

## Circular economy challenges in bioresources valorization – the role of microorganisms

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In a world that is expected to face acute resource shortage in the near future, exploring the possibility of fully using the available biomass and significantly improving the recovery of relevant nutrients/compounds are strategies of the utmost importance. Holistic strategies supporting a circular economy, enabling the sustainable and efficient use of available feedstocks, while targeting minimal environmental impact and zero wastes, are in order. In this context, selecting efficient strategies, aiming at recovering the maximum number of fractions while simultaneously allowing for high yields and functionality, economic feasibility, environmental sustainability, and holistic integration in biorefinery approaches, is a challenging task. Biorefineries were initially designed to provide energy and chemicals from lignocellulosic biomasses using fermentation processes. The concept can be extended to other types of under-used bioresources, including food wastes or marine biomasses. However, bottlenecks include the need for processes that can cope with different feedstocks and variable feedstock quality. In fact, improved enzymes and microorganisms are needed, resilient to these highly variable feedstocks and resistant to high(er) amounts of common inhibitors. Microorganisms capable of metabolizing specific compounds, such as oils or marine polysaccharides, into high-value products or ingredients would also allow broadening the range of biomasses that can be included in these circular economy approaches. Simpler valorisation strategies may include to enrich the biomass in different microbial metabolites or in single cell protein. Besides their role as high value commodities producer, microorganisms can also be an important processing aid. For instance, they may be used a stabilizing agent or to degrade packaging.

Summing up, microorganisms can be key players in adding value to under-used bioresources by providing feasible processes to convert these bioresources into different high-value products, thus increasing economy circularity.