#FACT6

SUSTAINABILITY ASPECTS OF THE NOVEL BIORESCUE BIOREFINERY

The EU-funded project BIOrescue has created **a new circular economy business model** by developing a novel biorefinery process to recover the vast majority of used mushroom compost. It transforms glucose and lignin into **biopesticides, enzymes and biobased nanocarriers** for plant vaccines.

BIOrescue partners C-Tech Innovation, Imperial College of London and CENER analysed the economic, social, technological and environmental aspects of this novel biorefinery process.

Economic aspects

Economic return -The products developed in BIOrescue **have high market value** and, once the process is upscaled, can be produced in large quantities keeping high quality standards. The market for biobased products is rapidly expanding, and BIOrescue products have the potential to **generate significant returns on investment**, even within the first years of operation.

New value for agricultural residues -This new concept will have a direct impact for mushroom farms in Europe, **reducing the cost of used mushroom compost disposal** by over €30 million/year.

The BIOrescue products have high market value and can reduce the cost of used mushroom compost disposal by over €30 million/year.

Social and health & safety aspects

This novel biorefinery is likely to **provide employment** throughout the supply chain in:

- Agricultural activities (e.g. cultivation and collection of biomass);
- Biorefinery (construction and operation, including management and administration);
- Research and development (at the biorefinery and in external organisations).

The BIOrescue concept can be a driving force for local and regional development by pursuing policies that promote **gender equity** (e.g. fair access to income opportunities and skilling) and **labour rights** (e.g. compliance with various labour laws and conventions).

The BIOrescue concept can create employment throughout the supply chain.

Technological aspects

The biorefinery process developed in BIOrescue involves different stages, with **technology readiness levels from TRL 3 to TRL 5**, meaning between a proven concept and a technology validated in relevant environment.

The main challenges and barriers for upscaling the process are:

- **Optimising the process** to increase production yields and continuous operation;
- **Reducing the investment** costs, especially in the pretreatment stage;
- Developing consistent **regulations and certification** schemes for biobased products.

The technology readiness level of the biorefinery process is between TRL 3 and 5.

Environmental aspects

The largest contributors to the overall greenhouse gas emissions from the BIOrescue biorefinery are the **chemical products used** and the provision **of heat and power to the plant**.

Although upscaling the process should reduce these emissions, some measures have been suggested to further improve the environmental performance of the biorefinery:

- Reducing the consumption of raw materials by recirculating the chemicals (up to 15% cuts in emissions) and **water** used in the production process;
- Using **100% renewable energy sources** for heat and power (up to 47% cuts in emissions);
- Introducing **energy efficient machinery** within the process;
- Improving **overall conversion efficiency**, so that inputs per unit mass are lower than outputs.

The chemical products used and the provision of heat and power to the plant are the largest contributors to GHG.

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http://bit.do/biorescue-sustainability

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The BIOrescue project has developed a new biorefinery concept to demonstrate the production of high-value value products from used mushroom compost and other underutilised feedstocks. It has received funding from the Bio-Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme, under Grant Agreement N°720708.