



INRA Occitanie-Toulouse Research Centre

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Research Centre

Regional INRA Delegate

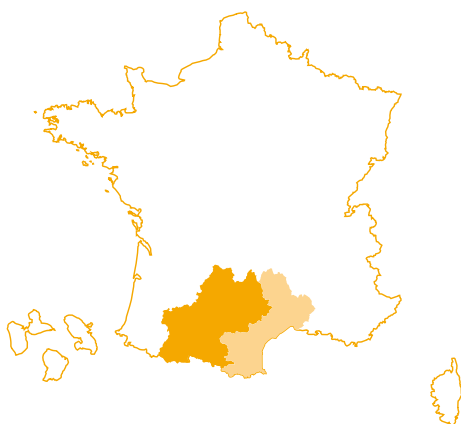
"A concentrated regional academic network is favoured for the development of cross-disciplinary approaches, and to accompany innovation for the benefit of agriculture, the food industry and the bio economy."

## THE INRA OCCITANIE-TOULOUSE RESEARCH CENTRE

With more than 1000 researchers, research engineers and technicians, including 630 full-time employees, the INRA Occitanie - Toulouse Centre accounts for approximately 10% of publications and almost 12% of the Institute's patents. Targeting innovation with regional stakeholders, the Centre is a hub of pluridisciplinary scientific activity within a rich and diversified academic partnership: more than 12 joint research units, sharing technological platforms and experimental units (large-scale farming, small ruminants, rabbit farming).

Michèle Marin, President of the INRA Centre, administers the scientific and collective facilities, assisting the smooth integration of teams within academic research and harmonising initiatives in relation to regional research policies, innovation, and economic developmental initiatives.

**Within the University of Toulouse, INRA is the second largest public scientific and technological funding council, supported by a strong academic partnership with 7 higher teaching institutions and 2 other research councils (CNRS, Inserm). INRA is a member of the GIS (Scientific Interest Group) Toulouse AgriCampus.**



## INCENTIVES

Teams working at the the INRA Occitanie-Toulouse centre focus on research and innovation in 3 main areas:

- Sustainable agricultural and forestry production systems (plants and animals) adapted to climate change, with a marked systemic approach in the field of agro-ecology with regional stakeholders through cross-disciplinary interactions between agronomic, social, and information sciences.
- Integrated health management, leading to healthier food production, adapting plants to climate change and a deepening understanding of the relationship between animal and human health.
- New channels for transforming agricultural resources in order to favour territory-based bioeconomy.

## CONTEXT AND PERSPECTIVES

Agriculture, agrifood processing and wood production, are major employment sectors of our region. Our research activities on agro-chains, from bioresources to value-added products (including biotechnology, agronomy and economy) are part of the Strategic Regional Innovation and Research priorities, dedicated to the territorial agri-food chain and the bio-transformation of renewable carbon.

Our teams are part of 5 laboratories of excellence (LABEX) and 1 convergence institute targeting inter-disciplinary approaches in the domains of biology and ecology, material sciences, agronomy, human and social sciences, and finally the digital sciences.

## Major partners in the region



# Our research priorities

## 1 INTEGRATIVE BIOLOGY OF PLANT-ENVIRONMENT INTERACTIONS

The interactions between plant organisms and symbiotic or pathogenic microorganisms play a key role in the capacity of plants to adapt to climate change. For example, symbioses between specialized soil bacteria and plant roots are of interest in reducing the use of nitrogen-based fertilizers in agriculture. Studies are focused on both plant models and agronomically beneficial plants including legumes, sunflower and tomato.



### Joint research units

- Laboratory of Plant-Microbe Interactions (LIPM)
- Fruit Genomics and Biotechnology (GBF)

### Shared scientific facilities

- Plant Genomic Resources Centre (CNRGV)
- Toulouse Plant Microbe Phenotyping (TPMP)

### Partners

- National Centre for Scientific Research (CNRS)
- National Polytechnic Institute of Toulouse: National Institute of Agronomy (INP-ENSAT)

## 2 INTEGRATIVE ANIMAL GENETICS AND BIOLOGY - ANIMAL HEALTH AND SUSTAINABLE FARMING SYSTEMS

Animal characteristics are determined not only by their genes but also by their environment.

The objective is to offer new management strategies, based on both genetic tools and adapted agricultural practices, to meet the challenge of modern farming systems (involving food efficiency, animal reproduction, disease resistance, production sustainability) as well as animal health. The Toulouse site brings together skills on small ruminants, pigs, rabbits, and fat palmipeds research networks.



### Joint research units

- Genetics, Physiology and Breeding systems (GenPhySE)
- Host-Pathogen Interactions (IHAP)

### Experimental units

- Sheep Experimental Unit (Domaine de La Fage)
- Rabbit Experimental Unit of Toulouse (PECTOUL)

### Shared scientific facilities

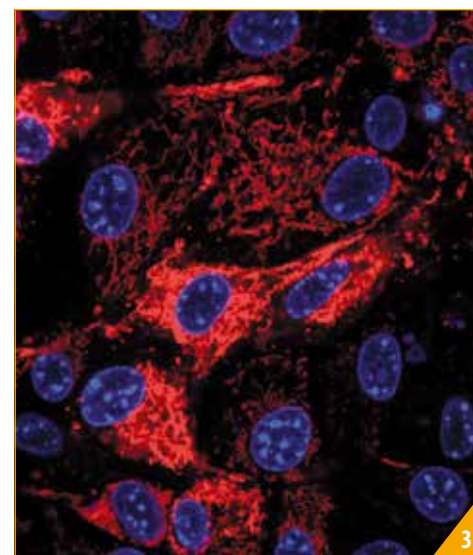
- The Genome and Transcriptome Platform (GET-Plage)
- Information System for Analysis of Breeding Animals' Genome (SIGENAE)

### Partners

- National Veterinary School of Toulouse (ENVT)
- National Polytechnic Institute of Toulouse - The National Engineering School of Agronomy (INP-ENSAT)

## 3 NUTRITION AND PREVENTION: TOXICOLOGY, BIOLOGICAL MARKERS

The Food Toxicology Centre unites the expertise of INRA scientists studying the health risks of food contaminated by various chemicals (PCB, pesticides, heavy metals, phthalates, Bisphenol A). These chemicals, present in low dosages and in various combinations can be responsible for chronic diseases in both humans and animals. Our objective is to identify key biological markers allowing us to identify the effects of food on health.



### Joint research units

- Research Unit in Food Toxicology (TOXALIM)
- Digestive Health Research Institute (IRSD)

### Shared scientific facilities

- Metabolomics and Fluxomics Platform of Toulouse (Métatoul-Axiom)
- Toulouse Imaging Network (T.R.I. Genotoul)
- Transcriptomic Impact of Xenobiotics Platform (GeT-Trix)

### Partners

- National Veterinary School of Toulouse (ENVT)
- National Polytechnic Institute of Toulouse - Purpan School of Engineers
- Paul Sabatier University (UPS)
- National Institute of Health and Medical Research (Inserm)

## 4 METHODS AND PLATFORMS FOR INTEGRATIVE ANIMAL, PLANT, AND MICROBIAL BIOLOGY

Life sciences platforms for generating and processing genomic or post-genomic data (transcriptomics, metabolomics, bioinformatics), representing valuable sources of knowledge and innovation for complex biological systems. Establishing models for life sciences and environmental data is encouraged by favouring collaborations between biologists, mathematicians and computer scientists.

### Research unit

- Toulouse Applied Mathematics and Informatics (MIAT)

### Service unit

- Plant Genomic Resources Centre (CNRGV)

### Shared scientific facilities

- Toulouse Genopole: genomics, transcriptomics, proteomics, metabolomics, fluxomics, ligand and enzyme binding, screening and cell sorting, creation, husbandry and functional testing on animal models, bio informatics.

- Modelling and Simulating Platform for Agroecosystems (RECORD)
- Information System for Analysis of Breeding Animals' Genome (SIGENAE)

### Partners

- National Centre for Scientific Research (CNRS)
- National Institute of Health and Medical Research (Inserm)
- The Paul Sabatier University (UPS)



## 5 INDUSTRIAL BIOTECHNOLOGIES

Whilst fossil carbon reserves are on a steady decline, biological processes, based on the use of enzymes and microorganisms, offer high innovation potential for the industrial development of agricultural resources for use in energy, pharmaceuticals, and materials sectors. Along with major scientific investment in the field of white biotechnologies, physical and chemical transformation methods are studied to define new orientations for the future.



### Joint research units

- ➊ Biological Systems and Biochemical Engineering Laboratory (LISBP)
- ➋ Agro-Industrial Chemistry Laboratory (CAI)

### Joint service unit

- ➌ Toulouse White Biotechnology (TWB)

### Shared scientific facilities

- ➍ Biochips platform (Get Biopuce)
- ➎ Toulouse Metabolomics and fluxomics Platform (Métatoul-Axiom)
- ➏ Toulouse Integrated Screening Platform (PICT)

### Partners

- ➐ National Centre for Scientific Research (CNRS)
- ➑ National Institute of Applied Sciences of Toulouse (INSA)
- ➒ National Polytechnic Institute of Toulouse - Interdisciplinary engineers in the fields of matter transformation, energy and related (INP-ENSIACET)

## 6 AGRO-ECOLOGY OF AGRICULTURAL AND FOREST LANDS

Improved agro-ecology, at the crossroads of agronomy, ecology and social and economic sciences, will be a source of innovation for agricultural and forest production systems that are part of a sustainable development perspective. Emphasis is put on risk resilience (economic, climatic, health risks, etc) and on developing synergies between agriculture and the rational management of natural resources. The selected territorial dimension is based on interactions between stakeholders and requires the acquisition and processing of spatial environmental data.

### Joint research units

- ➊ Agro-ecology - Innovations - Ruralities (AGIR)
- ➋ Forestry Systems and Rural Space Unit (DYNAFOR)
- ➌ Wildlife Behaviour and Ecology (CEFS)

### Experimental and services units

- ➍ Rural Development Observatory (ODR)
- ➎ Experimental Unit for Field Crops (Domaine d'Auzeville)

### Shared scientific facility

- ➏ Modelling and Simulating Platform for Agro-ecosystems (RECORD)

### Partners

- ➐ National Polytechnic Institute of Toulouse: National Engineering School of Agronomy (INP-ENSAT)
- ➑ National Polytechnic Institute of Toulouse - Purpan School of Engineers (INP-PURPAN)



For more information  
on our current projects and research  
[www.toulouse.inra.fr](http://www.toulouse.inra.fr)

## 7 ENVIRONMENTAL AND MARKET ECONOMICS

A fundamental theme for a major research center in economic sciences involves the relationship between resource management and climate change as a component of economic growth. The second theme involves food markets and consumer behavior, particularly food-health relationships and the structuring of food chains. The aim here is to offer expertise to economic and political players, along with decision-making tools.

### Joint research unit

- ➊ Toulouse School of Economics Research (TSE-R)

### Partners

- ➋ Toulouse 1 Capitole University
- ➌ National Centre for Scientific Research (CNRS)
- ➍ School for Advanced Studies in the Social Sciences (EHESS)



## PARTNERSHIPS, ADDING VALUE AND INNOVATION

### Research in collaboration with worldwide economic stakeholders

The INRA Occitanie-Toulouse Centre participates in the regional competitiveness pole "Agri Sud-Ouest Innovation" as well as the "WATER" and "Cancer Bio Health" poles. Support is provided to the TWB (Toulouse White Biotechnology) pre-industrial demonstrator and the Centre is also a member of 3 Carnot Institutes (3BCAR, France Futur Elevage, Plant2pro). Working closely with several Technical Institutes (Terres Inovia, Arvalis, Idele) within joint technical units (UMT tournesol, Eau, petits ruminants) and a network of Chambers of agriculture, the Centre is involved in several joint laboratories associated with agri-food sector SMEs and close to farmers for important programs (Research program for regional development - PSDR; Economic and environmental interest groups - GIEE...).

### Innovative projects

#### ► Partner of over 20 government-funded projects in the framework of "Investments for the future"



INRA Occitanie-Toulouse is involved in over twenty projects funded by the national initiative "Investments for the future" with a wide variety of instruments (5 LABEX, 7 biotechnological-bio resource projects and 1 bioinformatics project, 3 national infrastructures, 2 EQUIPEX, 1 pre-industrial demonstrator, 3 Carnot Institutes, 1 convergence lab).

These projects contribute to funding all the main scientific research themes of the Centre, with major activities in the fields of Integrative biology, Green and White biotechnologies, and Economic and Social Sciences.

### Shared scientific facilities and infrastructures



- 15 technological platforms and facilities in the fields of genomics, nucleic acid sequencing, transcriptomics, phenotyping (from the laboratory to field work), metabolomics, imaging, screening, statistics and modeling of agrosystems, monitoring and evaluation of agricultural policies and rural development.
- 5 experimental facilities: field crops (cereals, oilseed) rabbit farming, ovine species (meat and milk) wildlife (roe deer).

### Selected research achievements

- The selection of the Lacaune "Number1" milking ewe resulted in the development and support, at the European level, of the principle sheep's milk-producing Roquefort region, as well as other milk-producing regions.



- Genome sequencing of both sunflower and wheat (2016) should boost the selection of productive, disease resistant and climate change-adapted varieties.
- Agro-ecology: new concepts in agricultural systems based on a diversification of species, the reintroduction of legumes and other multi-service intermediate crops has resulted in a reduction of about 50% in the use of pesticides, without major economic consequences.



### Focus on...

#### TWB: a platform for bioeconomic innovation

Progress from fundamental and applied research to production at an industrial scale requires a crucial step which is often underestimated. Toulouse White Biotechnology (TWB) is a preindustrial demonstrator that develops new sustainable development methods using agro-bio-resources. The objective is to develop an economy based on the use of renewable carbon (ie. the industrial manufacture of chemical, energetic, pharmaceutical, household and food products using biomass). The TWB project currently involves a private/public consortium comprising 45 partners. Supported by INRA, the TWB is expected to generate more than €20M of industrial contracts over an eight-year period.





## INRA: AN OVERVIEW

INRA is the largest agricultural research institute in Europe, with **8,417 researchers, engineers, and technicians**, and is the second-largest producer of agricultural science publications. INRA contributes to development of knowledge and innovation in the fields of food, agriculture, and the environment.

INRA carries out its work across **13 scientific divisions** through a research network that is unique in Europe, with more than **200 research units** and **50 experimental units** located in **17 research centres throughout France**. Its aim is to contribute internationally to the development of healthy, high-quality food, competitive and sustainable agriculture, and a protected and valued environment.

## OCCITANIE-TOULOUSE RESEARCH CENTRE: KEY FIGURES

### Our support

**22** research units, 11 joint research units and 3 experimental units

A total of **983** INRA staff members: 626 permanent staff (309 women, 317 men) 257 fixed-term contractual staff (145 women and 112 men)

**688** on-site partner staff members

### Financing

An overall budget of **€77,3M**, of which **€24,8M** from INRA resources

**15** technical platforms and facilities

**8** different locations, more than **500** hectares of private land, **144** buildings occupying **52,000 m<sup>2</sup>**

### Achievements

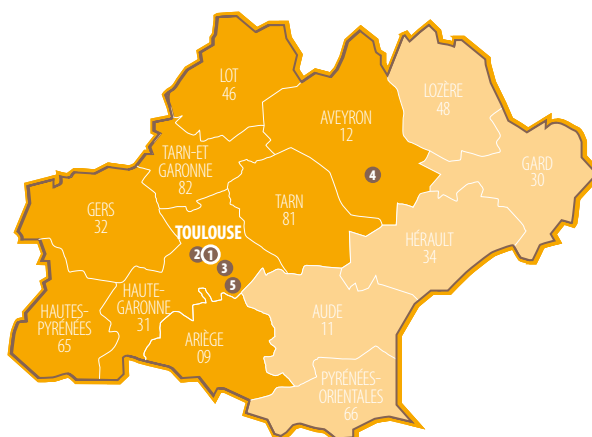
**89** partnership agreements

**112** research contracts (of which **5** european)

**52** active patents, **22** licences

**508** publications in 2014

## MAP OF OCCITANIE-TOULOUSE CENTRE FACILITIES



### List of sites

- 1 Site de Toulouse (Auzerville Tolosane)
- 2 Saint-Martin-du-Touch
- 3 Domaine de Langlade
- 4 Domaine de la Fage
- 5 Installation expérimentale de Gardouch



**INRA**  
SCIENCE & IMPACT

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