Industrial biotechnology - Contributing towards achieving the **UN global Sustainable Development Goals**

EuropaBio®

The European Association for Bioindustries

Table of contents: click on the icons to navigate

SUSTAINABLE DEVELOPMENT GOALS

INTRODUCTION

Industrial biotechnology (IB) – also known as white biotechnology – is a central pillar of innovation and is an enabler of more sustainable and competitive circular bioeconomies.

It uses enzymes and micro-organisms to make bio-based products in sectors such as chemicals, bio-based plastics, bio-based lubricants, bio-based solvents, food and feed, detergents, paper and pulp, textiles as well as bioenergy, such as biofuels and biogas. It can also play an important role in bioremediation through water purification and soil recovery.

As such, IB is increasingly recognised by most stakeholders as playing an important role in responding to some of the greatest global challenges. This includes enabling smarter, more efficient use of precious natural resources, developing more renewable, sustainable products and processes, mitigating the impacts of climate change and reducing levels of man-made emissions to soil, air and water as well as helping to manage threats to biodiversity. In the context of a growing global population, predicted to increase from 7 to 9 billion people by 2050, industrial biotechnology, and other cutting edge technologies, will become increasingly fundamental to meeting the UN Sustainable Development Goals (SDGs).

Industrial biotechnology provides solutions which create jobs in rural, coastal and de-industrialised zones, whilst improving energy, food security and nutrition. In addition, IB will increasingly help meet the growing global demand for protein whilst reducing associated impacts on the environment.

Here, we highlight just some of the ways in which IB is already contributing to delivering the UN SDGs, notably with a European perspective – while emphasizing that many of these opportunities are also valid for the rest of the world.

GOAL 1
END POVERTY IN ALL ITS FORMS EVERYWHERE

Industrial biotechnology has the potential to boost competitiveness and accelerate economic growth across a broad range of sectors - including in the farming, forestry, and fishing sectors - whilst creating new employment opportunities in the areas where they are most needed.

Biorefineries, converting locally sourced or grown renewable raw materials into valuable everyday products, are increasingly being developed around the world. Their construction helps create jobs and economies through the creation of new value chains from primary producers, right through to consumer product manufacturers and end of life waste and residue management. The benefits of biorefineries in contributing towards the development of renewable, zero waste installations is increasingly being recognised around the world, from Europe, to the USA, Brazil, China, India, South East Asia and increasingly in Africa.

It also helps giving additional value to agricultural products as a raw material. A vivid farming sector is recognized as the first step out of poverty.

GOAL 2
END HUNGER, ACHIEVE FOOD SECURITY AND IMPROVED NUTRITION, AND PROMOTE SUSTAINABLE AGRICULTURE

Industrial biotechnology plays a vital role in contributing to sustainable agriculture. For example, biostimulants are one of the most commonly used organic fertilisers which enhance plant nutrition and improve soil health. By using biostimulants, farmers introduce sustainable practices reducing the amount of chemical fertilisers applied while providing sustainable incomes. In addition, amino acids in animal feed improve the nutritional value of plant components, leading to significant saving in natural resources and arable land. In addition, animal feed (protein) production is an important output from bioethanol production, also enabled by IB. For example, in 2015, European ethanol biorefineries produced locally 5 million tonnes of animal feed as co-products, enough to feed at least 17% of the EU dairy herd[1], and thereby also decreasing the need for imports. IB also improves the efficacy of animal feed processes, as well as the health of livestock animals. Also by-products of bio-based processes such like advanced ethanol production can be used as fertilizer bringing back all the nutrients to the soil. Thus, IB enables the use of new feedstock such as waste and residues that could not be utilized before and reduces the pressure on natural resources.

Biodegradable agricultural mulch films also help improve soil quality and agricultural productivity, while offering additional advantages at the end of the crop cycle because they can simply be left on the field and ploughed under[2]. The benefits of industrial biotechnology are even broader in the area of improving food processing and manufacturing, where enzymes produced through IB processes are used to make juice, bread,

[1] ePURE, 'Fuelling Europe, feeding the world: | 5 things you need to know about food security and biofuels'
[2] See e.g. Position of European Bioplastics & EuropaBio on 'Fertiliser Regulation: Biodegradable Mulch Film'

vitamins and cheese. Last but not least, another benefit coming from IB technology is the development of bio-based chemical molecules for herbicides used in the treatment of weeds.

GOAL 6

ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL

Many of the enzymatic solutions, enabled by industrial biotechnology, help businesses and consumers save water during many applications compared with conventional methods. For example, enzymes can be used in the textile industry to combine processes and save significant amounts of water. They also replace chemical use in textile processing, thereby decreasing the amount of chemicals found in water effluents in textile processing-intensive regions around the globe.

In the pulp and paper industry, IB provides solutions to address lignin toxicity in effluents generated during the production process. It also offers solutions for waste water treatment and sludge reduction from municipal and industrial applications. In livestock management, amino acids, produced using IB, act as an aid to digestion in animal feed, reducing both the need for crude protein content and the amount of drinking water needed. This also lowers water pollution through a decrease in the amount of nitrates emitted into the environment through animal excretion[3]. Reduction in the amount of animal feed leads to knock-on benefits through water savings as less irrigation is needed for feed production.

GOAL 7

ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE AND MODERN ENERGY FOR ALL

Industrial biotechnology, which is used in bioethanol production, plays an important role in de-fossilising the transport sector and further diversify transport fuel sources. In 2016, European biorefineries produced 5.2 billion litres of renewable ethanol, 78% of which was used in transport[4]. This helped to achieve 66% GHG emission savings compared to petrol[5], equivalent to the annual emissions of more than 5 million cars[6]. Moreover, by using enzymes in household waste, the organic fraction of waste can be turned into biogas, which can again be converted in green power.

[3] Evonik (2017), 'What if, Evonik's Animal Nutrition contribution towards a more sustainable world', ISBN 978-3-00-055744-6
[4] ePURE, 'European renewable ethanol – key figures 2016'
[5] ibid
[6] ePURE webpage 'GHG Reductions & Air Quality'

GOAL 8

PROMOTE SUSTAINED, INCLUSIVE AND SUSTAINABLE ECONOMIC GROWTH, FULL AND PRODUCTIVE EMPLOYMENT AND DECENT WORK FOR ALL

In Europe, the bioeconomy sector is an important source of both economic activity and jobs. It already employs over 18 million people[7]. Industrial biotechnology, in turn, already employs close to 500 000 people with this number expected to increase to between 900 000 and 1500 000 jobs by 2030. This technology also has a high job multiplier, as for every job in the IB sector, there are four jobs created throughout the value chain. In the EU today, more than €31 billion is generated in terms of value added, a figure which is expected to grow to between €57,5 billion and €99,5 billion by 2030[8]. New biorefineries will also create job opportunities in rural areas, where jobs have been decreasing. Furthermore, the greater deployment of solutions provided by industrial biotech will increasingly be replicated by other economies around the world in South East Asia, India and Africa, with a potential to help foster competitiveness and create employment, with IB driven sectors already well developed in the US, Canada, Brazil and China.

GOAL 9

BUILD RESILIENT INFRASTRUCTURE, PROMOTE INCLUSIVE AND SUSTAINABLE INDUSTRIALISATION AND FOSTER INNOVATION

Industrial biotechnology is enabling the development of new, sustainable integrated economic models, based on circular economy solutions. Increasingly, these bio-based clusters are working towards the end goal of becoming fossil carbon-free and achieving zero waste. Developing countries can in particular benefit from these trends thanks to their feedstock potential, thanks to the fact that in many developing countries there are less established industries competing for the same market, etc.

[7] Piotrowski, S., Carus, M., Carrez, D. (2018), 'European Bioeconomy in Figures 2008-2015'
[8] EuropaBio, (2016), 'Jobs and Growth Generated by Industrial Biotechnology in Europe'

GOAL 11

MAKE CITIES AND HUMAN SETTLEMENTS INCLUSIVE, SAFE, RESILIENT AND SUSTAINABLE

Industrial biotechnology is increasingly providing solutions for municipal solid waste management and wastewater treatment with wide-ranging applications for cities. Together with electrification, blending of bioethanol into transport fuels can also provide significant benefits in urban air quality through reduction of particulates when compared with petrol or diesel fuels[9]. Advanced biomaterials are also used in the manufacture of protective gear against fires, hazardous chemicals and even bullets, without compromising on comfort of the fabric.

GOAL 12

ENSURE SUSTAINABLE CONSUMPTION AND PRODUCTION PATTERNS

Industrial biotechnology is developing solutions to help produce more from less and promote sustainable consumption and production patterns by reducing energy, water, and raw material use, chemical consumption and decreased pollution to air, soil and water. As plants capture CO_2 from the atmosphere, the carbon in these raw materials and, subsequently, in the end products is renewable rather than fossil-based, thus making them part of the natural carbon cycle. In this way, IB creates smarter, products and processes based on renewable raw materials including those that are currently not utilized such as agricultural residues or wastes, enabling carbon to be recycled at the end of a product's life. This process is a good example of the circular economy, which is about using resources more efficiently and sustainably throughout the economy. Industrial biotechnology also helps to phase out landfilling by providing the technology to produce fuels and materials from municipal solid waste, adding value and creating new markets for the resulting bio-based products.

Bio-based products, enabled by IB, increasingly have the novel properties that consumers are seeking while at the same time helping to reduce Europe's carbon footprint, its dependence on foreign fossil carbon imports and the impact on the environment. Enzymes are also used in food processing. They constitute invaluable processing aids for the baked goods industry, delivering many benefits in production process improvement and ensuring consistent high product quality – thereby reducing old bread wasted.

[9] See e.g. ePURE webpage 'GHG Reductions & Air Quality'

GOAL 13

TAKE URGENT ACTION TO COMBAT CLIMATE CHANGE AND ITS IMPACTS

According to the OECD, the full CO_2 mitigation potential of industrial biotech and bio-based products is between 1-2.5 billion tonnes of CO_2 equivalent per year, by 2030[10]. This is equal to emissions from 490 million cars. This is to a large extent because IB enables the use of renewable sources for making alternative products to fossil-based equivalents across multiple industries such as biofuels, biomaterials and biochemical building blocks. The 2015 EU-28 greenhouse gas emissions were 4.5 billion tonnes of CO_2 equivalents[11]. Already today, 31 million tonnes of CO_2 are currently saved per year as a result of industrial biotechnology[12].

GOAL 14

CONSERVE AND SUSTAINABLY USE THE OCEANS, SEAS AND MARINE RESOURCES FOR SUSTAINABLE DEVELOPMENT

The accumulation of plastics is a threat to our oceans and seas. Marine litter has been acknowledged as a significant problem by the European Commission, as release and accumulation of plastics in the oceans causes environmental as well as economic problems[13].

From a global perspective, Europe is not one of the major contributors to marine plastics pollution. However, in order to minimise and prevent further pollution of the marine environment several actions need to be taken. These include full implementation of EU waste legislation; a gradual phase out of landfilling of plastic products and measures to expand recycling and recovery of plastic waste as well as further efforts to reduce littering[14]. In this context, it should be noted that bio-based packaging and products are suitable for various end of life options, which can include recyclability and/or biodegradability / compostability, which can help diverting waste from landfill and contribute to sound waste management. Further research is also needed on biodegradation behaviour of materials in the marine environment[15]. It should also be noted that work is already ongoing in the field, including at ISO level to develop test methods and specifications for marine biodegradation. Another application that can contribute to reduce marine pollution are bio-based and biodegradable lubricants[16]. Approximately 50% of all lubricants end up in the environment, thus being a serious threat for environment, both aquatic and terrestrial.

---

[10] OECD, (2011), 'Industrial biotechnology and climate change. Opportunities and challenges'
[11] See Eurostat, "Total greenhouse gas emissions by countries"
[12] WWF Denmark (2009), 'Annual global impact'
[13] See e.g. European Commission (2018), 'A European Strategy for Plastics in a Circular Economy'
[14] See European Bioplastics, Position Paper on Marine Litter
[15] Ibid
[16] See e.g. Novamont webpage 'Matrol-Bi'

GOAL 17

REVITALISE THE GLOBAL PARTNERSHIP FOR SUSTAINABLE DEVELOPMENT

The development of an EU bioeconomy, circular economy, and Energy Union strategy hold great potential for strengthening cross-sectoral cooperation, sharing best practice and knowledge and creating new and novel partnerships. Industrial biotechnology provides solutions to increase resource efficiency and productivity in numerous sectors around the world and will be an increasingly vital tool in ensuring sustainable development. Many countries already have a bio-based strategy in place, and seek to better leverage opportunities across the rest of the world.

Innovation in this field has also greatly benefitted from the creation of the 3.7 billion Bio-based Industries Joint Undertaking (BBI JU), a public-private partnership initiated by the European Commission together with EuropaBio and other front-runners in resource efficient solutions. Since its launch in 2014, the BBI JU, enabled by industrial biotechnology, has contributed to significant advances in bio-based innovation and new and novel partnerships, across several sectors, in Europe[17]. This model is providing examples best practice and new collaborations which can be replicated around the world.

[17] See Euractiv, "Leading the transition towards a post-petroleum society" and the BBI-JU website

CONCLUSION

Industrial biotechnology already plays a valuable role in helping the EU to deliver on many of the UN SDGs, around the world. Developing economies are increasingly recognising the potential of IB to contribute to all three pillars of sustainability, bringing economic, environmental and societal benefits. However, huge potential still remains for the technology to offer even greater benefits, if a more ambitious policy framework is put in place. For this to happen, Europe needs to nurture this leading Key Enabling Technology and enable greater sharing of benefits with the rest of the world by:

1 / Engaging its decision makers and stakeholders from the fields of agriculture, regional policy, environment, industry, climate, trade, energy and research and innovation, amongst other sectors to speed up the implementation of the bioeconomy, which in turn equips the EU to deliver concrete results on the Sustainable Development Goals by introducing measures that facilitate the sharing of best practices and exchanging knowledge and expertise.

2 / Making the Common Agricultural Policy (CAP) fit for purpose for the bioeconomy e.g. through support for feedstock logistics.

3 / Ensuring coherence and stability in policy measures, to create an environment which enables both innovation and investment. This will help ensure that industrial biotechnology can fulfil its potential and increasingly make a greater contribution to the SDGs while achieving the EU objectives of establishing a circular bioeconomy.

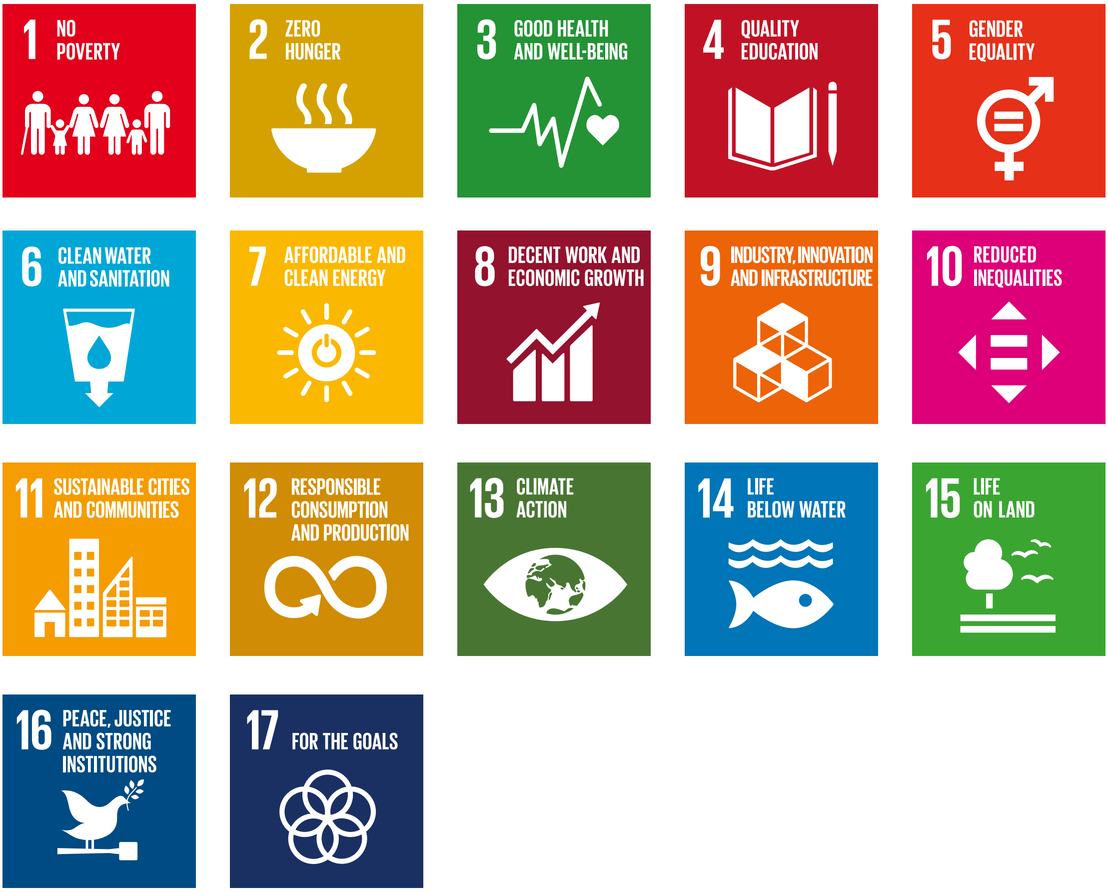
4 / Increasing funding and improving coherence of financing mechanisms for technologies delivering solutions for the UN SDGs. The new EU framework programme for research and innovation (FP9) should be reflecting these priorities.

5 / In particular, enabling the continued delivery of innovative and sustainable products and processes through a second mandate of the BBI JU ('BBI JU 2.0.').

6 / Facilitating market uptake of bio-based products.

7 / Undertaking initiatives to increase consumer awareness of the benefits offered by bio-based products in strategic sectors which deliver on the UN SDGs.

The EU has an opportunity to lead by example in the successful implementation of the bioeconomy into the UN SDGs, which in turn will inspire other regions to follow.



EuropaBio, the European Association for Bioindustries
Avenue de l'Armée 6, 1040 Brussels, Belgium
t. +32 2 735 03 13 | **f.** +32 2 735 49 60
www.europabio.org

MAY 2018