



INDUSTRIAL BIOTECHNOLOGY IN FRANCE

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INTRODUCTION

Given the importance of the agro-food and pharmaceutical industries in the French economy, France has a major stake in biotechnology. With agriculture playing a key role in France's economy and thus the access to raw materials, France has become deeply involved in the development of industrial biotechnology in Europe. Several public and private initiatives have accelerated the development of industrial biotechnology and increased the awareness of citizens, public authorities and enterprises of bio-based products.

I. RESEARCH AND INNOVATION

Modern industrial biotechnology is a relatively new discipline, with major areas of knowledge still to be explored. Public support to research as well as the establishment of pilot and demonstration facilities to scale-up individual processes will therefore help in the development of a European bio-based economy.

A. Public research funding

The French Environment and Energy Management Agency – ADEME² is member as a partner of the European Research Area for Industrial Biotechnology (ERA-IB)³. ADEME is an industrial and commercial public agency, under the joint supervision of French Ministries for Ecology, Sustainable Development and Spatial Planning (MEDAD) and for Higher Education and Research.

Until December 2007, Agrice⁴ was supported by ADEME. It was a scientific interests association (made up of scientific bodies, companies etc.) founded by ministries in charge of agriculture, environment, energy, industry and research. It supports and funds projects which promote products from agricultural origin. Agrice managed research programmes on liquid and solid biofuels as well as biomolecules and biomaterials⁵.

The National Research Programme for Bioenergies (PNRB)⁶ allocates some funds to research project dedicated to bioenergies of second and third generation from lignocellulosic biomass and wastes. This programme, managed by the ADEME, is supported by the Government with approximately €8 million per year.

The National Research Agency (ANR)⁷ is in charge of French research policy. Every year several calls for proposal provide funding for industrial biotechnology research⁸ in the research and innovation in biotechnology programme (RIB)⁹. Current funded projects include¹⁰:

- Butabiol: development of a bio-process to produce butanol directly from maize
- Transaronat: development of microbial and enzymatic production process for natural flavour

B. Pilot and demonstration plants

i. pilot plants

Sanazzaro

Institut Français du Pétrole, Biotechnology and Biomass Chemistry Department, Sanazzaro	
General, products, feedstocks	Fisher –Tropsch process (initially developed for natural gas)

² <http://www2.ademe.fr>

³ <http://www.era-ib.net>

⁴ www.ademe.fr/partenaires/agrice/index.htm

⁵ http://www.ademe.fr/partenaires/agrice/htdocs_gb/research01.asp

⁶ <http://www.pnrp.net>

⁷ <http://www.agence-nationale-recherche.fr/>

⁸ <http://www.agence-nationale-recherche.fr/AAPProjetsOuverts?NodId=17&IngAAPEtatId=1&IngAAPYear=0&IngAAPEtatId=0&IngAAPThemId=0&strMotClef=&btnSend=OK>

⁹ <http://www.agence-nationale-recherche.fr/templates/appele-a-projet.php?NodId=17&IngAAPId=111>

¹⁰ www.agence-nationale-recherche.fr/documents/aap/2006/selection/rib.pdf

Services	
Financing	
Contact	frederic.monot@ifp.fr / Tel: + 33 01 47 52 73 53

a) Open to all

Centre de recherche et de transfert de technologies (CRITT) – Bio-industries, Toulouse	
General, products, feedstocks	
Services	
Financing	
Contact	http://www.critt.net/bio_pres.htm

Dury

CVG & Fermensys, Dury	
General, products, feedstocks	Test or develop extraction and chemical/enzymatic modification processes. Validate technical choices. Produce industrial pre-series. Studies, scale-up and production for fermentative biomass and metabolites in collaboration with Fermensys
Services	Bioreactors of 50 litres, 150 litres, 300 litres and 3,5 m ³ Fermentation line of 300 litres Fermentation line of 3,5 m ³
Financing	
Contact	ducatel@cvgpn.com http://www.cvgpn.com/ http://www.fermensys.com/03_our_skills.html

b) Partly restricted

Pomacle

ARD – Agro-industrie recherche et développements, Pomacle	
General, products, feedstocks	ARD is a private research centre located in an important agro-industrial complex. It works on the different aspects of biorefineries, and especially on the ways to produce chemical intermediates.
Services	Micro pilot; pilot; Evaporator; atomisation Filtration; electro dialyse; extractor; drier Fermentors: 20, 50, 450 and 5000 liters. Fermentation process from 10 to 80m ³ The fermentation department offers its skills and equipment based on the needs of the customer.
Financing	Structured like private research with capital provided from "les coopératives céréalières de Champagne Ardenne", the sugar group "Cristal union", "la Caisse Régionale du Crédit Agricole du Nord Est", the "Chamtor" company (corn transformer out of gluten, starch, modified starch, glucose and derived) and "les Coopératives de déshydratation de Luzerne".
Contact	contact@a-r-d.fr

c) Restricted

Saint-Beauzire

Metabolic-Explorer, Saint-Beauzire	
General, products, feedstocks	Pilot plant built in 2007 ¹¹
Services	
Financing	Private, €3,3 million
Contact	http://www.metabolic-explorer.com/

ii. demonstration plants

- a) **Open to all**
- b) **Partly restricted**
- c) **Restricted**

Lestrem

BioHub, Lestrem	
General, products, feedstocks	The goal of this program is the development of cereal-based chemical products. The new cereals-based products are either new products (biosolvents, bioplasticisers, biolubricants, bioadditives for roads, biopolymers, biocomplexing agents) or current products with new biotech process (chemical intermediates or active ingredients). This programme is led by Roquette
Services	
Financing	€90 million: (€42 million from the French Innovation agency - €22 million as subsidies and €20 million as reimbursable loans). Industrial investment expected after 2010: €730 million
Contact	christophe.rupp-dahlem@roquette.com http://www.biohub.fr/

Pomacle

Bio Amber, Pomacle	
Bioamber is a joint venture of ARD and DNP Green Technology that combines the scientific, technical and commercial expertise of the two companies. Bioamber's goal is to make bio-based succinic acid competitive with maleic anhydride and therefore a viable platform molecule for four-carbon chemistry. They are currently using ARD pilot facilities and plan to build a demonstration plant.	
http://www.bio-amber.com	

Soustons

Safisis, Soustons	
General, products, feedstocks	Demonstration plants developed by the French Petrol Institute (IFP) and bought later by Soustons. They continue to work in cooperation with IFP.
Services	
Financing	

¹¹ http://www.metabolic-explorer.com/images/dynmetex/biblio/fichiers/reports/RA_inst_UK.pdf?PHPSESSID=37f4502d29e4db6c4c11e2849d3fd3c8

Contact	http://www.safisis.fr/
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Osiris, ???	
General, products, feedstocks	OSIRIS's R&D programme is an 8 years programme that aims to produce tools for the rapid selection of micro-organisms, develop industrial solid-state fermentation processes and create specific biotechnology products to improve the yield of biofuel production from wheat and maize in particular.
Services	
Financing	€77 million of which €31,2 million from the French Innovation agency
Contact	

II. POLICY

Public authorities can promote the quick take-up of industrial biotechnology innovations by implementing a number of “instruments” or policy initiatives. This can be the improvement of the regulatory framework; the integration of specification for bio-based products in public procurement; the establishment of standardisation, labelling and certification schemes to overcome perceived uncertainty about product properties and weak market transparency; the development of financial instruments and supports to increase investments into research, technology development and innovation as well as the elaboration of communication and information campaign to communicate the benefits of bio-based products to users.

A. Policies and regulations

No information.

B. Public procurement

The French Environment Agency, the ADEME, has published a guidebook on bio-products¹². The aim is to help public organisations to include more biomass-based products in their purchasing policies.

The guidebook gives buyers information and concrete data about green issues. It presents the 10 main bioproduct applications: bio fuels, wood heating, packaging, inks for printing, lubricating oils, building materials, agricultural films, cleaning agents, phytosanitary products, and road-surfacing. Each section includes an overview of the existing market in France and Europe, and of the legal context. The advantages of the vegetal alternatives are summarised, along with the existing commercial offer (suppliers, manufacturers, distributors). Some significant showcases illustrate the possible applications for the French authorities, at local and regional level.

C. Standardisation, labelling and certification

There is no standardisation, labelling and certification scheme for bio-based products.

ADEME has organised labelling of bio-based products. **Need for more information.**

D. Access to finance

OSEO¹³ was born in 2005, by bringing together ANVAR (French innovation agency) and BDPME (SME development bank). Its mission is to provide assistance and financial support to French SMEs and VSEs in the most decisive phases of their life cycle: start up, innovation, development, business transfer / buy out. By sharing the risk, it facilitates the access of SMEs to financing by banking partners and equity capital investors.

OSEO covers three areas of activity:

- Innovation support and funding: for technology transfer and innovative technology-based projects with real marketing prospects.
- Funding investments and operating cycle alongside the banks.
- Guaranteeing funding granted by banks and equity capital investors

¹² www.bourgogne.pref.gouv.fr/online/bourgogne/guide_bioprod_collectivite.pdf

¹³ <http://www.oseo.fr>

OSEO is currently supporting three major projects in the field of industrial biotechnology and biorefinery: BioHub (see above); Osiris (see above) and Futuro¹⁴ (IAR) a second generation bioethanol Research and Development Project.

The Futuro project was launched in September 2008. It is an 8 year projects with a total budget of €74 million (of which €29 million comes from OSEO). The first phase of the project will consist of the development of a pilot plant in Pomacle (ARD) with a capacity of 500l/day. In the second phase, a demonstration plant will be built with a capacity of 3,5 million liters per year.¹⁵

In 2004, the French Government decided a new industrial policy. One part of the policy aimed to establish competitiveness clusters¹⁶. For a given local area, a competitiveness cluster is defined as:

- an association of companies, research centres and educational institutions,
- working in partnership (under a common development strategy),
- to generate synergies in the execution of innovative projects in the interest of one or more given markets.

The aim of this policy is to encourage, then support, projects initiated by the economic and academic players in a given local area.

The French Government organises dedicated calls for competitiveness clusters twice a year. €400 million will be granted for the period 2008-2011.

Industrie et Agro-Ressources (IAR)¹⁷ is the cluster dedicated to biomass valorisation. It unites stakeholders from research, higher education, industry & agriculture in the Champagne-Ardenne and Picardy regions of France around a shared goal: the value-added non-food exploitation of plant biomass. It is active in the field of bioenergy, biomolecules, biomaterials and food ingredients. IAR cluster's missions are to:

- provide support for R&D projects, from the idea to the award of funding
- coordinate and network interregional skills
- build collaborations and international delegations & missions
- provide information and strategic intelligence
- perform promotional and public relations activities

IAR accredited projects have access to specific funding sources (Enterprise Competitiveness Fund; additional funding from the National Research Agency and earmarked funds from traditional funding bodies such as regional councils, ADEME, etc.).

E. Communication

French white biotech actors are supported by the newly established association "Chimie du vegetal"¹⁸. The association is chaired by Roquette¹⁹.

¹⁴ <http://www.iar-pole.com/index02.php?page=actualite#futuro>

¹⁵ [http://www.iar-pole.com/illust/DP_Projet_Futuro\(1\).pdf](http://www.iar-pole.com/illust/DP_Projet_Futuro(1).pdf)

¹⁶ <http://www.competitivite.gouv.fr/>

¹⁷ <http://www.iar-pole.com>

¹⁸ <http://www.chimieduvegetal.com/>

¹⁹ www.roquette.com/

III. OTHER