



## Pays de la Loire Centre

April 2020

INRAE



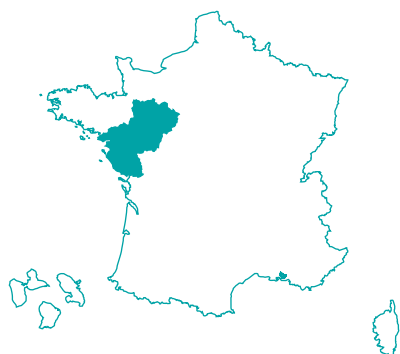
**Emmanuelle CHEVASSUS-LOZZA**  
President of the Pays de la Loire centre

“Located in the heart of an outstanding agricultural, horticultural and agri-food production area, the Pays de la Loire INRAE centre has built its identity on the sustainable management of healthy farming (crops and livestock), sustainable processing of agricultural bio-resources (food and materials) and the health and nutritional quality of food. These areas are key issues for human health.”

### PAYS DE LA LOIRE RESEARCH CENTRE

INRAE is the second-largest public research organisation in Pays de la Loire. Working with our five privileged academic partners, our science policy is implemented by a community numbering more than 1,000 individuals, over 100 of whom hold doctorates. Its 13 research units draw on two federative research structures, technical platforms and units, biological resource centres and an experimental unit comprising 70 hectares of orchards. Lastly, it enjoys a privileged relationship with the GEVES (the French Variety and Seed Study and Control Group), with two-thirds of this organisation’s staff working in Anjou.

**The research units enjoy a prominent international profile, with 75% of publications made in collaboration with at least one institution abroad, involvement in 35 European projects, attendance at the Dioxin 2020 (International Symposium on Persistent Organic Pollutants) in Nantes, the International Horticultural Congress IHC 2022 in Angers, the ICEF14 (International Conference on Engineering of Food) in 2023 in Nantes, and the annual Summer School Plant Health and Quality in Angers.**



### ONE CENTRE, TWO SITES

The INRAE Pays de la Loire Centre works within the framework of the two sites.

In Nantes, the centre works in partnership with the site, the aim being to turn the metropolitan area into a university location with international standing, recognised for its expertise in research, education and innovation in two major and interdisciplinary social issues: future health and future industry. The centre is also a long-standing stakeholder in the “Technocampus de l’Alimentation”, which works to develop links between businesses, research and education. In Angers the centre is a long-standing stakeholder in the Plant Campus, a recognised ecosystem for integrating Education/Research/Innovation in this French university attended by the largest number of individuals studying for plant-related qualifications.

### CONTEXT AND OUTREACH

The centre drew up its roadmap for 2018-2022 aiming for complementarity and coordination in France’s Grand Ouest region, working with the Brittany-Normandy INRAE centre. The themed positioning of our research work is fully in line with the area focused on by Pays de la Loire region in the smart specialisation strategy laid down in the 2014-2020 regional plan for Higher Education, Research and Innovation. At the inter-regional level, the centre works with the region of Brittany which, along with the Pays de la Loire region, is the leading French and European agricultural, horticultural and agri-food production area.

### Our regional partners



# Our research priorities >

## 1 PLANT BIOLOGY AND SUSTAINABLE MANAGEMENT OF HORTICULTURAL CROPS AND SEEDS

## 2 BIO-RESOURCE ENGINEERING FOR INNOVATIVE FOODS AND MATERIALS

## 3 ANIMAL HEALTH - FOOD SAFETY - FOOD - HUMAN HEALTH: BIOLOGY AND INTERACTIONS

## 4 THE ECONOMICS OF FARMING AND AGRI-FOOD INDUSTRIES, PUBLIC POLICIES FOR AGRICULTURE AND THE ENVIRONMENT

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The quality and health of horticultural products and seeds is a key factor in developing highly effective, healthy and sustainable production systems in these sectors, both for food and ornamental plants. The sectors in question are characterised by a broad spectrum of production systems and intensive production methods in rural, suburban and urban settings. Achieving quality is dependent on efficient, integrated management of development processes for both plants and their resistance to aggression, as well as seamless management of the pathogens themselves.

Our work focuses on the ornamental or organoleptic quality of specialised plant production, on biodiversity and the evolutionary ecology of phytopathogens, and also on seeds quality and biology. It primarily uses genomic, post-genomic and epigenetic approaches and puts the centre among leading organisations in France, particularly in the following areas: roses and other ornamental varieties, fruit and vegetables, in particular pome plants, and seeds. This work is rounded off by neuroethological approaches to the action modes of insecticides and insect repellents. Lastly, on the system level and in the field of agri-ecology, research is carried out on designing growth systems that are innovative, self-sufficient in nitrogen and less dependent on herbicides.



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### Research units:

- Research Institute of Horticulture and Seeds (IRHS) joint research unit
- Two teams from the biopolymers, interactions and assemblies (BIA) research unit
- Contracted unit working on ion channel and receptor functional signalling (SIFCIR)
- Contracted unit working on pulses, plant ecophysiology and agri-ecology (LEVA)
- One team from the joint research unit working on biodiversity, agri-ecology and landscape planning (BAGAP)\*
- One joint research unit with the Institute of Genetics, Environment and Plant Protection (IGEPP)\*

### Experimental units:

- Horticultural experimental unit (HORTI)
- GEVES experimental units

### Collaborative scientific structures:

- Collaborative scientific structures:
  - Plant quality and health federated research structure (QUASAV)
  - BiogenOuest network of regional strategic platforms
  - PHENOTIC (IRHS) phenotyping platform, IBI SA label
  - Experimental facilities with greenhouses and growth rooms (IRHS)
  - International centre for microbial resources - French collection of Plant associated bacteria (CIRM-CFBP), IBI SA and ISC certified
  - Biological resource centre for pome fruit and roses (CRBRosePom)
  - Biological resource centre for carrots and other *Apiaceae* vegetables
  - STRAtège joint technological unit
  - Nova<sup>2</sup>Cidre joint technological unit
  - LabCom MATCH
  - LabCom ESTIM (2016-2019)

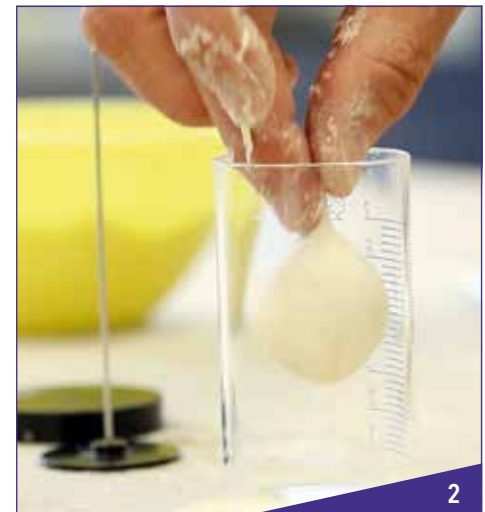
### Academic partners:

- Agrocampus Ouest
- Angers University
- Esa

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Against a backdrop of changing demographics and diet habits, environmental and energy considerations, and increasing awareness of the impact these factors have on public health, stakeholders in agriculture, agri-food and agri-forestry in the 21<sup>st</sup> century need to face up to a major challenge for the sustainability of production and food chains.

Our work focuses on the sustainable processing of agricultural resources and plant biomass. The aim is to understand the construction and breakdown stages of biopolymer assembly (proteins, polysaccharides) and biomolecules (lipids, phenolic compounds) in plant organs, food formulations and bio-sourced materials. This involves improving the qualities and features of native agricultural resources and developing new features via food (liquid mousses, honeycomb solids, emulsions, gels, films, particles, etc.) and non-food (bio-sourced composite materials) processing. Finally, our research encompasses product quality in conjunction with expert and consumer insight, and the co-design and co-development of differentiated quality products across the value chain.



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### Research units:

- Biopolymers, interactions and assemblies (BIA) research unit
- Agri-food products and processes research group (GRAPPE) contracted unit

### Collaborative scientific structures:

- Biopolymer engineering for structuring matrices and materials (IBSM) federated research structure
- BiogenOuest network of regional strategic platforms
- Biopolymers structural biology platform (BIBS) (BIA RU), IBI SA certified
- Nova<sup>2</sup>Cidre joint technological unit

### Academic partners:

- Oniris
- Nantes University
- Inserm (National Institute of Health and Medical Research)
- Esa



**Our work contributes on the one hand to integrated management of animal health and its impact on our diet, and on the other to understanding the relationship between human health and what we eat. Involved in this idea of "One health", the centre's units also contribute to strengthening the link between animal health and human health.**

In livestock farming (cattle, pigs, poultry and freshwater salmon farming), we research the mechanisms by which communicable diseases appear and spread at individual, population and territory levels. With respect to the food chain, foods' nutritional and health safety (a key factor in public health issues) is analysed across several different levels: i/ Assessing and managing microbial risks in meat and seafood products (campylobacter and *Listeria monocytogenes* as well as contaminating bacterial communities); ii/ Measuring external exposure to chemical contaminants via foods and their packaging, as well as internal exposure; iii/ Understanding foods' allergenicity via the structure of each allergen and the impact of food processing, and iv/ Measuring and forecasting nutritional impact in the first 1,000 days from conception. Lastly, research into innovative biotherapy at the frontier between animal and human health rounds off this line of research (hereditary diseases and type 1 diabetes).

#### 🔍 Research units:

- Biology, epidemiology and risk analysis in animal health (BIOEPAR) joint research unit
- Laboratory for the study of residues and contaminants in foods (LABERCA) joint research unit

- Physiopathology of nutritional adaptations (PHAN) joint research unit
- Animal physiopathology and biotherapy of muscles and nervous system (PANTHER) joint research unit
- Food safety and microbiology (SECALIM) joint research unit
- Cellular and molecular immunology-endocrinology (IECM) contracted unit
- Statistics, sensometry and chemometry contracted unit (STAT SC)
- Livestock systems contracted unit (URSE)
- 1 team from the biopolymers, interactions and assemblies (BIA) research unit

#### 🔍 Collaborative scientific structures:

- Human nutrition research centre, western region (CRNH)
- BiogenOuest network of regional strategic platforms
- Pathological anatomy platform - APEX (PANTHER), IBiSA certified
- Nikon Nantes centre of excellence (PANTHER)
- Metabolomics platform (LABERCA), IBiSA certified
- The CRNH Ouest mass spectrometry platform
- Carnot Institute Livestock Industry for the Future
- Ouesterel LIT

#### 🔍 Academic partners:

- Oniris
- Nantes University
- Inserm (National Institute of Health and Medical Research)
- CHU Nantes

**In this area, we undertake all of our research work jointly with the Brittany-Normandy INRAE centre. It is undertaken in a context of increasing internationalisation of markets, increased competition between EU Member States, increased price volatility and increased citizen awareness of public health, environmental and animal welfare issues.**

This research focuses on studying economic mechanisms and the evaluation of public policies as regards the economics of agriculture, agri-food and the environment in the context of numerous crises, and economic questions about environment/agriculture issues, territorial and international competitiveness, and greater exposure to the vagaries of agricultural prices. These questions increasingly come into play



More information on our news and research  
[www.inrae.fr/en/centres/pays-loire](http://www.inrae.fr/en/centres/pays-loire)

#### Focus on the GEVES

The GEVES (the French Variety and Seed Study and Control Group) is a public interest group and the official body tasked with conducting the studies needed to:

- register (or standardise) new plant varieties in the official catalogue,
- secure legal protections for rights holders,
- certify seeds before putting them to market for species that require regulatory certification.

Further information: [www.geves.fr](http://www.geves.fr)



in the integrated approaches of territory-level sectors (livestock, and particularly horticulture), employment in agriculture and employment in rural areas.

#### 🔍 Research units:

- Joint research unit into agricultural markets and structures, resources and regions/Economics research laboratory (SMART LERECO)\*
- Biology, epidemiology and risk analysis in animal health (BIOEPAR) joint research unit

#### 🔍 Academic partners:

- Oniris
- Agrocampus Ouest

\* attached administratively to the Brittany-Normandy INRAE centre



## ➤ PARTNERSHIPS, ADDING VALUE, INNOVATION

### Socio-economic and agricultural partnerships

In the Pays de la Loire region, the centre provides impetus for numerous partnership arrangements:

The centre is involved in the Pays de la Loire region's innovation policy, which has implemented a shared strategy for strengthening interaction between three areas - Research, Education and Innovation - in which it is an active partner for three programmes: Objectif Végétal, Food for Tomorrow and BioRegate. The centre benefits from being located near the "Technocampus Alimentation" facilities which house start-ups, a food technology centre, technology platforms, the Cap Aliment association for promoting and developing the agri-food sector, and Ligeria regional association of agri-food industries.

Developing cooperation around the scientific areas focused on by the centre is achieved through its involvement in **competitiveness clusters**: Végépolys Valley across the entire plant value chain, and Valorial for food safety and innovation. The centre also has an agreement in place with Ouest Valorisation TTO.

For its partnerships with **professional technical bodies**, the centre participates in two joint technological units: STRATège (led by Astredhor) and Nova2CIDRE (led by the French Institute for Cider Production). To support sectors, the centre is a partner in two national Scientific Interest Groups ("GIS Fruits" and "GIS PICleg" vegetable production) which bring together stakeholders in research, education and development.

In terms of partnerships with **SMEs**, the centre set up the LABCOM Match for alternative methods to chemical treatment of Hydrangea. For its research partnerships, one of the centre's units works with the Carnot Institute Livestock Industry for the Future. All of these activities fall within the framework of INRAE guidelines for partnership and transfer for innovation, which enable the centre to develop dialogue with socio-economic stakeholders.

### Involvement in innovative projects

In 2018, the centre was a stakeholder in 20 projects aimed at investing in the future, 35 European projects and 37 ANR (French National Research Agency) projects.

#### Four major projects:

- INVITE [H2020] Innovations in Plant Variety Testing in Europe
- Healthylivestock [H2020] Combating antibiotic resistance by improving livestock welfare and health
- PROTECT [Marie-Curie ITN] Modelling the effects of climate change on food safety
- BATMAN [H2020] Better Agri-food Trade Modelling for policy ANALysis

### Mobilising expertise in support of public policies

The expertise of the centre's researchers is mobilised with a view to endorsing public policies and supporting major national, European and international organisations (AFFSA French Agency for Food Safety, ANSES French Agency for Food, Environmental and Occupational Health & Safety, the French Ministry of Agriculture, the European Commission, UN FAO, etc.), particularly with respect to:

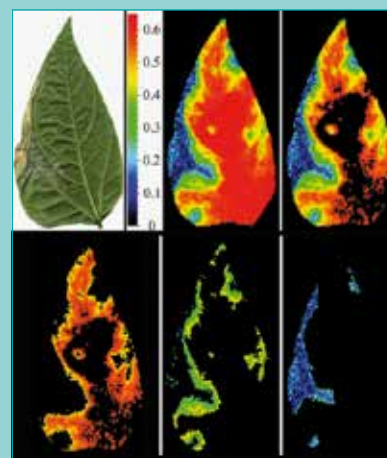
- Farmed varieties as a whole, for the purpose of recording varieties in the official catalogue, legal protection of varieties, quality control of seeds and specifically seed certification using the expertise of GEVES, the French Variety and Seed Study and Control Group,
- Plant biology, mainly for the purpose of developing methods for detecting and typing *Xylella Fastidiosa* bacteria,
- Animal health, for the purpose of explaining government decisions on the dynamics of animal diseases and risk management,
- Chemical safety in food, with a National Reference Laboratory contracted by the French General Directorate for Food (DGAL, Ministry of Agriculture) to address risk management issues relating to chemical residues and contaminants in foodstuffs,
- Microbiological safety in food, with the implementation of methods based on risk assessment for official controls introduced by the French General Directorate for Food,
- Human health, with nutritional recommendations primarily for children but also for the general public,
- Agricultural and agri-feed economics, supported by national and international public-sector stakeholders, particularly in terms of economic mechanisms and assessing policies surrounding agricultural, agri-food and environmental economics.

### Spotlight on... PHENOTIC

The platform PHENOTIC is awarded the IBiSA label, and is integrated into the PHENOME-EMPHASIS-FR national infrastructure and the BIOGENOUEST network.

PHENOTIC brings together phenotyping tools based primarily on acquiring and processing images for phenotyping seeds, seedlings and whole plants. Seed and seedling phenotyping aims to determine phenotypic characteristics that indicate seed quality. Whole plant phenotyping aims to result in phenotypic analysis of host/pathogen interaction and horticultural production quality. The platform is underpinned by a multidisciplinary team to foster the ties between plant biology and information and communication sciences and technologies (image processing, data processing). It is accessible for partnership-style projects in the context of research programmes or service provision.

To find out more, visit: <https://www6.inrae.fr/phenotic>



## ➤ INRAE: AN OVERVIEW

INRAE, the French National Research Institute for Agriculture, Food and Environment, created on 1<sup>st</sup> of January 2020, is a major player in research and innovation.

INRAE is a targeted research institute resulting from the merger of INRA and IRSTEA. It is a community of **12,000 people** with over **200 research units** and more than **40 experimental units** located in **18 regional research centres**.

The institute is among the world leaders in agricultural and food sciences, in plant and animal sciences, and is 11<sup>th</sup> in the world in ecology and environment.

INRAE's main goal is to be a key player in the transitions necessary to address major global challenges. In the face of the increase in population, climate change, scarcity of resources and decline in biodiversity, the institute develops solutions for multiperformance agriculture, high quality food and sustainable management of resources and ecosystems.

## ➤ PAYS DE LA LOIRE INRAE RESEARCH CENTRE KEY FIGURES

### Teams

**18** units, 13 of which are dedicated to research (1 own unit, 6 joint units, 6 contracted units, 1 experimental unit and 4 support units (2020 figures)

**850** agents: 440 permanent INRAE staff (♂ 61% and ♀ 39%) and 130 INRAE contract staff (♂ 52% and ♀ 48%), 115 interns and 165 partner staff in the centre's different units (2018 figures)

### Resources (2018 figures)

Budget of **42.5 million** Euros (INRAE resources only, including salaries), of which **5.8 million** Euros in own resources

**12** infrastructures: 4 tools with IBISA label and 8 technical facilities

**8,700** m<sup>2</sup> of greenhouses and growth rooms for plants

**1** horticultural space with 107 hectares for experiments

### Results (2018 figures)

**144** research conventions and contracts, including **10** with Europe

**320** publications in international peer reviewed journals (2018 figures)

## ➤ MAP OF PAYS DE LA LOIRE CENTRE SITES

