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Enhancing the Degradation of Environmental Pollutants Through the Engineering of Microbes

John Henry*

Department of Industrial Engineering, Vietnam National University, Hochiminh City, Vietnam

Description

Industrial biotechnology has revolutionized the production of a variety of goods, including chemicals, energy, materials, food, and others. One clear environmental advantage of biotechnology over the chemical industry is the use of renewable bioresources rather than non-renewable petroleum-based resources. 2) Producing biodegradable products rather than nondegradable or nonrecyclable ones; 3) avoiding hazardous waste and industrial gases, among other things. However, there is occasionally debate surrounding biotechnology's environmental benefits. In biotechnology, biomass is used as the feedstock for fermentation, assuming that it is renewable and carbon-neutral. However, the resource inputs required to obtain and process the biomass feedstock, particularly in its pure form (such as glucose), for its use in the biotechnological production process must be taken into account in order to assess the total environmental burden. Another topic of discussion is the conflict between growing biomass for fuel or chemical feedstock production and maintaining biodiverse forests, which act as a global carbon sink.

The sustainable metabolic engineering concept to evaluate and maximize the sustainability of biotechnological production. This concept can be derived from the metabolic characteristics of the exploited organism. The SME concept of optimizing metabolism takes into account economic, environmental, and societal sustainability parameters for all incoming and outgoing fluxes as well as the produced biomass of the organisms being utilized. By including sustainability estimation among the defining characteristics of metabolic engineering-created strains, the biotechnological production design can be enhanced from the outset. Industrial biotechnology is one of the most innovative and labor-productive industries, allowing for the expansion of existing value chains and their improvement, with estimated stable economic growth. In addition, when it comes to its environmental impact, biotechnology clearly outperforms the chemical industry. However, the societal aspects of biotechnology are frequently overlooked, and the environmental benefits of biotechnology are occasionally controversial. The importance of bioprocess sustainability for society, the economy, and the environment grows as we learn more about the complicated and interconnected effects of various human activities. Negative effects on society and the environment proportional to production volumes may result from ignoring sustainability concerns during the process of developing novel solutions.

The expanding biotechnology sector is one of the bioeconomy's most innovative and labor-productive sectors. The bioeconomy has gained traction as a force behind environmentally conscious and smart growth. In the bioeconomy sector, more than 40 nations are investing and promoting strategies and policies. More than 417 thousand people were employed in the production of bio-based chemicals, pharmaceuticals, plastics, rubber, and liquid biofuels in the EU's bio economy sector in 2017, which generated 63,528 million euros in value-added, or roughly 10% of the bioeconomy sector's total value-added. With climate neutrality, the bioeconomy, the circular economy, sustainable development, and bioeconomy high on the international agenda, it is anticipated that the creation of "green jobs" and revenue based on innovative biotechnological solutions will be further actively promoted. Biotechnological solutions will expand in size and number as a result of this agenda. In the process of developing novel solutions, it could result in suboptimal biotechnological production, resulting in negative environmental and societal issues proportional to the volume of production. Due to the growing pressure from society and the government to reduce environmental impact on ecosystems, human health, and resource availability, it is anticipated that a comprehensive economic, environmental, and societal sustainability assessment and optimization of a biotechnological process will soon become the industry standard.

Researchers agree on a common definition of sustainability. But sustainability is still a contentious issue. The manner in which various sustainability aspects are evaluated is influenced by the aim, boundaries, and stakeholder participation in the evaluation. Because of this, stakeholders are unable to come to an agreement on how to achieve sustainability and put the goals of sustainable development into action. In the context of industrial biotechnology, sustainability can be defined as the process of maximizing the production's economic, environmental, and social benefits by avoiding toxic substances, producing no gaseous, liquid, or solid waste, and adhering to ethical standards in order to produce profitable bio-based products. The UN's Sustainable Development Goals are prominently displayed, with the research directions that are necessary for a sustainable future taking precedence. Bioindustry has a role to play in seventeen interconnected goals that cover agriculture, climate change, industry, innovations, and other sectors.. [1-5].

Acknowledgement

The sustainability of different bioprocesses becomes increasingly important parameter due to the growing understanding about consequences of different human activities. The intention of EU and other regions is to develop stimulating mechanisms to facilitate implementation of industrial sustainability. That is the point where sustainability shifts business models and impacts profit along with classic parameters of bioprocess as yield and productivity and others making the assessment of competitiveness of a particular solution even more complicated.

Conflict of Interest

The Author declares there is no conflict of interest associated with this manuscript.

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***Address for Correspondence:** John Henry, Department of Industrial Engineering, Vietnam National University, Hochiminh City, Vietnam, E-mail: john345@edu.in*

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