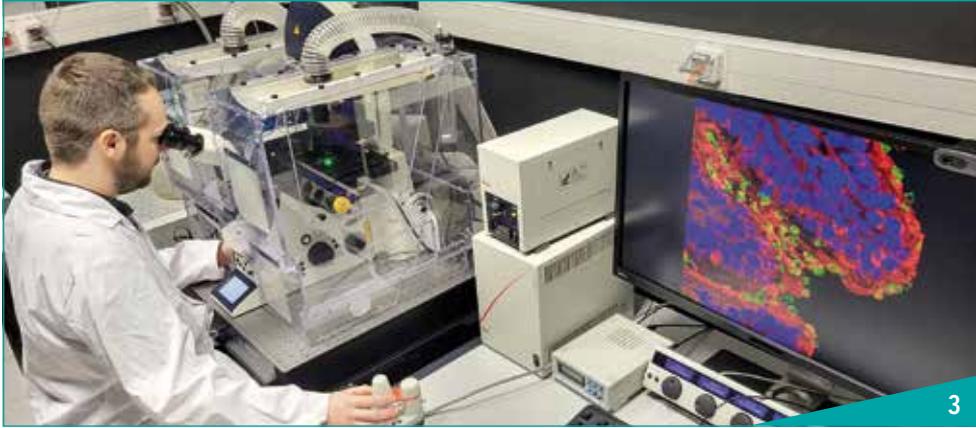
➤ Joint research facilities:

- PHENOBOIS platform
- Oak Pine Tree Mixture (OPTMix) Experimental Facility
- EquipEx XYLOFOREST
- GENIUS biotechnology and bioresources project
- Sycomore programme for connected and precision forestry
- EntomoCentre regional thematic network
- MiDi regional thematic network (Environment and Diversity)
- IN-SYLVA France–national research infrastructure for adaptive forest management
- Invasive Forest Pests in Eurasia (IFOPE)–a French-Chinese LIA
- FORESTIA–a French-Argentine LIA

➤ Academic partners:

- University of Orléans
- University of Tours
- CNRS
- French National Forests Office (ONF)

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One Health is a concept that treats animal, human, and environmental health as interconnected. Our infectious disease research thus takes three complementary approaches:

- Understanding host responses
- Studying pathogens "under stress", focusing on mechanisms of antibiotic and antiparasitic resistance
- Developing research to clarify 1) pathogens' evolutionary mechanisms in the environment and on livestock farms and 2) the population-level developmental dynamics of diseases within ecosystems

➤ **Research unit:**

- Joint Research Unit for Infectious Diseases & Public Health (ISP)

➤ **Experimental unit:**

- Infectiology Platform (PFIE)

➤ **Joint research facilities:**

- LabEx MAbImprove
- Biological Resource Centre for Pathogenic Bacteria (CIRM-BP)

More information about our current events and research
www.inrae.fr/en/centres/val-de-loire

- Federation for Infectious Disease Research (FéRI)
- National research infrastructure for the control of emerging or zoonotic animal infectious diseases through in vivo investigation (Emerg'in)

➤ **Academic partners:**

- University of Tours

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Livestock systems must incorporate the three tenets of sustainable development: economic feasibility, to ensure industry competitiveness; social stability, to promote the coexistence of small and large farms; and environmental sustainability, to limit inputs and manage landscapes. To this end, our researchers carry out fundamental and applied research on livestock reproductive functions, reproductive behaviours, and social behaviours. We generate academic knowledge and address societal concerns, particularly around livestock welfare, and we are developing innovative ways to improve breeding efforts and animal social dynamics. Research is also being carried out on poultry physiology and genetics to improve the sustainability of poultry farming systems.

➤ **Research units:**

- Joint Research Unit for Reproductive Physiology and Behaviour (PRC)
- Joint Research Unit for Avian Biology & Poultry Research (BOA)

➤ **Experimental units:**

- Small Ruminant Phenotyping Experimental Facility (P3R)
- Animal Physiology Facility (PAO)
- Poultry Experimental Facility (PEAT)

➤ **Joint research facilities:**

- PIXANIM platform (phenotyping & in/ex vivo imaging from the animal to the molecule)

- LabEx MAbImprove
- Biological Resource Centre for Domestic Animals (CRB Anim), part of AgroBRC-RARe National Research Infrastructure
- Nutri-Mod—a French-Canadian LIA

➤ **Academic partners:**

- University of Tours
- CNRS
- French Horse and Riding Institute (IFCE)
- Tours Regional University Hospital (CHU Tours)



➤ PARTNERSHIPS, ADDING VALUE, INNOVATION

Socioeconomic and agricultural partnerships

INRAE's Val de Loire Research Centre hosts more than 30 employees that are affiliated with the centre's agricultural collaborators and is developing partnerships with various chambers of agriculture.

It also harbours four start-ups that grew out of the centre's work. Two are winners of the national I-LAB innovation competition co-organised by BPIFrance and the French Ministry of Higher Education, Research, and Innovation. INRAE Val de Loire is committed to strengthening socioeconomic partnerships, an objective that is partially financed by local and regional governments. As a result, the Eliance Federation has a team working onsite to study methods for facilitating livestock reproduction. The centre also houses the headquarters of various professional collaborators, including those of SYSAAF, the French Poultry and Aquaculture Breeders Association, and of Fibois Centre-Val de Loire (CVL), the region's interprofessional organisation for the wood industry. It also runs an anaerobic digestion facility for recycling animal effluent. In addition, space is made available to research or professional collaborators who wish to use the centre's various platforms.

Higher education

Our researchers contribute to two master's programmes in forestry and animal science: 1) Infectiology, Immunity, Vaccinology, and Biomedicines and 2) Sustainability and Quality in Animal Production Industries. They also contribute to the three options for the Biology-Health master's programme: 1) Reproductive Biology, 2) Cognition, Neurosciences, and Psychology, and 3) Physiopathology. Finally, they play a role in the master's programme Agrosocieties, Environment, Regions, Landscapes, and Forests that is offered by the University of Orléans.

The centre's researchers also participate in the Erasmus Mundus master's programme Infectious Diseases and One Health, which is jointly taught by universities in Tours, Barcelona, and Edinburgh.

Innovation

Our centre is involved in six projects funded by France's Investments for the Future Programme:

- Loire Val-Health, an ExcellencES project that is an interdisciplinary research and teaching alliance in human and animal health in the Loire Valley, and VOLTAIRE, a laboratory of excellence (LabEx) that is nourished by the centre's high-quality regional partnerships and that examines exchanges among soil, water, and air, with particular attention paid to gases

- Three network-based projects:

- CRBAnim, focused on the preservation of animal genetic resources
- EquipEx XYLOFOREST, exploring the properties and functional genomics of wood in tandem with GENIUS, a molecular engineering project
- Sycomore, a programme for connected and precision forestry, coordinated by the centre as part of the region's research and development efforts (ARD CVL) aimed at developing new forest management practices

- ANAEE-S centred on infrastructure for ecosystem-level analysis and experimentation.

Collective scientific facilities and infrastructures

INRAE Val de Loire Research runs four facilities of international importance:

- European Conservatory for Soil Samples (CEES), which is managed by the Info & Sols research unit as part of the scientific interest group for soils (GIS Sol), responsible for gathering monitoring data at 2,200 sites in France

- France's largest experimental infectiology platform, which is ISO 9001:2000 certified and possesses animal experimentation facilities with A2 and A3 containment levels

- PIXANIM, a phenotyping and imaging platform that uses in vivo and ex vivo technologies for exploring animals at various scales, from whole individuals to individual biomolecules; it is ISO 9001 certified (2015) and has a 3Tesla MRI and scanner for studying the neurobiology of animal reproduction and behaviour or for monitoring infectious processes within individual animals

- Tree Cellular Engineering Laboratory (LICA), which is managed by the BioForA research unit; this facility is a combined laboratory and greenhouse that produces and characterises trees transformed or modified via cellular engineering.

Focus on...

PIXANIM, a joint imaging platform



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PIXANIM is an experimental and analytical platform that provides services in the areas of agricultural research, medical research, training, and innovation. Its technologies can be used to explore biological systems at various scales, from the whole animal to the biomolecule, using non-invasive and ex vivo methods to phenotype biological systems and characterise the underlying molecular mechanisms. PIXANIM is equipped to handle a variety of animal models and has facilities for conducting long-term studies. Its multiscale and multimodal approaches include magnetic resonance imaging (MRI), CT scan, laser endomicroscopy, 3D Doppler ultrasound, and mass spectrometry. Guided by the One Welfare concept, PIXANIM provides support to agricultural researchers, medical researchers, educators, and innovators.

Important Impacts of INRAE Val de Loire Research



Our research informs public policy. The centre's work influences soil management and classification as well as the integrated management of plant and animal health, notably efforts to limit the establishment and spread of invasive invertebrate populations.

We are developing and maintaining new genetic resources for plants and animals that the agricultural industry can use to promote disease resistance, adaptability, and sustainability. Our centre performs targeted studies of physiological and pathophysiological mechanisms at the cellular level, which can guide treatment development in veterinary and human medicine.

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➤ INRAE: AN OVERVIEW

The French National Research Institute for Agriculture, Food, and Environment (INRAE) is a major player globally in research and innovation. Gathering a community of **12,000 people** with **274 units** including fundamental and experimental research, spread out throughout **18 regional centres** in France.

Internationally, **INRAE is among the top research organisations in agricultural and food sciences, plant and animal sciences, as well as in ecology and environmental science.** It is the world's leading research organisation specialising in **agriculture, food and the environment.**

Faced with a growing world population, climate change, the depletion of resources and declining biodiversity, the Institute has a major role to play in providing the knowledge base supporting the necessary acceleration of **agricultural, food and environmental transitions**, to address the **major global challenges.**

➤ VAL DE LOIRE CENTRE: KEY FIGURES

Teams

8 research units, including 4 joint research units,

5 experimental units, and **2** research support units

556 permanent staff (👤 51 %, 👤 49 %)

211 contract staff (👤 58 %, 👤 42 %)

255 partner staff in the centre's different units

Resources

€71.5 million budget of which €16.4 million in own resources (contracts and revenue)

Results (2023 figures)

12 new contracts with private partners

Coordination of **2** European projects

400 publications in peer-reviewed journals

➤ MAP OF THE VAL DE LOIRE RESEARCH CENTRE



➤ Val de Loire Research Centre

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