



INDUSTRIAL BIOTECHNOLOGY IN SPAIN

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INTRODUCTION

Spain contributes an estimated 4% of the world's biotech-related scientific production, ranking 4th in the EU-15, only behind the UK, Germany and France. However, only 0.37% of the European biotech patents originated in Spain from 2000-2006; by this measure Spain ranks 11th among EU-15 countries. Red biotechnology accounts for 39% of the sector. The companies with transverse technology platforms with applications in more than one area make up 33% of the overall figure. Green biotech applications make up 18% of the market and industrial biotechnology for 10%. In the industrial biotech sector, the most outstanding applications belong to the bioenergy areas where Spain plays a key international role through biofuels manufacturing companies and where national biotech companies are becoming better positioned.²³

² www.swissbiotech.org/php5/aa2/userfiles/CMS/51504_07_biotech_spain.pdf

³ http://www.asebio.com/docs/pub_31_i.pdf

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 Spanish Ministry of Education and Science⁴ and the Fundación Española de Ciencia y Tecnología - FECyT⁵ (Spanish Foundation for Science and Technology) are members as partner of the European Network Area on Industrial biotechnology (**ERA-net IB**)⁶.

Biotechnology has been identified as one of the 5 strategic areas (healthcare; energy and climate change; nanoscience and nanotechnology, new materials and new industrial processes; telecommunications and information society; biotechnology) in the Spanish National Plan for R&D&I 2008-2011⁷. Calls for proposals will be opened for the Plan's six instruments (human resources; R&D and innovation projects; institutional strengthening; science and technology infrastructures; knowledge use and technology transfer; system articulation and internationalisation).

The Action Plan's budget for 2008-2011 is € 5.7 million; one third will be allocated to industrial biotechnology. This action was managed directly between ASEBIO⁸ and the Economic Office of the Spanish Presidency.

The autonomous community of Madrid developed its own Plan for regional development. One objective of the Plan is the promotion of technological innovation in the biotechnology sector. The total budget for 2008-2009 is €8 million.

There are other autonomous communities also active in industrial biotechnology including the Basque Country, Navarre, Galicia or Andalusia.

B. Pilot and demonstration plants

i. pilot plants

a) **Open to all**

Alcalá de Henares (Madrid)

Universidad de Alcalá - Planta Piloto de Química Fina	
General, products, feedstocks	Diverse fermentation processes, enzymatic reactions, design of residual water treatments, design of biopolymers.
Services	Calorimetric reactors (1L at 6 bar and 2L at atmospheric pressure) Reactors of glass and stainless steel (5L) Biofermenters (2 to 40L).
Financing	Public, open to customers and associated companies
Contact	http://www.ppqf.net/

⁴ www.mec.es

⁵ www.fecyt.es

⁶ <http://www.era-ib.net>

⁷ http://web.micinn.es/contenido.asp?menu1=1&menu2=0&dir=03_Plan_IDI/00-LIAs

⁸ www.asebio.com

Armillá (Granada)

BIOT	
General, products, feedstocks	Fermentation and bioprocesses in general (Synthesis of functional foods, production of bioalcohol, biogas, bioplastics).
Services	Biofermentors and bioreactors Capacity: 50, 100 and 300 L. (now in processes of expanding up to 1000 L).
Financing	Private. Open to customers
Contact	Tel.: +34 958750618 - +34 958301477 E-mail: info@biotgen.com

Bellaterra (Barcelona)

Fermentation pilot plant. Chemical Engineering Department Edifici Cn-Universitat Autònoma de Barcelona	
General, products, feedstocks	Development of continuous, batch or fed-batch processes with microorganisms either bacterium, fungi or yeast, genetically modified or not. Development of products obtained from cultures. Primary downstream stages.
Services	Biostat UD50 pilot scale bioreactor, 300L pilot scale bioreactor (B.Braun), Stirred tank with cooling system. Pressure and storage tanks.
Financing	Public, open to customers
Contact	http://eq3.uab.es/ppf/httpdocs/ingles/present.htm

Las Palmas (Canary Islands)

Centro de Biotecnología Marina	
General, products, feedstocks	Isolation, identification and maintenance of germoplasm banks. Cultivation, production and industrial evaluation of microalgae and cyanobacteria. Design and validation of photobioreactors for microalgae. Selection and conservation of algae strains.
Services	Vertical tubular photobioreactors. Stirred raceways (8m ² and 30 m ²) Capacity: up to 500 litres
Financing	Public, open to customers
Contact	ggarcia@dbio.ulpgc.es http://www.ulpgc.es/index.php?pagina=dbio&ver=inicio

Madrid

CIEMAT	
General, products, feedstocks	Lignocellulosic biomass fraction
Services	Steam explosion reactor
Financing	Public
Contact	http://www.ciemat.es/portal.do?IDM=195&NM=3 contacto@ciemat.es

Mollet (Barcelona)

IUCT	
General, products, feedstocks	Fermentation processes, enzymatic reactions. Optimization of biotech reactions for maximum yield, scaling-up, support in industrial applications of the system Large experience in developing biosynthetic processes for Active Pharmaceutical Ingredients (API) (Small molecules, Nucleosides, Vitamins, ...)

Services	Bioreactors - Capacity: 1, 4, 5 and 20 L. Parallel Reactors for development of bio-reactions Chemical Reactors 1-20 L for Bio-catalysis GMP Pharmaceutical Pilot Plant
Financing	Private. Open to customers
Contact	Tel.: +34 93 579 34 32 - +34 93 570 57 45 www.iuct.com E-mail: iuct.sales@iuct.com

Paterna (Valencia)

Biopolis, S.L.	
General, products, feedstocks	Development and optimization of fermentation processes Optimization of recovery processes for biomass and microbial products. Standardized production of batches according to established procedures
Services	Fermenters of 2, 5, 15, 30, 75 y 300 L of capacity, with "in situ" sterilization and control software. Production of microorganisms by fermentation up to volumes of 300 l.
Financing	Public-private co-funding. Open to customers
Contact	http://www.biopolis.es/en/

Zamudio

GAIKER Technological Centre	
General, products, feedstocks	Optimisation of enzymatic reactions for maximum yield, scaling-up, support for industrial applications of the system.
Services	Reactor type: Fermenter. Capacity: 30 L
Financing	Private (non-lucrative consortium of private companies). Open to customers
Contact	http://www.gaiker.es/english/index.asp

b) Partly restricted

c) Restricted

El Viso del Alcor (Sevilla)

PEVESA	
General, products, feedstocks	Production of peptides and amino acids from vegetal origin. Design for product development and market introduction studies
Services	Reactor type: Multi-purpose, versatile. Capacity: 100 litres
Financing	Private
Contact	http://www.pevesa.com/ info@pevesa.com

ii. demonstration plants

a) Open to all

Las Palmas (Canary Islands)

Instituto Tecnológico De Canarias, S.A.	
General, products, feedstocks	Cultivation and processing of microalgae for biomass production. Downstream processing of biomass for food production. Process optimisation.
Services	1200 m2 surface of open tanks. Production of 6 tonnes of dry biomass per year.
Financing	Public. Plant exploitation is offered as service for companies.
Contact	Tel: +34 928 727555 Fax: +34 928 727517 hmendoza@itccanarias.org http://www.itccanarias.org/

b) Partly restricted

c) Restricted

Babilafuente (Salamanca)

Biocarburantes Castilla y León (Abengoa Bioenergy)	
General, products, feedstocks	World's first commercial scale bioethanol plant using lignocellulosic biomass (cereal straw) as feedstock. Bioethanol production demonstration plant (under construction)
Services	Processing of 70 tonnes of agricultural residues to produce over 5 million litres of fuel grade ethanol per year.
Financing	Private
Contact	http://www.abengobioenergy.com/sites/bioenergy/en/acerca_de/oficinas_e_instalaciones/bioetanol/europa/biocarburantes_cast_leon/index.html

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

There are no specific policies or regulations supporting bio-based products.

B. Public procurement

Green procurement exclusively applies to public authorities.

The establishment of a specific national action plan for bio-based products is currently not an issue in the government administration.

C. Standardisation, labelling and certification

There is no standardisation, labelling or certification scheme dedicated to bio-based products.

D. Access to finance

Specific financing support for industrial biotechnology does not exist in Spain. However, several programmes and instrumental lines⁹ aim to help entrepreneurs in the establishment of companies

- CENIT: National Strategic Consortia for Technical Research
- PID: Creation and significant improvement of a productive process, product or service, including/understanding as much activities of industrial investigation as of experimental development.
- Iniciativa NEOTEC¹⁰: Creation of new companies of technological base in Spain
- CAPITAL RIESGO NEOTEC¹¹: Consolidation of new companies of technological base in Spain
- Instrumental line of performance of human resources: formation, mobility, hiring and personal incorporation of I+D+i
- Instrumental line of performance of projects of R&D&i: projects of fundamental Investigation, projects of applied investigation and projects of experimental development
- Instrumental line of scientific and technological infrastructure performance
- Instrumental line of performance of use of the knowledge and technological transference: support to young innovating companies
- Instrumental line of performance of joint and internationalization of the system

⁹ [http://www.plannacionalidi.es/plan-idi-](http://www.plannacionalidi.es/plan-idi-public/mostrarModelo.do?idContentValue=374&version=1&idContent=375&tipoModelo=23)

[public/mostrarModelo.do?idContentValue=374&version=1&idContent=375&tipoModelo=23](http://www.plannacionalidi.es/plan-idi-public/mostrarModelo.do?idContentValue=374&version=1&idContent=375&tipoModelo=23)

¹⁰ <http://www.cdti.es/index.asp?MP=7&MS=24&MN=3>

¹¹ <http://www.cdti.es/index.asp?MP=7&MS=156&MN=3>

E. Communication

Industrial biotechnology enterprises are represented by the national association ASEBIO¹².

In the framework of the Innoempresa programme, Asebio developed a communication campaign ""La biotecnología como vector de competitividad en sectores maduros"¹³¹⁴. This initiative intends to present the different applications and benefits of biotechnology in our daily life as well as in different industrial sector.

ASEBIO, with the support of the Spanish Ministry for Industry¹⁵ (MITYC), has set an ambitious biotech applications communications programme getting the word out about biotech solutions available to Spain's traditional industry sectors. The objective is to offer "bio-solutions" relating to: bioprocess (chemical, textile, foodstuff, pharmacy etc), quality control technologies, security and traceability based on biotechnology. A network of technological advisors has been created and will carry out technological analyses to determine where biotech solutions could be implemented.

ASEBIO, with the support of the Spanish Foundation for Science and Technology¹⁶ (FECYT) organised an exhibition on biotechnology in our daily life and particularly in houses. "Your Biotech House" showed to visitors that biotechnology is already present in their daily life through domestic surroundings.

¹² <http://www.asebio.com/>

¹³ <http://www.asebio.com/inno/index.cfm>

¹⁴ http://www.europabio.org/Education/edu_what.htm

¹⁵ <http://www.mityc.es/es-ES/index.htm>

¹⁶ <http://www.fecyt.es>