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Main goals of the present century to achieve sustainable growth and reduce climate impact as well as to improve the health-related quality of life, have been placed Biotechnology as an essential route to follow, even more as a key engine for Bioeconomy (Figure1).

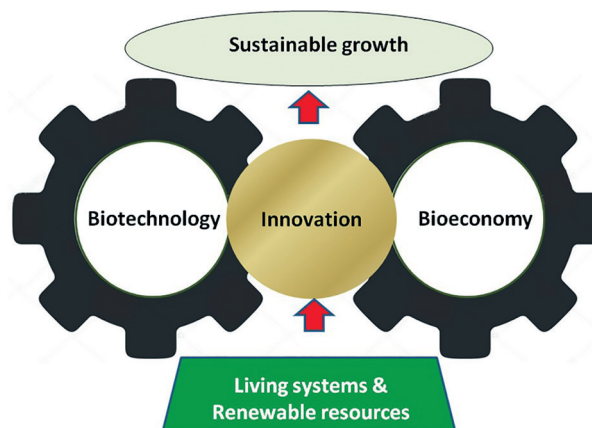


Figure 1. Linking Biotechnology and Bioeconomy. Bio-based economy is expected to replace the petroleum-based economy and only the use of living systems and renewable resources through biotechnology will allow to achieve main goals for a sustainable growth.

Bioeconomy, defined as “the production, utilization and conservation of biological resources, including related knowledge, science, technology, and innovation, to provide information, products, processes and services across all economic sectors aiming toward a sustainable economy’ according to the Global Bioeconomy Summit 2018, is closely linked to Biotechnology, since biological systems (organisms or parts of them), including cells, cellular structures, molecular complexes or single molecules, genes and regulatory sequences and circuits; as well as biomass (renewable resources) could be transformed in economic valued products and services.

Going further, biotechnology is one of the main drivers for the basic research development and knowledge-based innovation. Systems biology, synthetic biology and single cell biology, between other approaches, have overcome the complexity of living organisms to reveal molecular mechanisms and insights into the structure and functional processes of cells to produce several biotechnological applications. Only synthetic biology as a disruptive technology with different application sectors is generating a fast-growing market in biotechnology (Freemont 2019).

Also, continuous advances in high-throughput technologies including next generation sequencing and omics (structural and functional genomics, transcriptomics, proteomics, metabolomics, fluxomics, metagenomics and others) have led to obtain integrated large scale

data as the main input for knowledge-based innovation arising as enormous potential for bioeconomy (Jiménez-Sánchez & Philp 2015).

At the same time, the emergence of precision genome engineering technologies, specially CRISPR-Cas systems have become as main technical drivers for biotechnological revolution expanding applications and the market growth for the next years (Knott & Doudna 2018).

Because its wide applications, a colors code has been adopted to differentiate each area of biotechnology (Barcelos et al. 2019).

Main economic impacts of biotechnology hold on:

- *Health and Pharmaceuticals*: Main objective of Red Biotechnology is related to provide new drugs and vaccines but also technologies to improve diagnostics, therapeutic strategies and pharmacogenomics approaches oriented to personalized medicine.
- *Agriculture*: Green Biotechnology is advocated to improve crops productivity, avoid the use of hazard chemicals and reduced production costs. One of main goals is referred to genetic improvement of plants and crops through genetic engineering to increased yields and reduce plant susceptibility to biotic and abiotic factors.
- *Industry*: White Biotechnology refers to the use of microorganisms, plants or any engineering cells (cell factories) to produce metabolites, chemicals, biomaterials and biofuels through eco-friendly processes. Novel products are arising with the application of modern biotechnology strategies, including metabolic engineering and synthetic biology.
- *Environment*: Grey Biotechnology is referred as the application of living systems or engineering cells to manage, reduce or avoid soil, water and air pollution.
- *Marine and fresh-water ecosystems*: Blue biotechnology utilize bioprospecting approaches to obtain new products, namely bioactive compounds, pigments, from marine biodiversity. Also, algal

biomass is being used to produce biofuels.

- *Innovation and Intellectual Property*: are catalogued as Purple Biotechnology.

Although intellectual property and biotech based companies are widely distributed in Europe and North America, supporting and expending the global biotechnology market; more efforts and investment for the development of high level scientific research, as well as an adequate non-prohibitive rules and regulation are needed for Latin America and other developing countries.

Biodiversity richness should be transformed into economical growth, by allowing the transit from raw material-based economy into a knowledge-based economy. For that the use of Biotechnology is mandatory.

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