



BIOECONOMY

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INVEST
IN ITALY

ITCA
ITALIAN TRADE AGENCY

INVITALIA

FOREWORD ON METHODOLOGY

The data contained in and employed for the present report were collected by Cerved Group through the exclusive processing of information from both public and private sources. The term 'public sources' is intended here as data publicly available from institutions including, but not limited to, OECD, ISTAT, and the Italian Ministries for Education, Universities and Research (MUIR), Economic Development (MSE), Agriculture, Food and Forestry (MIPAAF), Environment, Land and Sea Protection (MATTM).

The term 'private sources' is intended here as Cerved Group's proprietary databases on the major companies that operate in the sector.

The data collected has then been aggregated to build a complete picture of the main segments of the overall bioeconomy: agriculture, forestry, fishing, food & beverages, tobacco, and other industries that use and/or transform biological resources (paper, wood, textiles, apparel, energy, etc.).

It is not possible to identify specific economic activity (ATECO) codes for companies operating in the macro bioeconomy sector, as it spans a wide range of industrial sectors within the national economy.

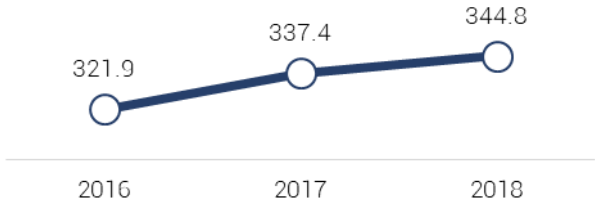
The graphs presented have been prepared by Cerved Group based on proprietary data and/or public sources listed above.

BIOECONOMY AT A GLANCE

THE BIOECONOMY IS A STRATEGICALLY IMPORTANT SECTOR, BOTH DOMESTICALLY AND INTERNATIONALLY. IN 2018 OVERALL TURNOVER GREW BY C.€7 BILLION VS. 2017, BRINGING IT TO 10.2% OF THE TOTAL OF NATIONAL ECONOMIC OUTPUT.

ITALY RANKS 3RD IN EUROPE IN TERMS OF TURNOVER, BEHIND ONLY GERMANY AND FRANCE.

BIOECONOMY, AGGREGATE TURNOVER, 2016-2018
€ bn



941

START UPS^(a)

2,050,000

EMPLOYEES^(b)

a) - updated in february 2020

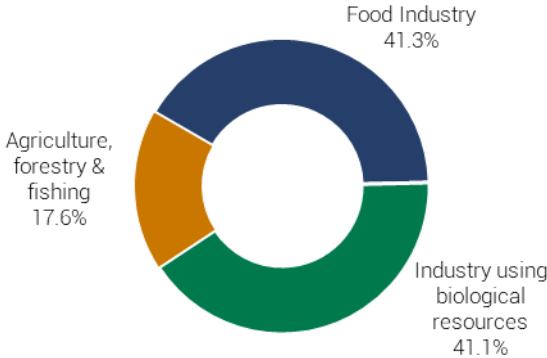
b) - updated to 2018 for the whole sector

Source: Cerved Group processing of data from various sources

BIOECONOMY AT A GLANCE

BIOECONOMY, BREAKDOWN OF TURNOVER BY SEGMENT, 2018

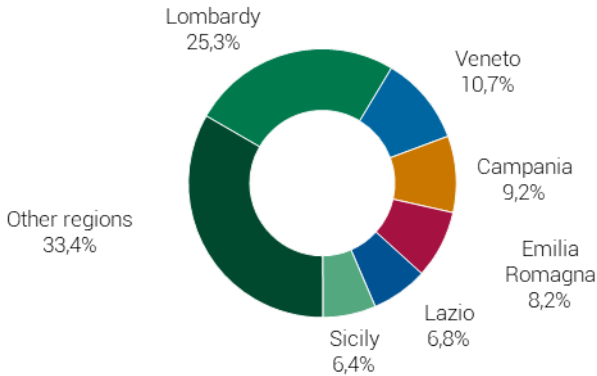
2018: 100% = €344.8 billion



FOREIGN DIRECT INVESTMENT (FDI) IN THE AGRICULTURE, FORESTRY AND FISHING SEGMENT CAME TO €1.525 BILLION IN 2018.

BIOECONOMY, NUMBER OF START-UPS BY REGION, FEBRUARY 2020

2020: 100% = 941 companies



IN FEBRUARY 2020, THERE WERE 941 START-UPS AND SME, OF WHICH 238 IN LOMBARDY, 101 IN VENETO AND 87 IN CAMPANIA .

Source: Cerved Group processing of data from various sources

HIGHLIGHTS

The European Commission defines the bioeconomy as *"The production of renewable biological resources and the conversion of these resources and waste streams into value added products, such as food, feed, bio-based products and bioenergy. To be successful, the European bioeconomy needs to have sustainability and circularity at its heart. This will drive the renewal of industries, the modernisation of primary production systems, the protection of the environment and enhance biodiversity"* (Source: European Bioeconomy Strategy).

There are therefore 3 important areas of the bioeconomy:

- agriculture, forestry, fishing and aquaculture;
- food, beverages and tobacco;
- other industries that use and/or transform biological resources (such as: the paper, wood, cosmetics, pharmaceutical, chemicals, biotech, energy, textile and apparel industries).

The objective of the bioeconomy is to create a **prosperous economy that respects the environment through the use of biological resources and renewable energy sources**, with an ever-decreasing reliance on fossil fuels.

In 2018, total national turnover from the bioeconomy **reached €344.8 billion, up 2.2% on the previous year**, which in turn recorded a 4.4% increase on 2016.

The major source of revenues is the food industry, which represents 41.3% of the total; this was followed by other industries using biological materials, with 41.1%, while the remaining 17.6% came from agriculture, forestry, fishing and aquaculture or the marine economy.



HIGHLIGHTS

On a national basis, the main **technology clusters** that can be directly associated with the bioeconomy macro-sector are:

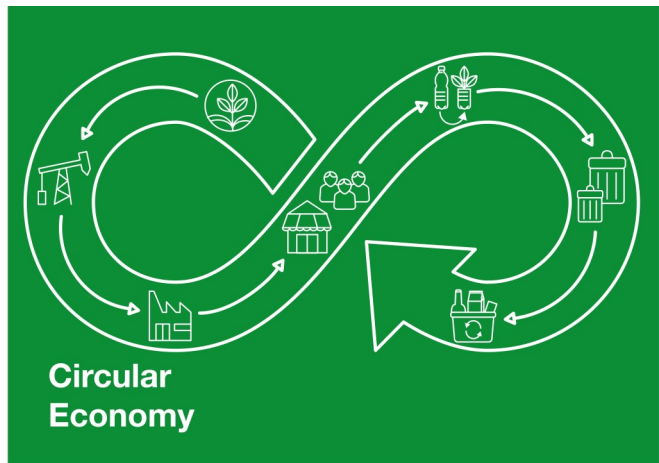
- Agrifood;
- Green Chemistry (SPRING - Sustainable Processes and Resources for Innovation and National Growth);
- Smart factories;
- Blue Growth^(a);
- Energy

It is worth noting that the final two clusters were created in response to the MIUR decree dated 3rd August 2016: *"Resolution for the development and enhancement of 4 new national technology clusters"*.

The main sector trends relate to the development of a circular economy, based on sustainable production processes and environmental protection, smart agriculture and agriculture 4.0 (digital technology, such as the Internet of Things and Big Data, applied to agriculture to enable greater precision in crops and more efficient monitoring activity) and the use of renewable raw materials.

Many European measures have been put in place to support and develop the bioeconomy, including Cohesion Funds and the Horizon 2020 plan.

a) - the Blue Growth cluster was set up by region Campania, with the aim of promoting research, innovation and training for the development of the "Blue Economy" (Marine Activities)



HIGHLIGHTS



Opportunities in the sector:

- Development of Agriculture 4.0
- Smart territorial specialisation;
- Alternative energy sources;
- Growing bio-pharma demand;
- European Circular Bioeconomy Fund;
- Rising foreign demand.

The **critical success factors** are:

- Investments in research, development and new technology for environmental sustainability as part of an efficient, green economy;
- High export tendency;
- Efficient company processes.

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INDUSTRY OVERVIEW

KEY CHARACTERISTICS

On 13th February 2012, the European Commission adopted a strategy entitled: *"Innovating for Sustainable Growth: A Bioeconomy for Europe"* dedicated to the **bioeconomy**, defined as an economy based on biological resources from land and sea, as well as from waste, that can function as fuel for industrial production, energy generation, food and feed, and also involves the use of production processes founded on biological products for sustainable manufacturing.

The update to the European Bioeconomy Strategy was published on 11th October 2018. The aim was to set new challenging targets, starting with an action plan focused on 3 key priorities:

- Strengthen and scale-up **bio-based** sectors, unlock investments and markets;
- Support local **bioeconomy development** throughout Europe;
- Understand the ecological boundaries of the bioeconomy, creating an **international monitoring** system.

The document estimates that implementation of the strategy could create up to 1 million jobs in industrial biotech sectors by 2030 and help mitigate climate change, reducing carbon dioxide emissions by as much as 2.5bn tons per year.

Indeed, the basic principle of the bioeconomy is **smart and sustainable use of renewable resources** that can create new 'green' jobs.



KEY CHARACTERISTICS

The planet's biological resources are finite, so we need to find ways to protect natural resources such as water and soil. The bioeconomy starts from this concept and aims to use the renewable element of the circular economy, finding new solutions to meet global needs for food, produce and energy through initiatives such as using algae in fuels, making biodegradable plastic from renewable resources and producing furniture and clothing from waste products, among others.

The bioeconomy therefore focuses on using natural resources from land and sea as input raw materials for food, industrial production and energy.



KEY CHARACTERISTICS

In 2018, activities connected to the bioeconomy generated **€344.8bn** in national turnover, up 2.2% on the previous year, and employed over 2 million people. In 2008, the equivalent turnover was €289 billion, meaning there was a c.€56 billion increase over 10 years, demonstrating that bioeconomy activities are growing rapidly in Italy.

Companies operating in the bioeconomy macro sector can be categorised in 3 main areas:

- agriculture, forestry, fishing and aquaculture;
- food, beverages and tobacco;
- other industries that use and/or transform biological resources (such as: the paper, leather, biopharma and biochem, green chemistry, bioenergy, textile and apparel industries).

The **agrifood chain** in particular is the main pillar of the domestic bioeconomy, responsible for over half of the turnover and jobs, and plays a leading role in promoting nutrition and health. In this respect, the national agrifood system is a leader within Europe; **Italy leads the way** for PDO/PGI production of food and beverages.

KEY FIGURES



KEY BUSINESS AREAS



KEY CHARACTERISTICS

R&D

While there are no precise figures available for research and development investments made by companies operating in the bioeconomy macro sector, as such companies operate in a wide range of industrial sectors within the national economy, the importance of innovation is demonstrated by the growing number of innovative bioeconomy start-ups, categorised under ATECO code 72 "Scientific Research & Development", which numbered 496 as at February 2020 (52.7% of total bioeconomy start-ups).

In general terms, it is more appropriate to talk about R&I (Research and Innovation, interventions in industrial and labour policy), the priorities of which are outlined in the "*National Bioeconomy Strategy (BIT)*":

- increase sustainable agricultural production through:
 - ◆ More efficient agricultural production and forestry models;
 - ◆ Implementation of techniques based on digital

technology and satellite monitoring of land and crops;

- ◆ Use of biodiversity;
- ◆ Strengthening of organic agriculture and farming;
- improve efficient resource management through:
 - ◆ Reusing agricultural and forestry waste for the manufacture of bio-based products, bioenergy or biofertilisers;
 - ◆ Exploitation of raw materials from forestry for energy generation and the production of energy efficiency materials;
 - ◆ Development of soil conservation and regeneration programmes;
 - ◆ Improvement of primary production in the Mediterranean through:
 - ◇ Preservation and implementation of biodiverse and sustainable crops and farms;

KEY CHARACTERISTICS

- ◊ Design of a Mediterranean agricultural production system;
- ◊ Exploitation of external energy sources, such as insects, algae, etc.;
- ◊ Mitigation of climate change impact on crops and farms in the Mediterranean area;
- Promote the development of marine resources through:
 - ◆ Increased fishing and marine aquaculture;
 - ◆ Promotion of the production of algae, jellyfish and phytoplankton as a possible source of edible protein, and also as biomass for the production of biological chemical resources;
 - ◆ Improvement in monitoring and control systems to develop so-called smart fishing through the use of ICT, Big Data and Industry 4.0 technology;
 - ◆ Sustainable use of zooplankton for the production of high value-added substances (drugs, cosmetics, nutraceuticals and other bio-based products);
- ◆ Sustainable promotion and conservation of the beauty of marine areas and cultural heritage;
- ◆ Promotion of clean-up operations in polluted areas.
- Stimulate sustainable, innovative and competitive food production;
- Enhance production of bio-based products and bioenergy through:
 - ◆ Mapping of biomass production, including innovative raw materials (organic waste, CO₂, marine biological resources);
 - ◆ Use of organic waste for energy generation;
 - ◆ Evaluation of risks associated with climate change.

KEY CHARACTERISTICS

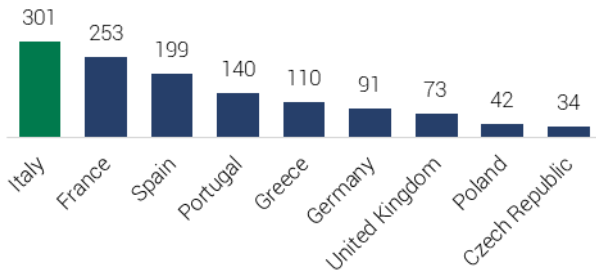
AGRIFOOD EXPORTS

Italy is the leading country in Europe for the number of PDO/PGI/TSG products^(a) both for agricultural specialities and the beverage industry, with 862 accredited products in total.

This is one of the drivers of the considerable increase in export trends for bioeconomy companies in recent years; on a global scale, Italy is the **6th largest exporter** of food and beverages.

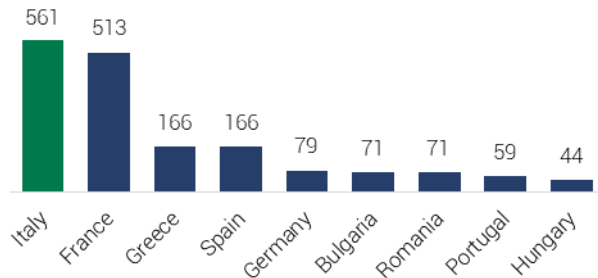
BIOECONOMY, LEADING EUROPEAN COUNTRIES' PDO, PGI AND STG AGRICULTURE AND FOOD PRODUCTION, 2020

€ bn



BIOECONOMY, LEADING EUROPEAN COUNTRIES' PDO, PGI AND STG BEVERAGE PRODUCTION, 2020

(N°)



Italy is in third place when it comes to exports of high-end foodstuffs (behind USA and Netherlands).

Italy is also notable for a high degree of biodiversity and the significant proportion of land dedicated to organic agriculture, for which it is the leading country in Europe with nearly 2mn hectares of land allocated to organic crops.

a) - PDO: Protected Denomination of Origin; PGI: Protected Geographical Indication; TSG: Traditional Speciality Guaranteed

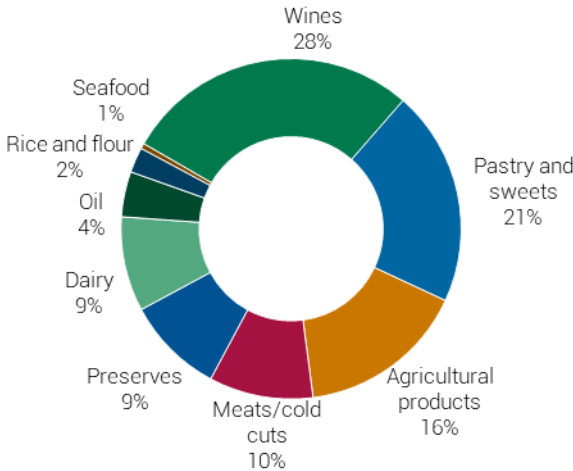
Source: Cerved Group processing of data from various sources

KEY CHARACTERISTICS

In 2019, the value of domestic agrifood exports came to €19.5 billion, up 4.4% on the previous year. The two leading export segments were wine (+6.6% in value) and pastry and sweets (+12.6%) which together make up nearly half of total exports, followed by agricultural products with 16% (-0.6% vs. 2018) and meats/cold cuts with 9.9% (unchanged).

BIOECONOMY, ITALIAN AGRIFOOD EXPORTS, 2019

2019: 100 = €19.5 billion



Source: Cerved Group processing of data from various sources

KEY CHARACTERISTICS

START-UPS

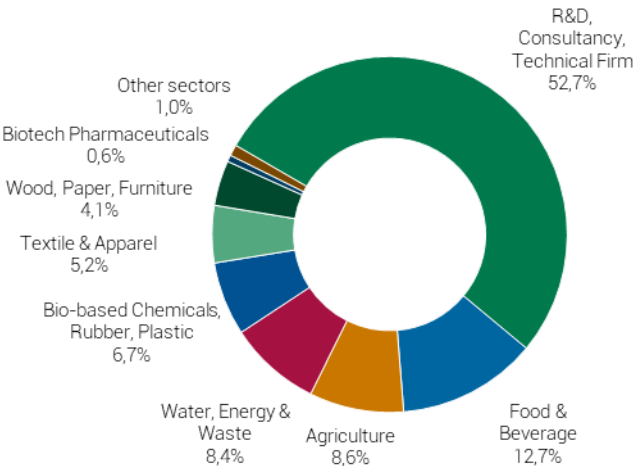
The bioeconomy sector is considered **fertile ground for start-ups and innovative SME** focused on developing new products based on renewable raw materials that make production processes more sustainable.

At the end of February 2020, around 11,000 operating companies were enrolled on the Company Register in all economic sectors, of which 941 in the bioeconomy sector.

The majority of bioeconomy start-ups are companies operating in research & development (496 companies, or 52.7% of the sector total) followed by companies active in the food & beverage (12.7%), agriculture (8.6%) and water, energy & waste (8.4%) segments. Biotech pharmaceutical start-ups represent just 0.6%.

Bioeconomy start-ups tend to be small in size but highly innovative.

BIOECONOMY, START-UPS BY SECTOR, 2020
2020: 100% = 941 units



Source: Cerved Group processing of data from various sources

KEY CHARACTERISTICS

As for the territorial presence of these start-ups, Lombardy is the dominant region, with 238 companies, trailed by Veneto (101), Campania (87), Emilia Romagna (77) and Sicily (60).

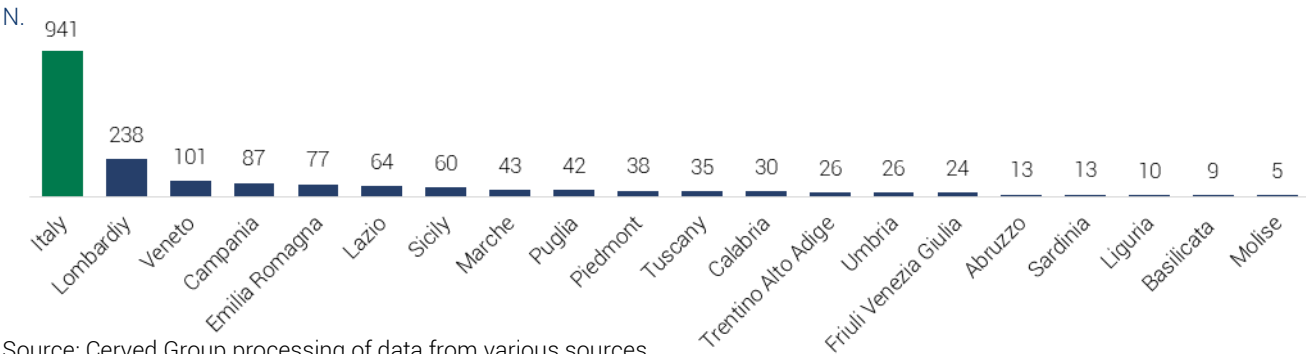
Drilling down further, the specific provinces with the most bioeconomy start-ups are Milan with 163 companies, followed at a great distance by Rome (53), Naples (40%) and Padua (30). Other than large cities, it is worth noting significant bioeconomy specialisation in the provinces of:

- Ascoli Piceno, with 20 start-ups recorded as at Febru-

ary 2020, linked to the agrifood, textiles, biotech and pharmaceuticals sectors;

- Bergamo with 29 new companies operating in energy and the circular use of biomass;
- Trieste, with 10 start-ups operating in R&D;
- Avellino, the only Southern Italian province (other than Naples) with 13 bioeconomy start-ups (these are largely companies focused on R&D, agriculture and leather processing).

BIOECONOMY, NUMBER OF START-UPS BY REGION, 2020



Source: Cerved Group processing of data from various sources

KEY CHARACTERISTICS

EUROPEAN REGULATIONS

- **Circular economy package:** In December 2015 the European Union adopted a package on the circular economy that defines strategies and sets targets to relieve pressure on natural resources, introducing new mechanisms to reduce waste (planned recycling, reduced packaging waste, etc.).
- **Marine Strategy framework directive:** the aim of the directive is to restore good environmental status for EU marine environments by 2020. It is the main tool for the definition and promotion of a sustainable approach based on safeguarding marine biodiversity.
- **Waste framework directive:** establishes the basic principles for efficient waste management, explaining at what point waste can become a secondary raw material.

NATIONAL REGULATIONS

Environmental Annex, 2014 Stability Law, "Environmental provisions to promote green economy measures to curb excessive use of natural resources" outlines the main phases of the national environmental strategy. The two main objectives are to develop the green economy and the circular economy, through:

- Green Public Procurement (GPP): sets minimum environmental criteria for purchases by public sector bodies (green purchasing);
- Incentives for purchasing recycled materials;
- Waste management and incentives to increase the volume of waste collected;
- Creation of a National Capital Committee to monitor the impact of public policy on the conservation of natural resources;
- Introduction of a payment system for environmental and ecosystem services;
- Drawing up a register to categorise subsidies according to whether they are harmful or beneficial to the environment.

KEY CHARACTERISTICS

Another factor to note with regard to the Environment Annex is the update to the National Sustainable Development Strategy to reflect the United Nations 2030 Agenda; of the 17 goals set, the following relate to the bioeconomy:

- end hunger, achieve food security, improve nutrition and promote sustainable agriculture;
- ensure access to affordable, reliable, sustainable and modern energy for all;
- promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all;
- build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation;
- ensure sustainable consumption and production patterns;
- conserve and sustainably use the oceans, seas and marine resources for sustainable development;
- protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

The **National Biodiversity Strategy (SNB)**, adopted in October 2010, aims to bring together and integrate the goals for the preservation of biodiversity and the sustainable use of natural resources.

The **National Marine Strategy** was adopted in 2010 to transpose the Marine Strategy framework directive to national legislation, and has the aim of preserving the good environmental status (GES) of national marine waters.



KEY CHARACTERISTICS

SPECIALISATION CLUSTERS ^(a)

Technology clusters play an important role in the development of the national bioeconomy sector. These are organisations of companies, universities, public or private research institutions and parties active in the innovation field. They operate in various different regions, across a range of disciplines and with international input, and act as drivers of sustainable economic growth both in their local areas and for the entire domestic economic system.

The clusters that can be directly associated with the bioeconomy are:

- Agrifood;
- Green chemistry;
- Smart factories;
- Blue growth and energy.

a) - Latium: Agrifood-Energy; Lombardy: Green chemistry (Spring); Emilia Romagna: Smart factories; Campania: Blue growth



KEY CHARACTERISTICS



The **National Agrifood Technology Cluster (C.L.A.N.)** comprises companies, regional representatives and stakeholders that operate in the agrifood supply chain. The cluster was formed in 2013 with the aim of promoting sustainable economic growth based on research and innovation. It is the single point of contact for national and European institutions actively dedicated to development of the sector.

There are currently 112 parties attached to the cluster, made up of large, mid-sized and small enterprises, universities, research centres, business associations, technological districts and other stakeholders.

Fifteen regions expressed an interest in the definition of the objectives for the cluster: Abruzzo, Emilia Romagna, Friuli-Venezia-Giulia, Liguria, Lombardy, Marche, Molise, Piedmont, Puglia, Sardinia, Sicily, Tuscany, Trentino Alto Adige, Umbria and Veneto.

Some important national and international associations are linked to the Agrifood cluster, including the "*Food for Life*" European technology platform; "*Italian Food for Life*", the national technology platform; *Partnership for Research and Innovation in the Mediterranean Area* (PRIMA).

The cluster's main **objective** is to **facilitate industrial research and innovation, and to promote competitive development and training in the national agrifood sector**, with specific interventions to assist some areas in Southern Italy.

a) - The headquarter of the Agrifood Cluster is in Rome (Lazio)

KEY CHARACTERISTICS



Among the main projects launched by the cluster, we would highlight:

- **HUMAN TECHNOPOLE (2019):** in October 2018 an agreement was signed between the Human Technopole foundation and the CLAN and ALISEI clusters to

develop and promote the Italian life sciences and agrifood sectors both nationally and internationally. Planned activities include the diffusion of technological innovations and the promotion of joint ventures between Italian companies and research centres for the development of research.

- **SO.FI.A. (2017):** the aim of the project is to improve the sustainability of the agrifood supply chain through research into innovative technological solutions in the main production supply chains with an impact on the entire cycle of production, transformation and end consumption. The project's objectives are:
 - ◆ adaptation to climate change: reduction of primary production loss through crop selection, precision farming and energy/environmental certification for the main national crops (cereal cultivation, viticulture, horticulture);

KEY CHARACTERISTICS

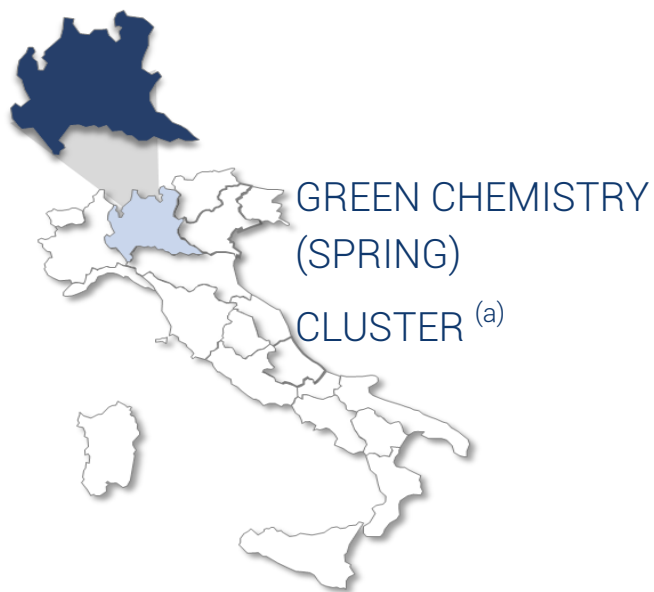


- ◆ recovery and re-use of by-products and waste products from agrifood processing (ready-to-eat fresh products, wine, dairy and meat) for the production of molecules with high added value, new products and energy recovery systems;

- ◆ new food processing methods and innovative preservation techniques aimed at increasing the overall sustainability of the agrifood supply chain and at reducing waste.

Furthermore, with a Decree Law published on 13th July 2017, the Ministry of Education assigned €497 million of financing to experimental industrial research and development projects. **€59.1 million of these funds were allocated to agrifood projects for the development of innovative technological solutions for food production, preservation, traceability, safety and quality.**

KEY CHARACTERISTICS



The SPRING cluster aims to bring together innovative institutions to develop a national Green Chemistry supply chain as part of the creation of a new sustainable economy: the BIOECONOMY.

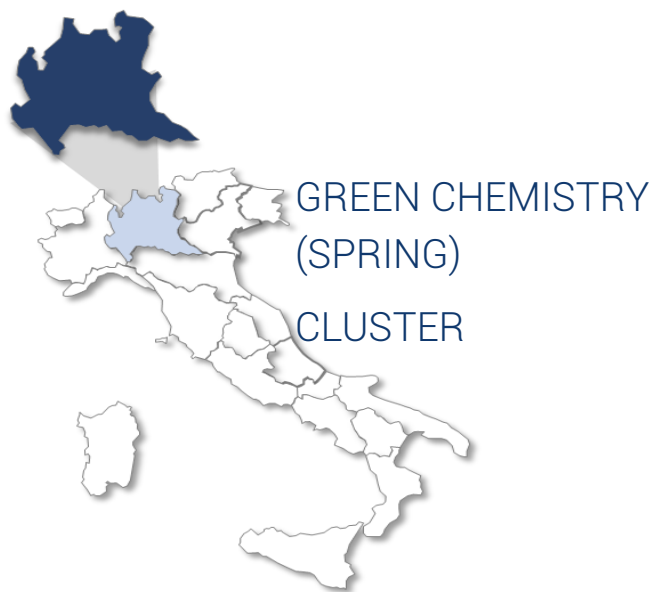
The cluster is a trigger for sustainable innovation and growth of the green chemistry sector based on the bioeconomy, respecting the environment and safeguarding biodiversity.

SPRING was founded in 2014 as a not-for-profit association on the initiative of Biochemtex S.p.A., Novamont S.p.A., Versalis S.p.A. and Federchimica in response to the *"Notice of the development and enhancement of national technology clusters"* (Executive Decree no.257 dated 30th May 2012, Ministry of Education, Universities and Research).

In 2017 the cluster was officially recognised with legal entity status as a national institution in the bioeconomy sector. There are now over 100 bioeconomy sector operators registered with the cluster from the entire length of the Green Chemistry supply chain. These include major industrial companies, SME, universities, and all the leading Italian public research organisations operating in the transformation and collection of biomass.

a) - The headquarter of the Green Chemistry (Spring) Cluster is in Milan (Lombardy)

KEY CHARACTERISTICS



There are currently 12 Italian regions associated with the cluster's projects and initiatives and supporting its activities, namely: Basilicata, Campania, Emilia Romagna, Friuli Venezia Giulia, Liguria, Lombardy, Piedmont, Apulia, Sardinia, Tuscany; Umbria and Veneto, as well as the auton-

mous province of Trento.

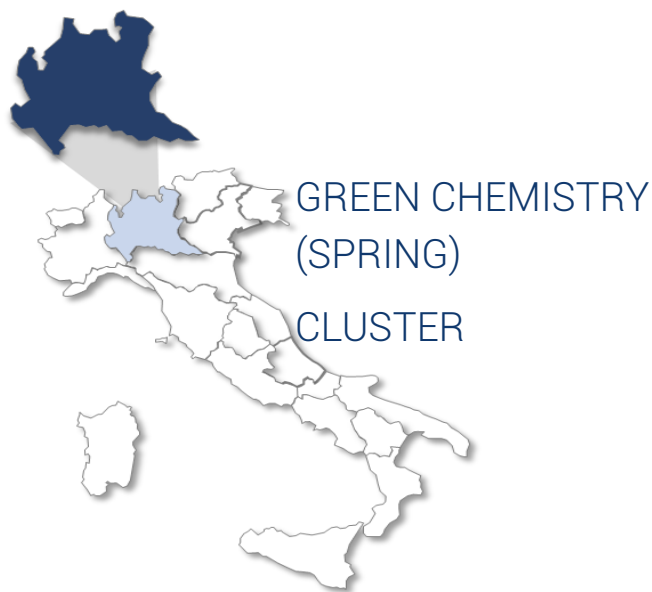
In January 2016 the SPRING cluster joined the bioeconomy workstream of the *"Food, Health and Quality of Life"* project.

The cluster was also identified as a key player for the drafting of the National Bioeconomy Strategy.

Consistently with the National and European Bioeconomy Strategies, the SPRING cluster's actions are built on 4 pillars:

- use of renewable resources as raw materials;
- creation of biorefineries integrated in the local areas in order to obtain high value-added products (biochemicals and biomaterials);
- development of new bio-based products with low environmental impact;
- implementation of specific actions to incentivise R&D activity, in order to help increase investments in innovative technology and foster the growth of the bioeconomy on a regional and national scale.

KEY CHARACTERISTICS



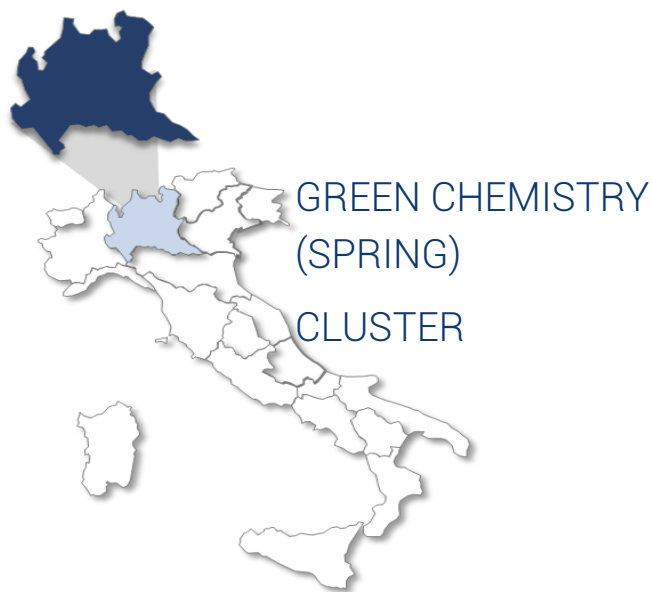
NATIONAL PROJECTS

At the beginning of 2014, the Strategic Development Plan presented to the Ministry for Universities and Research included four 3-year industrial research, experimental de-

velopment and training projects focused on specific areas of application:

- **ALBE (Alternative Biomasses for Elastomers):** research into the development of a sustainable catalytic process for the production of bio-butadiene from renewable sources; in collaboration with Versalis.
- **BIT3G (Third generation biorefinery integrated in the local area):** development of bio-industries in Italy through a holistic approach to innovation, and re-launching the Italian chemicals industry on the basis of environmental, social and economic sustainability.
- **REBIOCHEM (Biochemicals from biomass):** development of chemical and biotech processes for the production of energy and biochemicals from biomass waste generated by the agri-industrial production chain.
- **LIDIA:** development of second-generation technology for the conversion of biomass derivatives into green carboxylic acids, as building blocks from renewable sources for the synthesis of chemicals and polymers.

KEY CHARACTERISTICS



As part of its efforts to create relationships with international bioeconomy bodies, the cluster is also a partner in the following projects:

- **GRACE:** *Growing Advanced Industrial Crops on marginal lands for Biorefineries.* Within the 5-year project, which commenced on 1st June 2017, SPRING is responsible for coordination of the Industry Panel and the dissemination and communication of information on the bioeconomy;
- **POWER4BIO:** *emPOWERing regional stakeholders for realising the full potential of European BIOeconomy,* is a 3-year project launched in October 2018 with the aim of supporting European regions in their transition to the bioeconomy and a circular economy.

It should also be noted that with a Decree Law published on 13th July 2017, the Ministry of Education assigned €497 million of financing to experimental industrial research and development projects. **€29.5 million of these funds were allocated to green chemistry product and process innovation relating to biorefineries and the manufacture and use of bio-based products.**

KEY CHARACTERISTICS



The **"Smart Factories" National Technology Cluster (CFI)** is a recognised association that includes small, medium-sized and large companies, universities and research centres, business associations and other stakeholders that operate in the advanced manufacturing sector. The association is recognised by MIUR as a driver of sustainable

economic growth on a national scale.

The cluster was formed in September 2012 with the following mission:

- enhance the competitiveness of the Italian manufacturing industry through the development of new technology;
- preserve and cultivate advanced manufacturing expertise in Italy;
- increase companies' ability to gain access to international funding;
- support entrepreneurialism and the growth of national companies thanks to the involvement of private business people.

233 companies are members of the cluster, of which 171 SME and 62 large corporate. CFI also includes 37 national associations, 37 research centres and 12 regional organisations/ institutions.

a) - The headquarter of the Smart Factories Cluster is in Bologna (Emilia Romagna)

KEY CHARACTERISTICS



Technical scientific workgroups, tasked with putting the strategic research and innovation roadmap for CFI into effect, were set up in the following areas:

- **systems for tailored manufacturing:** creation of industrial systems and models for the efficient manufacture of high value-added personalised products;
- **strategies, methods and tools for industrial sustainability:** implementation of manufacturing processes that are environmentally, economically and socially sustainable;
- **systems to enhance the contribution of people in factories:** new technologies that allow people and machines to cooperate effectively, performing activities together efficiently and safely;
- **high-efficiency manufacturing systems:** development of highly efficient manufacturing systems that minimise production costs and improve productivity and product quality;
- **innovative manufacturing processes:** creation of new systems capable of designing innovative production processes for the manufacture of products, micro- and nano-components and mechatronic products, using complex and highly value-adding materials;
- **evolutionary and innovative manufacturing systems:** development of a new generation of production systems capable of evolving and adapting dynamically to changes to contextual conditions caused by demand turbulence, rapid technological developments and competitive dynamics that all evolve over time.

KEY CHARACTERISTICS



- **strategies and management for next generation production systems:** development of new strategies for production and management of complex industrial networks and supply chains that increase the competitiveness of Italian manufacturers.

The cluster launched the **Lighthouse Plant Club (LHP-Club)** in 2017, bringing together all of the CFI member companies that are involved in the production and implementation of so-called Lighthouse Plants (production plants based entirely on technology 4.0).

The objectives that the cluster proposes to meet are defined in the "*Research and Innovation Roadmap*". For each strategic action line, CFI has formed a dedicated Technical Scientific working party.

Over the last five years, the CFI cluster has presented 4 projects to MIUR that involve the development of industrial research activity:

- **PROJECT 1, SUSTAINABLE MANUFACTURING:** there are 37 partners in this project, from industrial companies to research centres. With a budget of €11.1 million, its aim is to create artifacts using manufacturing processes and systems that minimise negative environmental impact, save energy and natural resources, guarantee the safety and security of workers, the community and consumers, and are cost effective;

KEY CHARACTERISTICS



- **PROJECT 2, ADAPTING MANUFACTURING:** proposes the development of technology and solutions to improve the flexibility and efficiency of modern factories, in order to respond effectively to the changes dictated by rapidly-evolving market trends. Specifically, various enabling technology will be developed:
 - ♦ dynamic modelling to optimise robotic finishing

processes;

- ♦ adaptive robotic assembly;
- ♦ digital models for the optimisation of robotic cells;
- ♦ industrial digital communications systems;
- ♦ reconfigurable sensors and actuators;
- ♦ computer vision systems;
- ♦ haptic interfaces;
- ♦ virtual reality systems.

◊ Budget: €10.2 million.

- **PROJECT 3, SMART MANUFACTURING 2020:** aims to increase the competitiveness, productivity and reactivity to market changes of any manufacturing or distribution business. The project will develop new production planning and monitoring systems to optimise the use of energy and resources, new manufacturing solutions for smart preventative maintenance, and advanced new virtual prototyping methods for manufacturing products and processes.
 - ♦ Budget: €12 million.

KEY CHARACTERISTICS



- **PROJECT 4, HIGH PERFORMANCE MANUFACTURING:** aims to research and develop new design tools and solutions to improve the performance of machine tools and production systems and increase the competitiveness of *Made in Italy* capital goods products

for industry. The concept of High Performance Manufacturing is based on two fundamental objectives

- ◆ improve performance at process level (in terms of processing times and overall quality);
 - ◆ enhance processing system flexibility (in terms of working conditions and autonomous functions).
- ◇ Budget: €11.1 million.

With a Decree Law published on 13th July 2017, the Ministry of Education assigned €497 million of financing to experimental industrial research and development projects.

€59.1 million of these funds were allocated to smart factory projects for technological solutions dedicated to optimising production processes, supporting industrial automation and promoting manufacturing collaborations between companies.

KEY CHARACTERISTICS



The national “**Blue Italian Growth**” (BIG) technology cluster was launched in Naples, and brings together universities, research centres, established companies and start-ups from across the country. It was set up by the Campania Region with the aim of promoting research, innovation and training for the development of the “blue” economy, i.e.

marine activities that are more respectful of the natural environment.

The action plan can be boiled down to the following areas:

- Marine and coastal environment;
- Blue biotech;
- Marine renewable energy;
- Marine abiotic resources;
- Shipbuilding and marine robotics.

With a Decree Law published on 13th July 2017, the Ministry of Education assigned €497 million of financing to experimental industrial research and development projects. **€29.5 million of these funds were allocated to Blue Growth**, namely the development of an environmentally sustainable marine economy.

a) - The Blue Growth cluster was set up by the Campania

KEY CHARACTERISTICS



Like the BIG cluster, the **Energy** cluster, led by the National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), was founded in response to the MIUR decree published on 3rd August 2016: *"Notice of the development and enhancement of 4 new national technology clusters"*.

The cluster is open to all domestic operators interested in energy issues.

There are 72 members, of which

- 65% are public research institutes;

- 18% regional representatives;
- 17% business representatives.

The aims of the cluster are:

- marry up demand for innovation in the industrial sector with the supply of the country's highly accredited research facilities;
- research and develop the next generation of innovative energy technology and services, with the aim of creating a new sustainable energy model to enable the transformation to a low carbon economy;
- promote a structured and coordinated network of sector companies, including the supply chain, universities, research centres and institutions, with the aim of fostering the development of a national supply chain focused on technological innovation and enhancing the international competitiveness of the domestic industry.

a) - The headquarter of the Energy Cluster is in Rome (Latium)

KEY CHARACTERISTICS



The macro areas of intervention are:

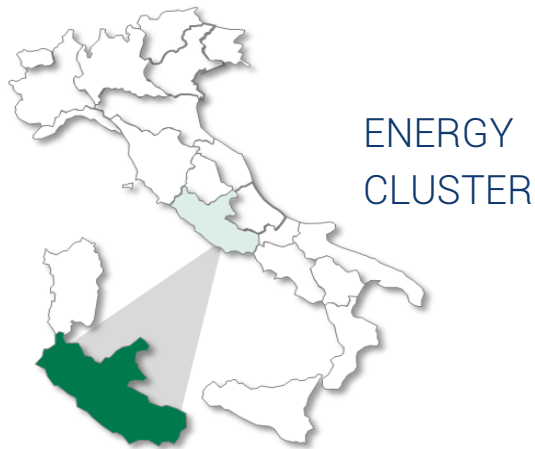
- energy efficiency;
- sustainable fossil fuel usage;
- renewable energy;

- smart grids (a combination of IT and electricity distribution networks that allows smart management of the electricity network);
- energy storage;
- sustainable mobility, involving contributions to the development of innovative fuel systems and research.

New technologies will relate to:

- innovative planning, operation, monitoring and control systems for electricity transmission and distribution networks;
- hybrid energy generation systems;
- technology and equipment for the conversion from fossil fuels to more efficient low carbon systems with reduced environmental impact;
- energy efficient materials and technology.

KEY CHARACTERISTICS



The cluster's objectives include:

- Establishing a network to enable collaboration and coordination between research institutes and companies;
- Facilitate the transfer of technological expertise to

SME;

- Foster investments in technological and technical scientific infrastructure;
- Promote and support the formation of new high-tech companies;
- Raise national awareness on the sector.

During 2019, the first two Energy cluster pilot projects were approved and financed, at an overall cost of around €2 million, in the following areas: **development of smart grid and energy storage technology; electricity generation and concentrated solar thermal.**

In its Decree Law published on 13th July 2017, the Ministry of Education assigned €497 million of financing to experimental industrial research and development projects. **€29.5 million of these funds were allocated to the Energy cluster** for the generation, storage and distribution of sustainable energy with a low CO₂ footprint, and for energy efficiency projects.

KEY SECTOR DATA

ENHANCEMENT OF NATIONAL BIOECONOMY TURNOVER

The bioeconomy has a crucial role to play in the necessary transition towards an environmentally sustainable economy, through the radical renewal and modernisation of the national industrial fabric.

Indeed, agriculture, forestry, fishing, aquaculture and industrial sectors that use and/or transform biological resources are all constituents of the bioeconomy, along with the food and beverage, wood, and paper industries and part of the pharmaceuticals, cosmetics, chemical, bio-tech and energy sectors.

The aim of the bioeconomy is therefore to create a sustainable economy that safeguards the environment, reducing dependence on fossil fuels and non-renewable energy sources.

The current “*National Bioeconomy Strategy*” (BIT) targets a 15% increase in the current performance of the national bioeconomy.

This goal will be achieved through:

- Improving sustainable manufacturing and product quality in each sector associated with the bioeconomy, enabling significant enhancement of terrestrial and marine biodiversity and a shift towards a circular economy;
- Greater investments in R&D, start-ups, innovation, training and communication;
- Coordination between regional, national and European stakeholders and political operators;
- Targeted actions to develop markets in the sectors in question.



KEY SECTOR DATA

The national bioeconomy strategy also includes actions for the environmentally sustainable development of the Mediterranean basin through two initiatives:

- **P.R.I.M.A.** (*Partnership for Research and Innovation in the Mediterranean Area*), aimed at making water and food supply systems more efficient, practical and sustainable;
- **BLUEMED**, promoted by Italy on a European stage, aims to create “blue” jobs and grow a sustainable marine and maritime economy.

The BIT will focus on the following themes: “Health, Food and Quality of Life”, and “Smart and sustainable Industry, Energy and Environment”.

Globally, more than 50 countries have put forward actions and strategies to strengthen the role of the bioeconomy, which has grown rapidly in recent years.

In the EU the bioeconomy sector is worth over €2 trillion in annual turnover, and is responsible for over 18 million jobs.



KEY SECTOR DATA

Nationally, the bioeconomy chain generated **€344.8 billion in turnover** in 2018 (+2.2% vs. the previous year), and employed over 2 million people. Indeed, the bioeconomy now represents 10.2% of domestic production and 8.1% of total jobs in the national economy.

In absolute terms, the value of the bioeconomy has grown by c.€7 billion since 2017, thanks to increased turnover in all the sectors considered, especially in the food supply chain. There was also a 1% increase in employment in 2018 compared to 2017.

BIOECONOMY, AGGREGATE TURNOVER, 2016-2018

€ billion



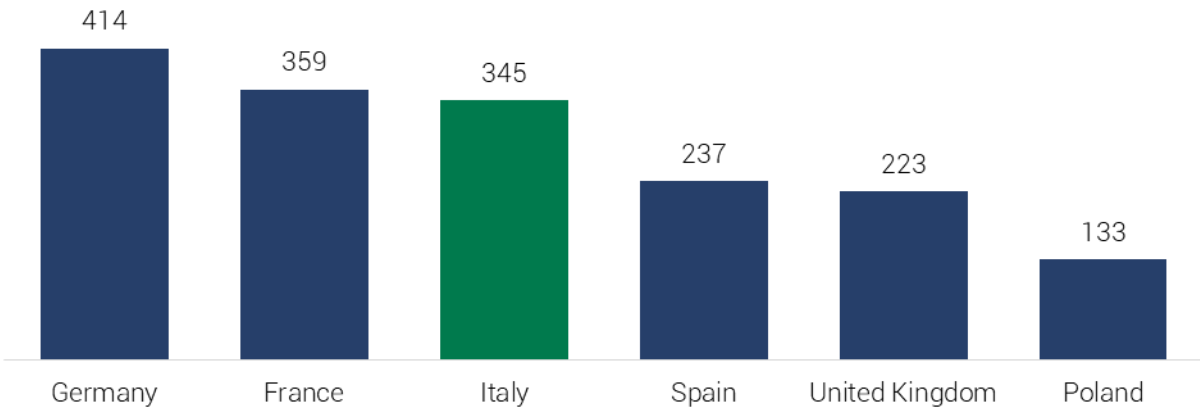
Source: Cerved Group processing of data from various sources

KEY SECTOR DATA

BECNMARKING AGAINST LEADING EUROPEAN COUNTRIES

If we compare the value of the national bioeconomy sector to those of other leading European countries, **Italy ranks 3rd** behind Germany and France and ahead of Spain, the United Kingdom and Poland.

BIOECONOMY, AGGREGATE TURNOVER IN MAIN EUROPEAN COUNTRIES, 2018
€ billion

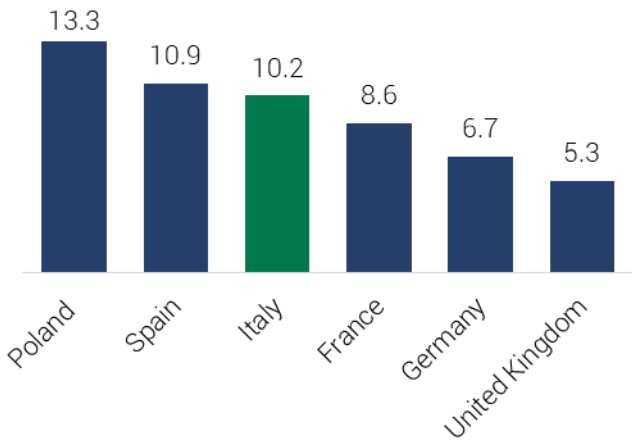


Source: Cerved Group processing of data from various sources

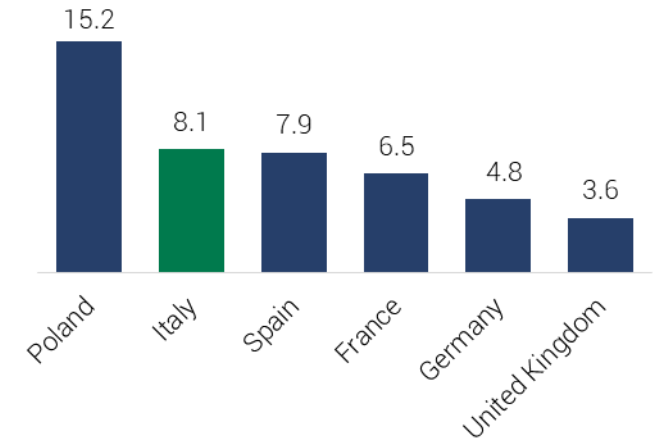
KEY SECTOR DATA

If we compare the value of production of the bioeconomy sector as a percentage of total national production, Poland occupies 1st place, **with Italy again 3rd in the rankings. Italy is in 2nd place** in the table that shows the number of jobs provided by the bioeconomy sector as a proportion of the national total.

BIOECONOMY AS PERCENTAGE OF TOTAL NATIONAL PRODUCTION IN MAIN EUROPEAN COUNTRIES, 2018
%



BIOECONOMY EMPLOYMENT AS PERCENTAGE OF NATIONAL TOTAL FOR MAIN EUROPEAN COUNTRIES, 2018
%



Source: Cerved Group processing of data from various sources

KEY SECTOR DATA

Italy's excellent standing compared to other European countries is largely attributable to the agrifood sector, especially the numerous regional specialities and well-preserved local traditions. Indeed, of the 15 leading European regions in terms of added value in agriculture, forestry and fishing, 6 are Italian: Lombardy, Emilia Romagna, Veneto, Sicily, Apulia and Campania; while 3 are Spanish (Andalucia, Castilla La Mancha, Cataluna), 4 are French (Pays de la Loire, Champagne-Ardenne, Bourgogne, Bretagne), one is Dutch (Zuid-Holland) and one German (Weser Ems).

Moreover, some Italian regions stand out for the surface area of organic cultivation; the most "organic" regions in Italy are Sicily, Calabria and Apulia, which host 47% of the land and 53% of companies converted to organic farming.



KEY SECTOR DATA

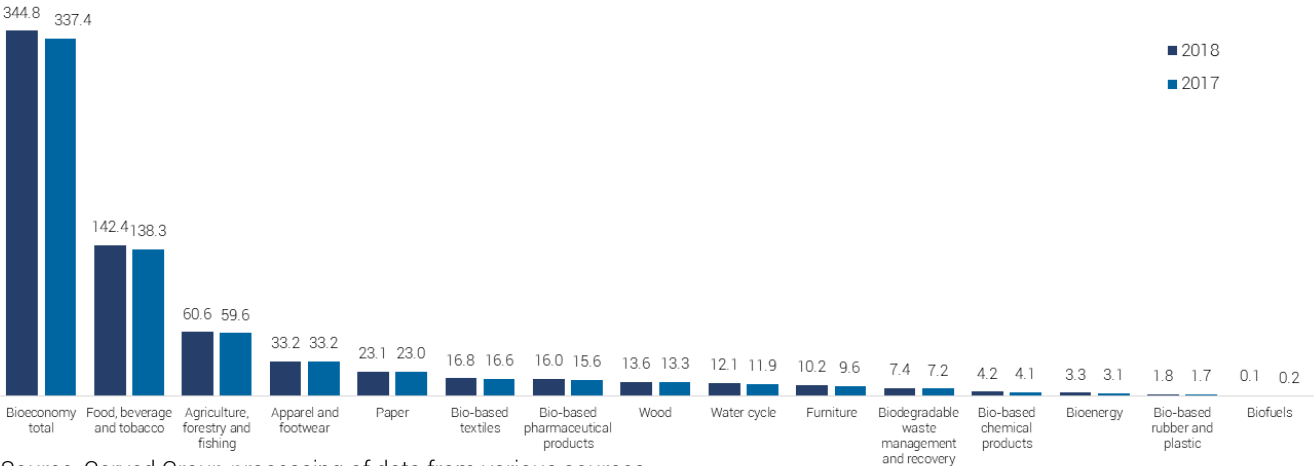
MAIN AREAS OF THE NATIONAL BIOECONOMY CHAIN AND THEIR SEGMENTATION

In 2018, the national bioeconomy generated €344.8 billion in turnover in 2018, up 2.2% vs. 2017.

Food, beverages and tobacco were the main source of revenues, generating €142.4 billion or 41.3% of the total (a +2.9% increase on the previous year).

BIOECONOMY, NATIONAL VALUE BROKEN DOWN BY SEGMENT, 2017 AND 2018

€ billion



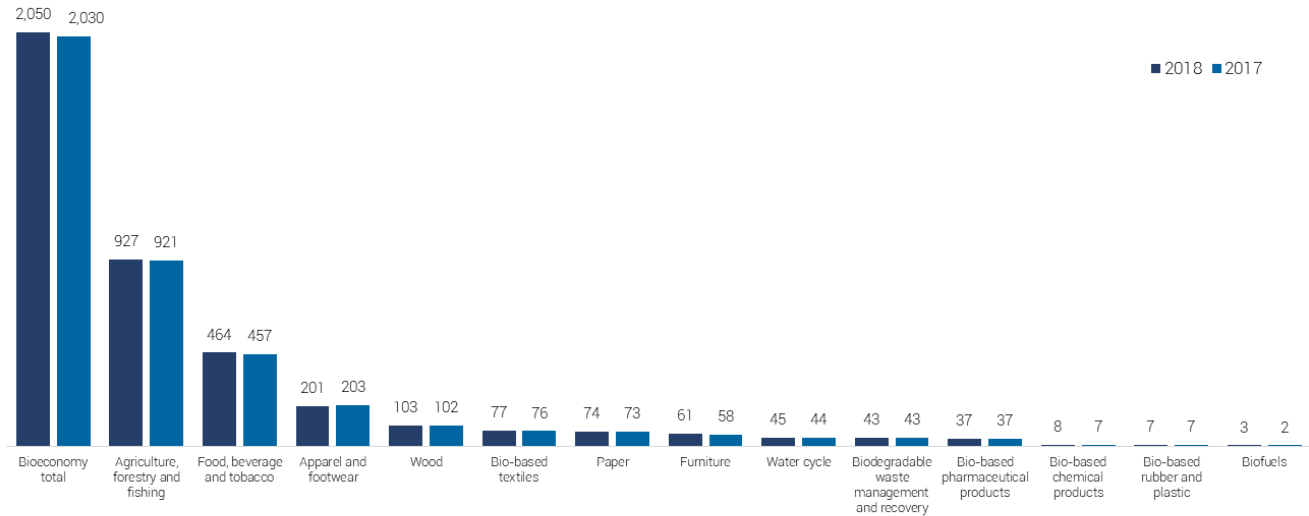
Source: Cerved Group processing of data from various sources

KEY SECTOR DATA

As for employment, agriculture, forestry and fishing is the largest sector, with 927k employees (up from 921k in 2017), followed by food, beverages and tobacco with 464k (up from 457k in 2017).

BIOECONOMY, JOBS BY SEGMENT, 2017 AND 2018

units x 1,000



Source: Cerved Group processing of data from various sources

KEY SECTOR DATA

FOOD, BEVERAGES AND TOBACCO

Food, beverages and tobacco is the most important market segment, accounting for 41.3% of the entire bioeconomy chain. The sector is largely made up of SMEs, and its significance to the domestic economy is demonstrated by the success of Italian products throughout the world and the consolidated brand recognition enjoyed by domestic companies. The agrifood national technology cluster contributes to the development of this segment through an action plan that identifies priorities for the Italian food industry.

BIOECONOMY, AGGREGATE TURNOVER FOR FOOD, BEVERAGE AND TOBACCO INDUSTRY, 2016-2018
€ billion



Source: Cerved Group processing of data from various sources

KEY SECTOR DATA

INDUSTRIES USING BIOLOGICAL RESOURCES

With aggregate turnover of €141.8 billion in 2018 (+1.6% vs. 2017), this area includes all other industrial sectors that use renewable biological resources in innovative production processes to provide goods and services. It is a macro sector in which Italy plays a leading role at European level due to the significant technological component of some important industrial segments. These include:

- The wood industry, which in 2018 benefited from rising demand from the furniture and packaging sectors;
- The paper industry, supported by companies towards the end of the production chain, especially those involved in the production of semi-finished goods destined for packaging;
- Bio-based chemicals play an important role nationally, especially for the notable research, development and innovation activity that various national operators have undertaken in this segment in recent years;
- The pharmaceutical industry, in which Italy plays a leading role in Europe, especially due to strong exports (over half of the pharmaceuticals produced are bio-based; among other European countries only Spain has more than 50% bio-based pharmaceutical production);
- The fashion segment, in the form of bio-based textiles and apparel, which generated €16.8 billion and €33.2 billion of turnover in 2018 (in luxury leather products Italy is a leading player on the global stage).

BIOECONOMY, AGGREGATE TURNOVER FOR OTHER INDUSTRIES USING BIOLOGICAL RESOURCES, 2016-2018

€ billion



Source: Cerved Group processing of data from various sources

KEY SECTOR DATA

AGRICULTURE, FORESTRY AND FISHING

The agriculture, forestry and fishing segment leads the way in terms of jobs, while 2018 turnover came to €60.6 billion (+1.7% vs. 2017). Agriculture covers over 16.5 million hectares of the country, 75% of which are in use. **Italy's variety and wealth of local traditions are unparalleled in Europe.**

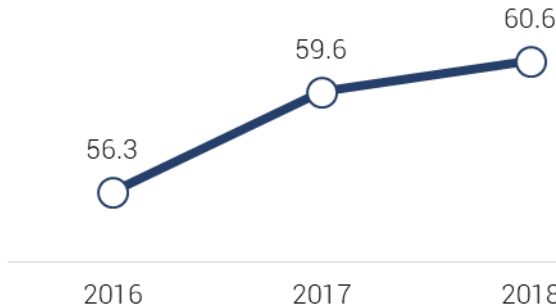
For the circular and biological economy, agriculture and forestry have major potential in terms of efficient management of resources, biodiversity, sustainable soil management, production of environmental services, waste use and recycling, bioenergy generation and biological products through sustainable production models and efficient use of renewable resources.

There are 11 million hectares of forest in Italy, producing a large quantity of wood-derivatives, although as things stand they are still only converted into a limited range of products (they could be further exploited in other sectors, such as bio-building), as well as non-wood products (mushrooms, truffles, herbs, cork, etc.).

The **marine bioeconomy** includes fishing, biomonitoring, and bioremediation of marine water sedimentary systems. Specifically, **Italy boasts 8,000km of coastline and ranks 2nd in Europe for fishery production and 4th for aquaculture production.**

BIOECONOMY, AGGREGATE TURNOVER FOR AGRICULTURE, FORESTRY AND FISHING INDUSTRY, 2016-2018

€ billion



Source: Cerved Group processing of data from various sources

KEY SECTOR DATA

BIOECONOMY, STRATEGIC POSITIONING OF REGIONS

The majority of the Italian regions has specific territorial characteristics (nature of the landscape, biodiversity of plants and fauna, services, etc.) that link it to a particular branch of the bioeconomy.

- INDUSTRY USING BIOLOGICAL RESOURCES ●
- AGRIFOOD □
- BLUE ECONOMY ●



Source: Cerved Group processing of data from various

MAIN TRENDS

RENEWABLE RAW MATERIALS

Among the main trends involving companies operating in the bioeconomy macro sector, it is worth highlighting the "new" raw materials that allow a gradual but radical transfer from the use of non-renewable resources to renewable resources in numerous manufacturing processes.

The main objective of this major shift in the sourcing of materials for production is to safeguard the environment and create a sustainable ecosystem. This enables a reduction in the dependence on resources that are not infinitely available within Italy.

The exploitation of renewable resources also allows more efficient waste management and treatment, with the possibility of eliminating much wastage through reuse and recycling.

The two underlying principles of a "correct" bioeconomy that is economically and socially sustainable are: *"make better use of what has already been used"* and *"make good use of what is yet to be used"*.

Specifically, the so-called "natural capital" which goes beyond the use of food, energy, water and medicines, and which must be managed **sustainably**, comprises renewa-

ble natural resources such as: forests, water resources, products of the natural landscape and terrestrial and marine plants.

Agriculture that is based on the sustainable use and exploitation of natural resources such as soil, water and air therefore enables the production of sustainable food with a low environmental impact. Indeed, nature provides a range of resources from which it is possible to obtain chemical derivatives without using fossil-based raw materials (the use of renewable raw materials such as vegetable oils, corn starch, potatoes, cellulose extracted from straw and wood, algae and similar items allow a reduction in the environmental impact caused by the use of fossil fuels).



MAIN TRENDS

SUSTAINABLE AND SMART, AGRICULTURE 4.0

Sustainable agriculture is based on natural production processes that do not involve the use of artificial chemicals. Not only does this help improve product quality, it also creates working processes that are much less wasteful for the farmer.

The absence of chemical products reduces soil degradation and pollution; it is a form of agriculture that is both organic and biodynamic.

In organic farming, bacterial insecticides are used to deal with parasites instead of traditional artificial pesticides. Other techniques, such as crop rotation, allow enrichment of the soil without the land being unproductive.

Biodynamic agriculture is born out of an intention to enrich the environment and improve the quality of human nutrition.

This type of approach helps increase production on al-

ready-cultivated land and tackle problems arising from climate change and population growth, which is driving increased global demand for agricultural products.

Furthermore, the use of innovative industry 4.0 technology, such as the Internet of Things (IoT), has led to the conception of so-called smart agriculture, or agriculture 4.0. Technological developments and improvements such as digitalisation, big data, and geolocation greatly enhance the precision of working the land and using the appropriate substances and resources, helping to minimise waste.



MAIN TRENDS

Implementing smart agriculture and forestry models, using digitalisation and satellite monitoring, enhancing organic agriculture and animal breeding, reducing greenhouse gas emissions, improving water use and management, and exploiting and reusing agricultural and forestry by-products and offcuts are all methods that contribute to **SUSTAINABLE AGRICULTURE**.

According to a 2019 Symbola-Coldiretti report, **Italy is among the 5 leading European countries in terms of agriculture, and also has the lowest number of products with chemical residues that exceed legal limits, at 0.8% vs. the average of 1.3% in EU countries. Italy is also at the top of global rankings for organic land cultivation, with 1.95 million hectares in 2018 (15.5% of agricultural land).** The Italian agrifood sector leads the way in terms of food safety and quality.



MAIN TRENDS

CIRCULAR ECONOMY

The gradual transfer towards the CIRCULAR ECONOMY involves combining economic development with environmental protection, reducing inefficient usage of resources and minimising waste.

The theory of the Circular Economy is based on the creation of a new economic model to supplant the Linear Economy, which assigns 4 phases to the life cycle of a product: extraction, production, consumption and disposal. There are clear drawbacks to Linear Economy theory:

- Finite raw material resources;
- Pollution;
- Waste production.

These drawbacks can be definitively overcome by the transfer to a Circular Economy, the basic principles of which are:

- Raw materials: reduce the environmental impact of resources used (energy and materials) employing renewable sources wherever possible;

- Design: products must be designed for versatility and adaptability in order to extend their useful life for as long as possible;
- Production: processes must maintain high standards of sustainability and efficiency;
- Distribution: the development of new digital technology allows supply and demand to come together in new ways (reducing costs, ensuring the recycling of materials and achieving a high degree of efficiency);
- Waste collection: maximise separate waste collection, for both municipal and industrial waste;
- Recycling: recycled waste becomes a secondary raw material;
- Residual waste: items that cannot be reused as secondary raw materials must be disposed of sustainably (e.g. through waste to energy plants, a broad concept that includes various waste treatment processes that can generate energy).

INTERNATIONAL PERSPECTIVE



INVESTMENTS IN ITALY

FOREIGN DIRECT INVESTMENT (FDI)

According to rankings published by Research on Investment (ROI), in 2018 and 2019 Italy was one of the 30 best countries for business.

In 2018, based on OECD figures on Foreign Direct Investments (FDI), incoming FDI for businesses operating under ATECO codes relating to Agriculture, Forestry and Fishing made up a negligible proportion of total FDI, coming to €1.525 billion (-15.5%).

BIOECONOMY, ITALY'S FDI STOCKS(a), 2017-2018
€ million, %

| Activity | FDI | | |
|-----------------------------------|----------------|----------------|-----------------|
| | 2017 | 2018 | % of 2018 total |
| Agriculture, forestry and fishing | 1,805 | 1,525 | 0.4 |
| Other sectors | 352,346 | 370,902 | 99.6 |
| Total | 354,151 | 372,427 | 100.0 |

a) - FDI positions represent the value of direct investment stocks held at the end of the investment period

Source: Cerved Group processing of OECD data

INVESTMENTS IN ITALY

FINANCING PROGRAMMES

There are a range of European, national, regional and local programmes to finance the development of the bioeconomy. Solid, long-term financing mechanisms are required, which can be guaranteed by the various European cohesion funds.

An example is the European Agricultural Fund for Rural Development (EAFRD) which supports investments in the smart use of agricultural waste and in industrial culture, creating the required conditions for supply to agri-energy and other industries using biological resources.

The fund also identifies KET, or Key Enabling Technologies (green biotech, omics technologies, precision agriculture, nanotechnology) as drivers of innovation and sector development.

COHESION FUNDS

In the 2020-2027 period, the bioeconomy will be able to benefit from the resources made available by cohesion funds in the following areas:

- Smarter Europe, through innovation, digitalisation, economic transformation and support for SME;
- Greener, low-carbon Europe thanks to investments in energy transition, renewable energy and tackling climate change).



INVESTMENTS IN ITALY

FINANCING PROGRAMMES

HORIZON 2020

On a European scale the **Horizon 2020** programme plays an important role.

It is a 7-year programme (2014-20) which brings together all financing for research and innovation, based on 3 fundamental pillars:

- Scientific excellence
- Industrial leadership
- Challenges for the company

The fund has two specific objectives: *"Spreading excellence and widening participation"* and *"Science with and for society"*, and has €77.028 billion at its disposal (8% of the EU Budget).

Financing has been awarded through 3 work phases: the first for the 2014-15 period, the second for 2016-17 and

the third for 2018-20. So far €28.537 billion of financing has been allocated in support of 13,643 projects in 44 countries (Source: *Chamber of Deputies*).

Within the *"Societal Challenges"* area, the *"Food security, sustainable agriculture and forestry, marine, maritime and internal water research and the bioeconomy"* programme has a budget allocation of €3.851 billion to address issues involving the bioeconomy.

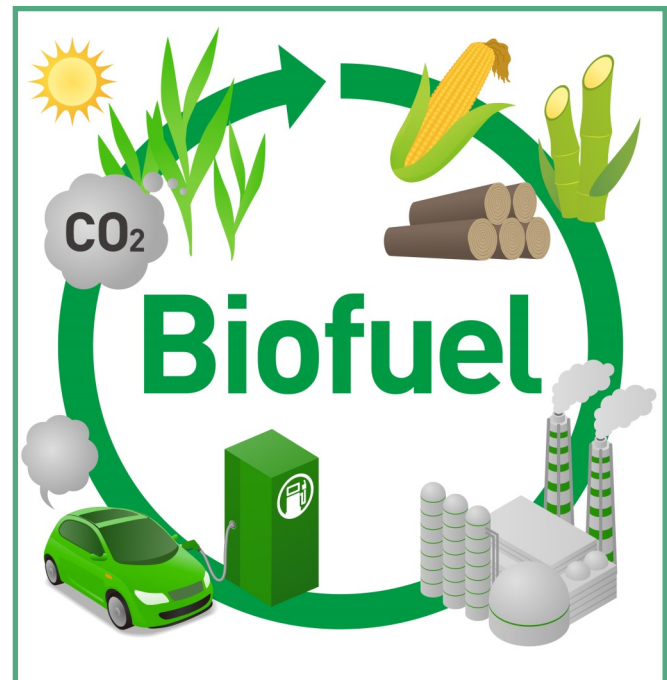
Other budget allocations in this area are:

- Secure, clean and efficient energy: €5.931 billion;
- Smart, green and integrated transport: €6.339 billion;
- Climate: €3.081 billion;
- Inclusive, innovative and safe societies: €1.309 billion.

INVESTMENTS IN ITALY

Another part of the Horizon 2020 budget relating to the bioeconomy is managed by the *Bio-Based Industries Joint Undertaking* (BBI JU) which aims to develop new biorefinery technology for the sustainable transformation of natural renewable resources (agricultural waste and residue) into bio-based products, materials and fuels.

Furthermore, the new Horizon Europe project allocates around €10 million for projects on the theme of "Food, bioeconomy, natural resources, agriculture and environment" for the 2017-21 period.



INVESTMENTS IN ITALY

FINANCING PROGRAMMES

Within Italy, good opportunities could arise from the Industry 4.0 plan.

The plan's central objective is to provide financial support for companies through "hyper-" and "super-amortisation" (enhanced amortisation rates for innovative digital investments), tax credits for research, development and innovation, and venture capital funds.

The bioeconomy sector can also benefit domestically from incentives put in place in previous years (energy efficiency, SME fund) and new initiatives to support investment contained in the 2019 Budget (Venture Capital Fund, National Innovation Fund, greater support for research and sustainable development activity thanks to the creation of the Technopole Mediterranean Research Institute).

Further measures were included in the Growth Decree, including:

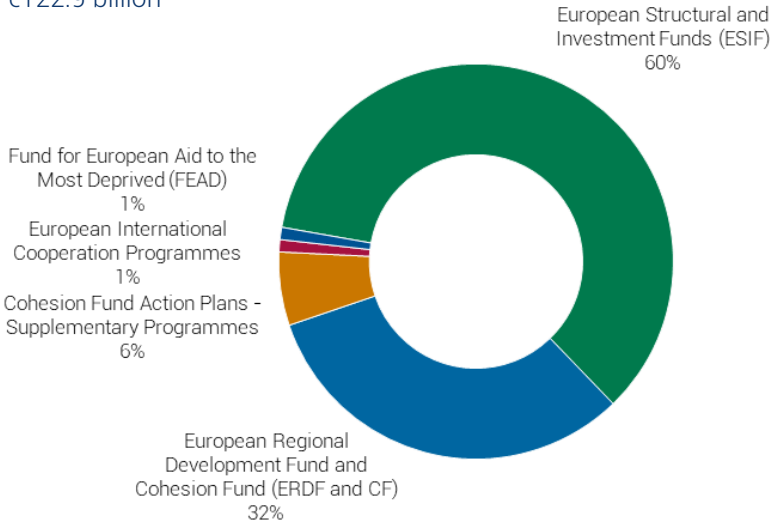
- major investment plan for special economic zones (Zone Economiche Speciali - ZES); financing tools that promote direct and indirect investments to foster development in areas connected to ZES.
- Incentives to support research and the development of a Circular Economy thanks to the funds made available for 2020 by the Development and Cohesion Fund and the Revolving Fund for companies.

The National Technology clusters defined by MIUR also have an important role to play in growth of the bioeconomy sector. They were formed to create direct links between companies, research centres and institutions.

INVESTMENTS IN ITALY

The graph shows financing opportunities for the bioeconomy in Italy based on cohesion fund initiatives.

BIOECONOMY, FINANCIAL RESOURCES FROM COHESION FUNDS IN ITALY (NATIONAL AND EU FUNDS), 2014-20
2014-2020: 100% = €122.9 billion



Source: Cerved Group processing of data from various sources

INVESTMENTS IN ITALY






FINANCING PROGRAMMES

SOME IMPORTANT BIOECONOMY SECTOR PROJECTS FINANCED IN 2019

These are projects that won the P.R.I.M.A. tender in 2018. The financing started in 2019 and lasts for 36 months.

- **FIT4REUSE:** define sustainable solutions for the integrated use of non-conventional water resources in agriculture (purified waste water and desalinated sea water) in the Mediterranean area; financing contribution: €2 million. (<https://www.isprambiente.gov.it/it/progetti/cartella-progetti-in-corso/acque-interne-e-marino-costiere-1/fit4reuse>)
- **FREECLIMB:** promote the development of smart agricultural systems in the Mediterranean area to preserve natural resources and increase production efficiency (project coordinated by the University of Milan); financing contribution: €0.5 million (<https://www.unict.it/it/ricerca/progetti/freeclimb>).
- **GENDIBAR:** genetic modifications for the cultivation of barley in the Mediterranean area (coordinated by Italy through CREA - Council for Agricultural Research and the Agrarian Economy); financing contribution: €1.4 million.

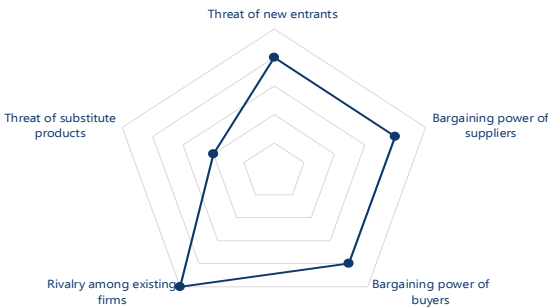
INVESTMENTS IN ITALY

-  **MED-BARRY:** finding innovative solutions for the prevention and control of diseases affecting strawberry crops. Solutions must be economically and environmentally sustainable, and therefore avoid the use of agricultural chemicals; financing contribution: €1.2 million (<https://medberry-prima.eu/contenuti/141709/progetto>).
-  **SIMTAP:** create a multi-trophic aquaponic system for the production of fish and plants for food from brackish water. The fish will consume feed made from algae, worms and molluscs, as partial or total replacement for raw materials such as flours, fish oils and vegetable proteins; financing contribution: €0.9 million (<https://www.simtap.eu/index.php/it/>).
-  **VEG-ADAPT:** adapt Mediterranean agricultural crops to ongoing climate change; financing contribution €2.1 million (<https://www.veg-adapt.unito.it/>).
-  **MEDWATERICE:** innovative, precision water system solutions to reduce water wastage during land cultivation; financing contribution €1.4 million (<https://www.medwaterice.org/>)
-  **IMPRESA:** expansion of the genetic base of durum wheat in order to develop new genes and features that can make the species more adaptable to various abiotic stresses (drought, high temperatures, salinity), with positive repercussions in terms of the quantity, quality and stability of final crop yields; financing contribution €0.7 million.

INDUSTRY ATTRACTIVENESS



INDUSTRY ATTRACTIVENESS RADAR, 2020(a)



a) The smaller the area between the five points, which represent attractiveness factors, the more attractive the sector is for business.

THREAT OF NEW ENTRANTS

The increasing possibility of new entrants is linked to rapid market growth rates that attract new innovative companies. Entry barriers mainly come in the guise of the investments

required to develop innovative production systems with low environmental impact.

For some products there is also a need for specialist expertise in the production/ transformation process, and there are also barriers linked to the historical image of the company, bureaucratic processes and accreditation.

BARGAINING POWER OF SUPPLIERS

In the organic food segment, the bargaining power of suppliers is increasing as, in the context of escalating demand, the increase in the domestic supply of raw materials has come about more slowly.

In the pharmaceutical segment, suppliers are the pharmaceutical companies themselves, so there is a low threat in this case.

For other sectors the bargaining power of suppliers is at medium levels.

INDUSTRY ATTRACTIVENESS RADAR

BARGAINING POWER OF BUYERS

Food and agriculture: organic food is gaining increasingly prominent positioning in supermarkets, partly thanks to more widespread availability of a broader range of products, both under company brands and supermarket's own labels. The main supermarket chains are seeking to develop their own organic labels, partly at the expense of the main industrial brands.

In other sectors buyers enjoy medium to high bargaining power.

RIVALRY AMONG EXISTING FIRMS

Competition remains high and continues to grow due to the presence of specialist operators attracted by vibrant demand trends, especially in the food sector.

THREAT OF SUBSTITUTE PRODUCTS

In the food sector, the main threat to organic products comes from cheaper traditional products.

In other sectors the threat from substitute products is medium to low.



OPPORTUNITIES

DEVELOPMENT OF AGRICULTURE 4.0

Agriculture 4.0 comprises the use of all technology capable of enhancing yields and increasing crop sustainability, production quality and, as a result, working conditions.

Many SME are committed to digitalisation in the agriculture sector, and innovation has also been boosted significantly by new smart agrifood start-ups.

Specifically, digital innovation in the agrifood business occurs in all phases of the sector, from food production to distribution, including product transformation. The sector itself contributes to 11% of national GDP and 9% of exports (*Source: Smart AgriFood Monitor from Milan Polytechnic University's School of Management and University of Brescia's RISE Laboratory*).

Digitalisation has a part to play in all phases of the food sector, guaranteeing sustainability to all actors in the sup-

ply chain, including at the production stage, where innovative digital systems can support high quality production processes.

Precision agriculture technology, using innovative systems such as the Internet of Things and Big Data Analysis, and inter-connected agricultural technology (the so-called Internet of Farming) are the pillars on which Agriculture 4.0 is based. Through cross-analysis of environmental, climatic and cultural factors, it enables:

- establishment of crops' irrigation and nutritional needs;
- disease prevention;
- identification of infestations before they proliferate;
- targeted interventions, saving time and resources;
- enhanced product quality;
- improved crop yields;
- improved working conditions.

OPPORTUNITIES

In summary, digital innovation currently allows Italian agrifood companies to improve and enhance various elements relating to: product origin, guaranteed production processes, and the overall safety and quality of food.

In the agrifood business, digital processes also play a significant role in ensuring the traceability of food products, reducing costs, increasing revenues and enhancing process efficiency. The most used tools for traceability are:

- barcodes
- Radio Frequency Identification (RFI)
- Management information systems
- Big data
- Mobile technology
- Internet of Things (IoT) technology
- Blockchain

The segments in which innovative traceability systems are used most frequently are fruit and vegetables, the meat production chain, dairy products, coffee and cocoa.



OPPORTUNITIES

TERRITORIAL SMART SPECIALISATION

Crops and local varieties available regionally that are capable of adapting to changing climates and to low input farming techniques represent a clear opportunity for the bioeconomy sector.

Indeed, smart specialisation is a new policy approach to planning innovation strategy, and represents a major opportunity for rural development. It identifies priority areas for development and support based on a preliminary analysis of the key features and strengths of a particular territory.

Territorial smart specialisation also aims to foster interaction between institutions, businesses and investors with the aim of focusing research and development activity on territories that offer significant development potential.

The territorial specialisation process could also help regenerate marginal land that has been abandoned and degraded, creating new opportunities and new value for local rural communities.

This is also justified by the fact that in contrast to many European counterparts, the Italian food industry is firmly rooted in local traditions.



OPPORTUNITIES

ALTERNATIVE ENERGY SOURCES

Making production plants as efficient as possible and using innovative energy sources with low environmental impact are notable opportunities for the sector, helping to reduce production costs as well as wastage.

In recent years, environmental sustainability has been an important element of a company's reputation, especially considering the opportunities arising to benefit from numerous incentives, both at national and European level, for the adoption of sustainable environmental policies and the use of renewable energy. In actual fact, in its efforts to reduce the use of non-renewable energy sources (fossil fuels) the European Union offers incentives for the use of photovoltaic, wind and biomass energy.

On 19th June 2018 a political agreement was reached between the European Commission, Parliament and Council to improve energy efficiency in Europe, one of the 8 legislative acts contained in The Clean Energy for all Europeans package. The agreement extends annual energy saving commitments beyond 2020, and will attract private investment and new market operators.

Offshore and onshore wind, photovoltaics, hydroelectric, bioenergy and geothermal energy are the future for renewable energy. Thanks to ongoing investments in research and development, generation costs are steadily being reduced.

GROWING DEMAND FOR BIOPHARMACEUTICALS

The new frontiers of the bioeconomy show that biological technology, such as biopharmaceuticals, represent a major opportunity for sector companies. The global production value over the next decade is forecast to be hundreds of billions of euros.

Biopharmaceuticals and next generation pharmaceutical products, manufactured from the synthesis of biological cells, represent a developing reality that forms the basis of those areas of the biotech industry dedicated to medicine and healthcare.

OPPORTUNITIES

EUROPEAN BIOECONOMY FUND

There are numerous national and European incentives to support investments in the development of the Bioeconomy sector, providing notable opportunities for companies that operate in this area.

In November 2019 the EU and the European Investment Bank (EIB) launched the European Fund for the Circular Bioeconomy. The fund aims to gather €250 million from public and private investors in 2020 for the development of innovative bioeconomy projects. Specifically, the aim will be to finance innovative companies and projects related to the circular bioeconomy in the EU and countries associated with Horizon 2020. Agriculture, fishing, animal husbandry, forestry, production of biomaterials and biochem products and food will be the sectors benefitting from Fund's financing. ECBG Management GmbH was chosen as an investment consultant.



OPPORTUNITIES

GROWING FOREIGN DEMAND

The excellence of "Made in Italy" products and the importance of local products both nationally and internationally drive growing foreign demand, which represents a major growth opportunity for companies operating in the bioeconomy.

Made in Italy is now a global symbol of quality, especially in the food sector, justified by the excellent craftsmanship of domestic companies.

Indeed, in 2019 agrifood exports exceeded €19 billion (+4.4% vs. 2018). The structure of the Italian agrifood chain is characterised by well-established regionalisation and crop specialisation that allows Made in Italy to be highly competitive internationally. Indeed, according to Intesa Sanpaolo's *"European Bioeconomy"* *"Bioeconomia in Europa"* report, there are over 50 agrifood districts in Italy, namely geographical zones featuring typical products and focused specialisation in specific crops (the main ones include wines from Piedmont and Veneto, cold cuts

from Emilia Romagna, olive oil from Tuscany, dairy products from Campania, and Pachino tomatoes from Sicily).

Exports are also a significant source of revenues for other industry sectors. In the pharmaceutical sector, for example, exports account for a significant proportion of domestic production, as is the case in other sectors in which "Made in Italy" is a globally-recognised mark of quality (textiles, fashion, etc.).



CRITICAL SUCCESS FACTORS

INVESTMENTS IN RESEARCH, DEVELOPMENT AND NEW TECHNOLOGY FOR ENVIRONMENTAL SUSTAINABILITY WITHIN AN EFFICIENT, GREEN ECONOMY

Rising investments in research and development and the implementation of new technologies, including as part of the digitalisation process that is affecting all sectors of the national economy, are a critical success factor for companies operating in the BIOECONOMY macro-sector.

Indeed, economically sustainable development relies on the national and international strategies of companies operating across all industrial sectors. Focus is frequently on smart growth based on the development and implementation of “environmentally-innovative” systems linked to both the production phase and to consumption.

Moreover, in recent years the need to implement sustainable growth, identified as a strategic priority in the European Union’s “Europe 2020” strategy, has generated rising public and private sector investments aimed at building an

economy that is competitive and at the same time efficient in deploying resources.

Investing in environmental innovation, promoting niche green markets, creating new employment hubs that alter the traditional structure of the labour market are all objectives that are wholly consistent with the green revolution.

It is worth underlining that the term green economy implies an economy whose environmental impact is kept within acceptable limits. The main investments involve:

- Renewable energy: namely wind, biomass, solar, geothermal, and hydroelectric power, in other words sources that exploit the force of nature to generate energy;
- Energy efficiency: the use of technology that can increase the energy efficiency of machinery in order to reduce wastage and lower consumption;
- Waste cycle: in green economies the production-consumption cycle is devised to minimise the production of waste and unproductive by-products.

CRITICAL SUCCESS FACTORS

HIGH EXPORT TENDENCY

Italy is the leading country in Europe for the number of products with PDO/PGI designation, both in terms of agricultural specialities and industrially produced beverages, with 862 products in total.

In recent years there has been a significant increase in export tendency: globally Italy is the **6th largest exporter in the sector**.

The success of Made in Italy is confirmed by Italy's ranking as the **3rd largest exporter** of expensive high-end food products (following the USA and the Netherlands).

The innovative capabilities of the Italian food industry also play an important role on the European stage.

The success of the national food industry and the variety of agrifood production are also demonstrated by the numerous regional specialities and traditional local products. Italy also plays an important role internationally in other industrial sectors, such as pharmaceuticals.

The country's success on international markets largely centres on the quality of the Italy brand, which further enhances the perceived value of domestic products.

For these reasons, a structural predisposition to exports, especially through an extensive foreign commercial and distribution network, represents a notable distinguishing feature.



CRITICAL SUCCESS FACTORS

PROCESS EFFICIENCY

The capacity for efficient production processes through the optimisation and rationalisation of production costs that can be sustained over the medium to long term is a critical factor for the success of bioeconomy companies.

Moreover, in a scenario where economic and environmental sustainability are elements that cannot be ignored, it is also crucial to be equipped with production facilities that are able to:

- Reduce negative environmental impacts;
- Use renewable energy resources;
- Reduce production wastage and unusable by-products;
- Use innovative materials.

Efficient company policies can be implemented through:

- Appropriate process management (in purchasing, marketing, personnel, production, etc.);

- Keeping a tight rein on promotional spending;
- Cost control;
- Streamlining of logistical and commercial structures;
- Attentive evaluation of distribution channels through efficient management of relationships with agents and distributors;
- Assessment and analysis of client payment times.



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