The Midi-Pyrenees has become THE region for Research. The major economic industries installed there, such as aeronautics, aerospace and pharmaceuticals, are a major contributor. However, beyond these historic fields, a truly diverse ecosystem has been created in the Midi-Pyrenees over the last few years.

The Midi-Pyrenees Region has chosen to make the most of this taste for science, this scientific culture that flows through the region, because Research can be found at the heart of society’s current challenges – health, energy, environment, transport, etc. – but also because is it one of the keys to the economic development of an entire area.
MIDI-PYRÉNÉES

Research and development in the Midi-Pyrenees

A formidable potential

Devote a minimum of 3% of its GDP to R&D: this was the objective set in 2000 by the Council of Europe in order to develop access to the knowledge economy. To this end, the Midi-Pyrenees region cuts an exceptional figure, since it is the only one in France to meet this criterion. Better yet, with 5.06% of its GDP devoted to R&D and 7.2% of scientific jobs (public and private) on a national scale, the Midi-Pyrenees is at the top of the French regions for the intensity of its research and in 3rd position (behind the Ile-de-France and the Rhône-Alpes) with regard to jobs.

The main unique feature of the region in terms of R&D is that this is mostly carried out by the private sector (aeronautics, aerospace, pharmaceuticals, etc.), which alone represents 70.3% of domestic expenditure in research and development and 62.5% of personnel. A uniqueness that is also illustrated by taking 3rd place for declared expenditure as research tax credits, the first source of public funding for corporate R&D expenses.

The Midi-Pyrenees is not to be outdone on the public research side. The CNRS, the Midi-Pyrenees-Limousine delegation of the Inserm and the Inra Toulouse Midi-Pyrenees centre, the universities and engineering schools gather some 10,000 jobs and contribute to the region’s influence.

The Cnes set up the most important of its centres in Toulouse (1,800 people, of which 80% were engineers in 2012). Space vehicles and complete spatial systems (satellites, probes and balloons) have been designed, developed and operated from there. The CEA, already present

The LAAS-CNRS micro and nanotechnology platform hosts projects from the academic and socio-economic world. Micro and nano components are developed and prototyped on this.

LEADERS IN PUBLIC INDUSTRIAL RESEARCH...

Dossier created with the support of the Midi-Pyrenees regional department for higher education and research. Text: Nathalie Mayer. Graphic design and production : Carta-Link & Partners. Photo credits : Philippe Grollier - PatrickDUMAS/Look at Sciences - Becus David/Arch. Cardete et Huet - Laurent Moynat - Sébastien Chastanet -Dutchpilot22/Fotolia - Flô/Fotolia - Dreaming Andy/Fotolia - Smileus/Fotolia - Nuryuydijes/Fotolia - LAAS - Cirimat - Goodluz/Fotolia - Frédéric Prochasson/Fotolia -Jean-Luc Exposito - TWB - Damien Cabrol - DR. CANNOT BE SOLD SEPARATELY
in the Midi-Pyrenees by way of its study centre in Gramat (Lot) launched, at the start of 2013 in Toulouse, with the support of the Region, the State and Europe, a regional technology transfer platform open to companies and laboratories in the Midi-Pyrenees. The Onera Midi-Pyrenees centre (Toulouse and Faugue-Mauzac) has exceptional testing facilities including a world-class wind tunnel that allows the study of take-off and landing conditions, aerodynamics and the atmosphere re-entry phases for space vehicles.

... AND IN THAT OF THE PRIVATE SECTOR

Airbus Group, global leader in the aeronautic, aerospace, defence and related service sectors concentrates almost all of its research means in France, as well as its head office, in Toulouse (Haute-Garonne). With over 13,000 employees, Airbus Operations is the biggest factory in the country (New Factory classification, July 2013). Still in the aerospace sector, the region plays host to Thales (Alenia Space, Avionics, Services), Alstom, Liebherr Aerospace and Ratier Figueac. In the field of health, Laboratoires Pierre Fabre, which began in Castres (Tarn) as a dispensing pharmacy, concentrates almost 80% (i.e. some 900 researchers) of its R&D staff in the Midi-Pyrenees (neuropsychiatry in Castres, oncology, dermatology and dermocosmetics in Toulouse). The Gaillac (Tarn) site carries out the development and production of the main active ingredients for all the group’s activities. Laboratoires Pierre Fabre currently employs 2,700 people in the Tarn Department alone. Another heavyweight industrial sector in the Midi-Pyrenees: food processing. Among the main players in this field: the Arterris agricultural cooperative, the 3A agricultural group (dairy chain), the Poul biscuit factory and even Natais (European leader in popcorn) and Andros preserves.

COMPETITIVE CLUSTERS

Three leaders...

The global competitive cluster at Aerospace Valley constitutes the biggest European labour pool in the fields of aeronautics, aerospace and onboard systems. In turn, the Cancer Bio Santé hub contributes to the development of technologies and innovative products to improve the treatment of and fight against cancer.

... and many more

The Midi-Pyrenees is also involved in many other competitive clusters: Water (identification, mobilisation, management and use of water), Viameca (design, production and integration of intelligent mechanical systems), Elopsy (microwaves, photonics, secured networks, digital images and interfaces), Ceramics (decorative and sensory ceramics, green buildings, extreme environments, electronics and optics, biological uses) and Derbi (renewable energies applied to construction and industry).

R & D in Midi-Pyrenees

27 800 people in R&D.
10 000 researchers.
400 public laboratories.
17 universities and higher education establishments.
16 laboratories of excellence.
11 facilities of excellence.
1 Institute of Technological Research for aeronautics, aerospace and onboard systems (Saint Exupéry).
122 560 students.

3 QUESTIONS TO

Marie-France Barthe
Chair of the Community of Universities and Establishments at the University of Toulouse, Midi-Pyrenees

What place is there for public research in the Midi-Pyrenees?

An important place. The sector employs over 10,000 people, which ranks the Midi-Pyrenees in 4th place among the French regions.

What relationships are there between public and private research?

Private research is particularly dynamic in the region. This allows strong partnerships to be developed between manufacturers and public sector researchers. The proof of this is the 57 projects chosen within the framework of future investments for a total amount of EUR 1.2 billion. There are also the competitive clusters, the main aim of which is to link companies, research centres and training organisations around innovative projects.

Can you give us a few words on the measure to group universities and higher education institutions within the University of Toulouse? The UNITI project was selected at the beginning of 2013 within the framework of the Excellence Initiative operation, but the idea had been sown well before that. Our aim is to federate all the higher education institutions, including the 17 engineering and specialised schools, and the research organisations around two major themes: research and internationalisation. In November 2013 we inaugurated the new research and development centre, a major step and a symbol of the synergies we hope to encourage. We are now waiting for March 2014 and the publication of our new statutes.
## Research supported by the Regional Council

### Strengthen the position

The Region is a presence throughout the innovation chain

<table>
<thead>
<tr>
<th>ACADEMIC RESEARCH</th>
<th>COLLABORATIVE RESEARCH AND FINALISED RESEARCH</th>
<th>RESEARCH, DEVELOPMENT AND INDUSTRIAL INNOVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Make research influential</strong>&lt;br&gt;The Region supports academic research in order to form a network of lectures and researchers and to increase its international influence.</td>
<td><strong>Encourage transfers</strong>&lt;br&gt;In order to create a link between research laboratories and the region’s SMEs.</td>
<td><strong>Stimulate competitiveness</strong>&lt;br&gt;As innovation is the basis of corporate competitiveness, the Region has set up mechanisms aiming to increase economic development and distribute innovation.</td>
</tr>
<tr>
<td>Doctoral and post-doctoral grants</td>
<td>Support for research platforms</td>
<td>Innovation support contracts: multiyear support provided to innovative companies</td>
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<td>State-Region Agreement</td>
<td>Support for the Regional Centre for Innovation and Technology Transfers</td>
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<td>Hosting teams of excellence</td>
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<td>Call for SHS projects</td>
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<td>EPICURE, EPICEA, ELECTRA, LAPEROUSE, AEROSAT, AGILE IT, ECO INNOV</td>
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### Chinese researcher Xiaobo Wang came to Toulouse at the beginning of 2012. His specialty: optogenetics or the manipulation of live cells using light in order to understand how these move as a group within the body, particularly in pathological contexts, such as the formation of metastases.

Within the framework of the EPICURE regional call for projects, a food processing manufacturer and two laboratories aim to develop a nonpolluting and non-toxic process (physicochemical denaturation) capable of eliminating the major allergens from peanuts and seafood without altering their nutritive and taste qualities.

A project concerning the development of OLEDs is mobilising two Toulouse laboratories around the Oliscie start-up. Organic electroluminescent diodes are capable of revolutionising lighting by allowing the construction of flashing surfaces such as a low consumption light wall that are easy to integrate into our environment.
In terms of research, the action of the Midi-Pyrenees region is guided by three main objectives: strengthen the links between laboratories and businesses, ensure the attractive nature of regional research and encourage the distribution of scientific know-how.

**NEARBY UNIVERSITIES**

Make access to higher education democratic and promote innovation economics across the land: these are the objectives the Midi-Pyrenees region wishes to achieve thanks to local universities. The Midi-Pyrenees is the largest region in mainland France and its préfecture, Toulouse, combines the main education and R&D hubs for the region. Outside Toulouse, university sites are also developing with the support of the Midi-Pyrenees region, which has drawn up an outline for higher education and research, the main tool of which is multi-year contracts for the sites in Rodez, Albi, Cahors, Castres, Figeac, Foix, Millau, Tarbes, Montauban and Auch allowing the 10 university sites outside the state capital to set challenges and perspectives especially in the Research field. “With this tool which, when we adopted it in 2011, anticipated the law that now renders these outlines mandatory, our aim is to support the development of research, its links with the socio-economic players in the region in order to meet the needs of the population and thus encourage the development dynamic with a view to balanced regional town and country planning”, explained Nadia Pellefigue, vice-president in charge of higher education.

**STATE-OF-THE-ART TECHNOLOGICAL RESOURCES**

The Midi-Pyrenees region has over 130 public research and innovation platforms. “Since 2000, the Region has accompanied several projects to give the area top-flight technological resources that are accessible to researchers and companies”, explained Jean Tkaczuk, regional councillor for Research in the Midi-Pyrenees region. The dynamic is strengthened by the regional strategy developed in the FEDER Programme to acquire structuring equipment for the public research platforms open to regional businesses. The CALMIP supercomputer and the underground laboratory for measuring low-level radioactivity (LAFARA) are two great examples of public research and innovation platforms in the Midi-Pyrenees region. The first will soon rub shoulders with the top 100 most powerful machines in the world (274 expected TFlops), while making sure to keep an acceptable ecological footprint. It should host 220 “Midi-Pyrenees ranked 8th in the European regions” Martin Malvy, President of the Midi-Pyrenees region projects in 2014, representing over 100 million hours of calculations. LAFARA, installed in Ferrières (Ariège), is equipped with two gamma-ray spectrometers placed under 85 metres of rock. This drastically reduces background noise and analyses samples with extremely low levels of radioactivity (marine sediments, seawater, aerosol particles, industrial materials, etc.)

€30 M devoted by the Midi-Pyrenees region each year to higher education and student life.

€40 M devoted each year by the Midi-Pyrenees region to research and innovation.
The major fields of research in the Midi-Pyrenees

An international influence

In addition to the “intelligent specialisation” fields highlighted by the Regional Innovation Strategy, there are sectors in the Midi-Pyrenees that are clearly renowned.

AERONAUTICS
Aeronautics is the main industrial sector of the Midi-Pyrenees. The region groups together constructors, equipment manufacturers, sub-contractors, design offices, training organisations and test and research centres. In relation to this, it occupies a global first place, a position it intends to strengthen.

fields studied (fields common to aerospace): aerostructures (materials and processes), human/machine interactions, complex systems (design, architecture and integration), etc.

AEROSPACE
In the wake of the aeronautics industry, the Midi-Pyrenees has been able to develop a high quality aerospace industry (first place in Europe). Most of the satellites carried by Ariane are designed and assembled in the region.

ECONOMICS
The Toulouse School of Economics groups together over 100 economists of excellence. It is recognised by the State as one of the thirteen spearheads of research and its ambition is to raise itself to be amidst the best economics departments in the world, in a sustainable fashion.

Fields studied: Experimental and behavioural economics, industrial economics, public economics, macroeconomics, etc.

ARCHAEOLOGY
Among the most recognised works of the researchers from the «Archaeological Works and Research on Cultures, Spaces and Societies» (TRACES) and «Environmental Geography» (GEODE) laboratories: the 3D reconstitution of the Marsoulas grotto (Haute-Garonne), the creation of a facsimile of the Large Cave Painting in Marsoulas and even the human-environment observatory project in the Haut Viscardos valley (study of the process, origins and possible consequences of changes to region).

GREEN ECONOMICS
The Midi-Pyrenees has some 1,800 eco-businesses and R&D hubs (Albi, Toulouse and Tarbes) recognised for the quality of their work. Fields studied: water, eco-materials, waste, renewable energies, etc.

30% of the French R&D workforce in the aeronautics sector, i.e.:
5 000 researchers.
50% This is what the aerospace sector represents in the national workforce...
25% ...and 25% of the European workforces.

1st structured industrial channel in the world for dismantling aircraft at the end of their life.
2nd largest wind farm in France, installed in Aveyron.

CURIOSITY
Since summer 2012, Curiosity, a rover launched by NASA, has been exploring the Martian soil. On board, a chemical camera designed in the Midi-Pyrenees. ChemCam is one of 10 scientific instruments installed on board Curiosity. By determining the elementary composition of Martian rocks, its ambition is to play a role in studying the past habitability of the red planet, but also to direct the robot towards more interesting targets for samples and detailed analyses. Piloted from Toulouse, the arms of the ChemCam comprise a laser, the beam of which can be focussed on a rock and thus cause the release of gas, which is then observed by a camera and a spectrometer. This reveals the chemical components present at the core of the target. For the teams who worked on its development, the challenge was size. They had to transform an 8 Kg laser into a tool weighing 500 g with reduced dimensions (20 x 5 cm), waterproof, resistant to shocks and vibrations and capable of operating in a temperature range of -30°C to +30°C.
Six fields at the heart of the Region’s action

The first Regional Innovation Strategy (SRI) was adopted in the Midi-Pyrenees in 2009 to favour a concentrated and coherent approach to innovation on a regional scale. The new version of the SRI, presented at the end of 2013, defines six fields of “intelligent specialisation” to be explored over the following pages.

1 Cellular engineering and regenerative medicine

Concentrating skills

The potential applications of cellular engineering and regenerative medicine are numerous. The construction of a building devoted to research in this field at the Oncology hub site in Toulouse represents a good opportunity to concentrate means in the Midi-Pyrenees.

“We wish to develop the research into and production of mesenchymal stem cells, which are found in all the body’s tissues. They are capable of differentiating themselves into several cell types and have immunomodulatory actions. We will therefore be better able to understand how to manipulate them ex-vivo and use them in innovative therapies”, explained Luc Sensebé, Medical and Scientific Director of the Etablissement français du sang Pyrénées Méditerranée (EFS-PM).

An ambition that should be helped to fulfilment by the project for the research and development building dedicated to these cells, a project carried out within the framework of the subject “Stem cells, bioethics and biotherapy”, which the Midi-Pyrenees region has made one of its priorities. The property complex will group together the Stromalab mixed research unit (UMR: University of Toulouse 3 Paul Sabatier, CNRS, INSERM, EFS), a platform to produce cellular medicines for innovative therapies (EFS), an area to host future teams of excellence (stem cells, epigenetics, microenvironment, cancer and cellular therapy, etc.), a zone dedicated to public/private collaborative projects and a Midi-Pyrenees Incubator destined for spreading and accommodating startup businesses. Objective: group together on the same site the research, transfer and production forces for mesenchymal stem cells applied to regenerative medicine, and make the best equipment available to the region’s scientific community and businesses. “For example, we will have a complete hypoxia chamber (low-oxygen environment) which will allow us to study the behaviour of cells under natural conditions, to develop more suitable culture processes and to maximise therapeutic potential”, concluded Luc Sensebé.

ZOOM ON...

LE STROMALAB

In January 2011, the Etablissement français du sang Pyrénées Méditerranée (EFS-PM), CNRS, Inserm and the University Paul Sabatier began a unique project with the Stromalab mixed research unit (UMR). The aim of the Stromalab UMR (48 people) is to stimulate research into adult stem cells from adipose tissue and bone marrow. More specifically, the researchers involved are studying the mechanisms that allow mesenchymal stem cells, one of the best known adult stem cells, to play a role in tissue homeostasis (maintenance of physicochemical parameters) and the repair/regeneration processes. They are also interested in the way in which these tissues could serve as physiological reservoirs for adult stem cells, and from this to develop, over the medium term, new therapeutic approaches. Ambition: acquire international renown in this field, both in terms of the physiological understanding of stem cells and their origin, and of the clinical effects with their use as regenerative cells for the ex vivo production of cells allowing the recreation in the patient of heart tissue (for treating heart attacks), skin tissue (skin grafts for major burns), corneas, bone tissue, etc.
2 Onboard systems

Achieving the best returns

In the historic industrial channels of the Midi-Pyrénées, specialised robotic electronic and IT systems are legion. However, the regional fabric is also positioning itself on the “onboard systems” diversification markets.

When we talk of onboard systems, of course we first think of all those found on board vehicles of all types. The Aerospace Valley competitive cluster also has a section devoted to R&D, as with the constant increase in the complexity of the systems, it is essential to continually improve the related engineering.

Powerful electronics

Among the life blood of the sector, the Primes platform, dedicated to R&D for the integration of powerful electronic converters, is very busy improving the return from onboard systems and increasing the power mass density. “We have on site a prototype manufacturing unit that allows us to test and characterise these”, stated Maurice Fadel, Chairman of the strategic and scientific steering committee. For railway applications, for example, the aim is to design high power converters. In aeronautics, on the other hand, reliability and compactness are essential. “We work on packaging technologies and, amongst other things, we use silicon carbide components that allow high frequency operation in order to reduce volume”, the chairman of the platform’s steering committee explained further.

Onboard energy

In the Plasma and Energy Conversion Laboratory (Laplace), researchers are interested in the problems of onboard energy, and more specifically in the new related technologies such as fuel cells. Here they study the topics of aging or conversion efficiency, and above all the hybridisation of sources. “In order to improve the energy performances of onboard systems, the idea is to couple several sources (fuel cell and battery or super-capacitor). The difficulty is in correctly sizing the components and managing their cooperation in real time. In the end, it will mean integrating true “smart grids” into onboard systems,” explained Maurice Fadel, the chairman of Laplace.

“Our aim is to provide methods that can be reproduced and used over a wide range of applications.”

The PR2 robot can locate and move objects in its environment.

ZOOM ON...

- The PR2 robot can locate and move objects in its environment.

20,000 jobs

842 M€ invested over 10 years in the IRT Saint-Exupéry (Technological research centre for aeronautics, aerospace and onboard systems).

11 future investment plan programmes.

EVERYDAY ONBOARD SYSTEMS

In Toulouse, the Systems Analysis and Architecture Laboratory (Laas) carries out research into information sciences and technologies, communications and systems applicable to onboard systems and future habitat.

Technological advances (internet, sensors, communications, robots, software, etc.) allow for the development of so-called cyber-physical systems. Autonomous and cooperative, they combine the virtual IT world with the real physical one. The Reconfigurable Dynamic Architectures for Autonomous and Mobile Onboard Systems (Adream) project carried out by Laas aims to design, produce, deploy and assess such communicative systems and to anticipate their synergies. Its originality: combining a validation platform unique to its genre with a research programme taking the appearance of an intelligent and energy-optimised building. “The objects in our daily lives will integrate software that is more and more sophisticated and must communicate between themselves in complete safety. In order to guarantee an assessment, and appropriate validation, the staff at Laas are the first users”, specified Michel Diaz, the project manager. On the platform, five robots interact and develop within a flat crammed with sensors (cameras, motion detectors, temperature sensors, etc.). From this, the companion robots and utility robots (intervention in dangerous environments, etc.) of tomorrow will be prefigured.
**3 Coupling materials and innovative processes**

**An important role in technological innovation**

In the Midi-Pyrenees, there are two complementary skills in the new materials development sector, a field that finds its applications in both aeronautics and elsewhere.

In the Midi-Pyrenees in particular, innovative materials, their use and integration, constitute a big challenge. The aeronautics and aerospace industry is in fact a major consumer. Local skills (assembly, multi-material and hard metal machining, emerging processes, shock resistance, etc.) are renowned and the know-how in terms of engineering, processes, structures and production have seen it able to diversify. For several years, several R&D works have been launched in the region in relation to composite materials. A resources and transfer centre for innovative composites will soon be created on the site of the national engineering school in Tarbes (Enit). “One of our special characteristics will be the study of agro-sourced composites that allow us to develop products resulting from agriculture and which are low energy consumers”, stated Talal Masri, the school’s Principal. They have already made their appearance in the bodywork of electric cars, bicycle frames and even in formula 1 helmets.

**Hi-tech equipment**

Within the Espace Clément Ader, researchers will soon have, for the development of new composite materials, extremely high level equipment dedicated to structural, system and process mechanics (microcharacterisation, intensive calculation infrastructure platform, etc.).

**Nanomaterials allowing for improvements to the characteristics and functions of a material or system are another strong point of the Midi-Pyrenees region. The Nano, Extremes & Theoretical measurements Laboratory combines six Toulouse laboratories that work, amongst other things, on synthesising and studying thin films and nano-objects that are chemically and physically isolated or assembled (nanomagnetism, nanotransport, strongly correlated electron systems, nanobiophysics and nanochemistry). The Material Creation and Structural Study Centre (Cemes – CNRS), for its part, inaugurated the picoLab last June. This building is dedicated to design, construction and nanocommunications with a molecular machine or an electronic circuit built atom by atom. It houses the first items of equipment in the world offering electronic and mechanical multiaccess with atomic precision to a single molecule.**

**A SURFACE TREATMENT FOR BETTER PERFORMANCES**

The Inter-university materials research and engineering centre (Cirimat) has made surface treatments one of its specialities. The purpose of the surface treatment is to render a support material functional (rust proofing, anti-wear, lubrication, etc.). “The difficulty is in finding innovative solutions that are economically viable and environmentally friendly”, explained Florence Ansart, team leader at Cirimat (Toulouse). The sol-gel process is one that meets these specifications. The concept: put a functional coating on a metal part and create, at the interface, chemical links that ensure excellent adherence with the material to be protected. When one material is replaced with another, generally lighter material, the surface treatment also allows certain useful properties to be found. A telecommunications satellite, for example, contains waveguides (aluminium tubes) that serve for the transmission of signals. “With composites, we can gain a triple weight factor, but we lose in electrical conductivity”, explained Constantin Vahlas, team leader at Cirimat. In this case, the techniques for plating classic thin metal films (anodisation, electroplating) do not work. Consequently, to resolve this sticking point, the team from Toulouse is studying chemical plating in the vapour phase (dry process).
In the Midi-Pyrenees, the influence of agriculture and food processing in regional development is considerable. Innovation in the service of a regionalised food processing chain that is diverse and of quality is borne by both industry and public research.

50% of the land in the Midi-Pyrenees is devoted to agriculture, and all the players in the food processing chain devote their energies to match quantity with quality. The region already boasts some 120 products bearing the Quality and Origin Identification Label and it is the region where organic agriculture is the most widespread (+29% in area converted in 2012). At the end of 2013, in conjunction with the Aquitaine region, a South-West organic label was launched, designed to promote agriculture that is respectful of both the environment and the consumer. A label that the Midi-Pyrenees region has taken particularly to heart, as it intends to continue its actions in favour of responsible and sustainable agriculture by involving all the players in the sector in its approaches (cooperatives, manufacturers, communities, etc.).

Regional challenges
In order to make its agroecological transition a success, the players in the Midi-Pyrenees are highly involved in the research programmes For and On Regional Development (PSDR), co-funded by Inra and the Region. Devoted to analysing territorial dynamics and the role played therein by economic activities and rural areas, their aim is not just to produce scientific knowledge. They also aim to design operational elements for regional players.

The Midi-Pyrenees was thus the first French region to recruit a promotional engineer for this type of Programme. The Rami Fourrager® (Inra, Farming Institute) constitutes one of the operational results of the Midi-Pyrenees PSDR3. This participative challenge aims to accompany professionals in the design and adaptation of farming systems within the context of climate and economic restrictions. PSDR4, currently under construction, will attempt to meet regional challenges in terms of quality and innovation in the regionalised food processing chain, by favouring both the emergence and consolidation of innovation (technique, environmental and organisational economics), in agricultural production systems right up to the consumer. The objective is to end up with a local reorganisation of channels and a reduction in the dependence on international markets for agricultural inputs.

ZOOM ON...

AGRICULTURAL COOPERATIVES
Among all the players in the region, the cooperatives take a predominant place in the coordination of the various links in a channel within the scheme of creating value.

Agricultural cooperatives aim to enhance the production of their members by upstream organisation (supply of input products and advice, product collection and storage, etc.) and by seeking to add value downstream of the channels. They explore various options for strengthening the regionalised food processing chains, whether this means entering closer relations with consumers or developing the technical innovations of tomorrow. They can therefore rely in particular on the Agri Sud-Ouest innovation competitive cluster and its agro-food chain concept based on market expectations for a return to the region and to the farmers. The main issue for agricultural cooperatives is in managing to link, on a regional scale, the various links in the agro-food chain. By combining arable and livestock production, often in line with quality approaches, they play the integration card, as demonstrated by the examples of the Protected Geographical Indications and the Quality and Origin Identification Labels: fat ducks from the South-West, lamb from Quercy, veal from Segala, garlic from Lautrec, Roquefort, etc.
Industrial biotechnologies for renewable carbon recovery

Innovate in order to recover renewable carbon

The Midi-Pyrenees region is one of the major agricultural regions in the country. Consequently, it has major renewable carbon deposits to be recovered.

The industrial biotechnologies for recovering renewable carbon are an element of attractiveness for the Midi-Pyrenees region, whether in the public research sector or the private one. Producing molecules, new materials or energy out of the carbon from biomass and without going into competition with food uses actually allows for the sustainable recovery of the agricultural by-products abundant in the region. Methanisation is one of the main routes explored in the Midi-Pyrenees, which has emerged as a pioneering region in this area. Several projects by AgriMip Sud-Ouest Innovation, Industries AgroRessource, and Cluster Enermass are developing around this subject and allow for the recovery of renewable carbon as products resulting from green chemistry or, of course, as energy. In July 2013, a State-Region agreement was signed for the development of methanisation and the implementation of some one hundred biogas production units in the region by 2020. In the laboratories, research is directed towards an inventory and characterisation of the resources just as much as towards the implementation of innovative biological processes (aerobic granulation, etc.) on a laboratory scale and then on an industrial site. The Insa is thus preparing, for example, to carry out the first trials of methanisation using a discontinuous dry process, on the new experimental platform, Solidia, installed in Bélesta-en- Louragais (Haute-Garonne). This natural process for breaking down organic matter allows for the recovery, as biogas, of agricultural waste with a high dry matter content (greater than 25%) and a uniform structure (manure, in particular). This is a typological substratum that is particularly widespread in the Midi-Pyrenees region. The objective: offer a more reliable and better performing model of methane digester. In the end, this could equip medium-size farms (under 100,000 tonnes of livestock effluent to be treated per year). Other technologies profit from the support provided by the Midi-Pyrenees Region to R&D on the subject of white biotechnologies, thus strengthening local knowhow in terms of renewable carbon recovery. The Agromaterials exchange (Hauts-Pyrénées) is developing materials of 100% natural origin, that are biodegradable and eco-compatible, and the Val-ThERA platform (Tarn) is designing energy recovery processes for agricultural, forestry and food processing waste.

TOULOUSE WHITE BIOTECHNOLOGY

Backed by the public laboratories and a private consortium, the aim of TWB (Inra, Insa, CNRS) is to design biological tools (enzymes, micro-organisms, etc.) that can be used in industrial processes. Several projects have been started. Among them, Synthacs is aiming for a world first: design and implement within the heart of a microbe a synthetic process leading to the formation of a molecular precursor with a high commercial potential from renewable carbon resources. An alternative to petrochemicals which could see the light of day in 10 or 20 years. “In order to innovate, you must know how to take risks”, confirmed Pierre Monsan, Director of TWB. Consequently, the demonstrators team has also chosen to fund projects far upstream of industrial applications and designed to generate real breakthroughs. As a result: the project by Denis Pompon (CNRS). His idea: design a yeast that will allow CO2 to be captured and use this as a raw material.

90 businesses.
3 400 jobs.
300 researchers.
€1,4 M allocated by the Region to white biotechnologies in 2 years.
2 200 GWh (1/4 of gas consumption), this is the estimated annual potential for biogas production.
20 methanisation units in operation at the end of 2013 avoiding the production of over 4,000 tonnes of CO2 per year.

€8 M invested by the Region into the Midi-Pyrenees Biogas scheme 2011-2014.

ZOOM ON...

Biotechnologies classified as being white are those that use micro-organisms for the manufacture, transformation or breakdown of molecules for industrial purposes.
6 Translational research in oncology and cancerology

Frankul fundamental research to serve the patient

In the fields of oncology and gerontology, translation research is a peculiarity of the Midi-Pyrénées.

The Langlade cancer hub (Toulouse), created in 2003 further to the national cancer plan, is exceptional because it concentrates complementary public and private skills on a single site. At the heart of this hub, the Cancerology Research Centre (CRCT) is the largest of the type in France and soon in Europe. All levels of the illness are studied here: molecular biology of the deficient gene in the cancerous cell, biology of the cell and the tumour, the individual response and behaviour of a cancer sufferer and experimental therapies on cohorts of patients with their abilities to respond to treatments. “Our aim is to find new therapeutic options. The original feature of the CRCT is in linking its research projects directly to the fundamental oncological issues raised by patients”, highlighted Jean-Jacques Fournié, CRCT Director.

Studying the mechanisms “It is currently important to favour translational research in regard to aging as well”, confirmed Sophie Guyonnet, project leader at the Toulouse gernontology hub. “Our challenge is to develop molecules and innovative therapies in the fields of cachexia (weakening of the body), sarcopenia (loss of physical capabilities) and Alzheimers”, specified Bruno Vellas, department head at CHU. At the same time, studies are underway into the biomarkers for fragility and sarcopenia. The Institute of Metabolic and Cardiovascular Diseases (I2MC), one of the biggest research centres in Toulouse, has itself recently launched several projects aiming to study the issue from the specific angle of cardiovascular and metabolic problems. “A moderate weight loss (5 to 10%) reduces the risks of diabetes and heart diseases occurring, but in the elderly the calculation is not as simple as that. This is because, 1/3 of the 70 million French people will be aged over 60 in 2050. 40% of the elderly population are considered as fragile. 280,000 new cancer cases diagnosed in France per year. 223 companies, 70 laboratories and over 3,500 researchers. €32 M allocated by the Region to the 2011-2014 Cancer Plan. €11.6 M (of €41 M) in regional grants (Biggest public financer of the operation) for the CRCT. for certain pathologies, the adipose tissues present protective characteristics. The best balance must be found and to do this, we must learn to understand the underlyng mechanisms better”, concluded Dominique Langin, deputy director of I2MC.

Building created on the oncology centre hub by Mr Roger Taillibert and Laboratoires Pierre Fabre.

Translational research aims to speed up the transfer of innovative therapies and tools, and fundamental research for the patient.

ZOOM ON...

THE CAPTOR PROJECT

The Cancer Pharmacology of Toulouse Oncopole & Region (Captor) project is one of two university hospitals specialising in cancerology selected in relation to Future Investments.

The ambition of the Captor project (Toulouse oncology hub) is two open new avenues for anticancer medicinal treatments. «France has missed the corner in targeted therapies. With Captor, we hope to recoup some of our delay”, explained professor Guy Laurent, project coordinator. And thanks to the high quality of the basic research scientists, clinicians like professor Attal, director of the University Cancer Institute, and manufactures present on the site. Among Captor’s specialties: social pharmacology. The project therefore studies the observation of treatments, the post-cancer phase (psychological problems, after effects, etc.) and even the influence of social factors on the successful therapy sequence. “Assessing the real benefits of a medicine is crucial but we are lacking tools and we hope to develop these with Captor”, concluded Guy Laurent.