



**BIOrescue:**  
A novel biorefinery concept for mushroom compost

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# CREATING VALUE FROM AGRICULTURAL RESIDUES: INTRODUCTION TO THE BIORESCUE PROCESS

Inés del Campo, CENER

BUILDING SUSTAINABLE VALUE CHAINS FOR THE BIO-BASED INDUSTRY. 28 FEBRUARY 2019 MAINZ.



## CHALLENGES

Each year, over **3 million tonnes of mushroom compost** is generated by mushroom production, thus creating **significant economic and logistical problems** for Europe's farmers.

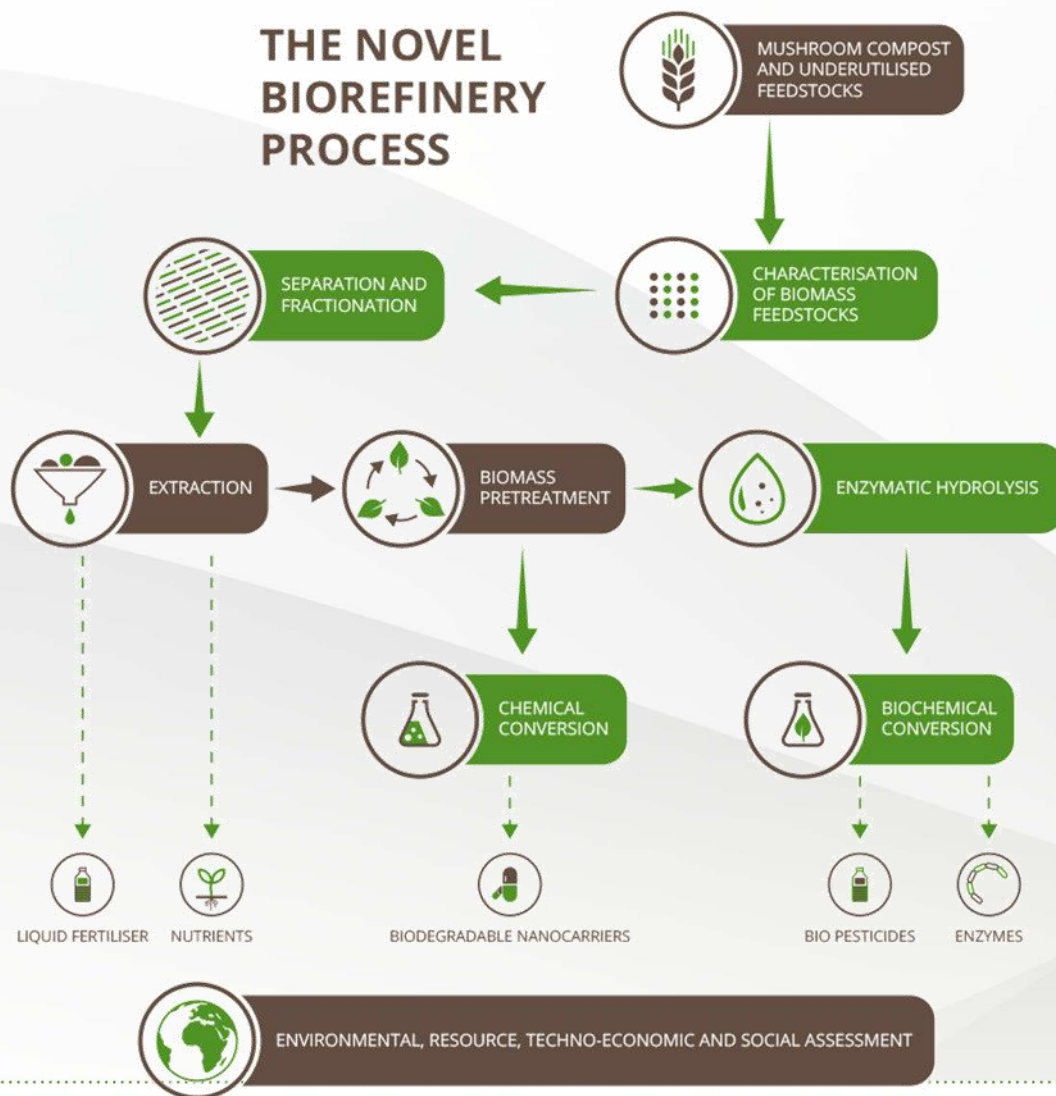
- Mushroom compost, prepared solely for growing mushrooms, is only suitable for one to three harvests;
- The compost is currently disposed of, even though it contains valuable components;
- The mushroom industry lacks adapted technological solutions to upgrade this compost into valuable products



## OBJECTIVES

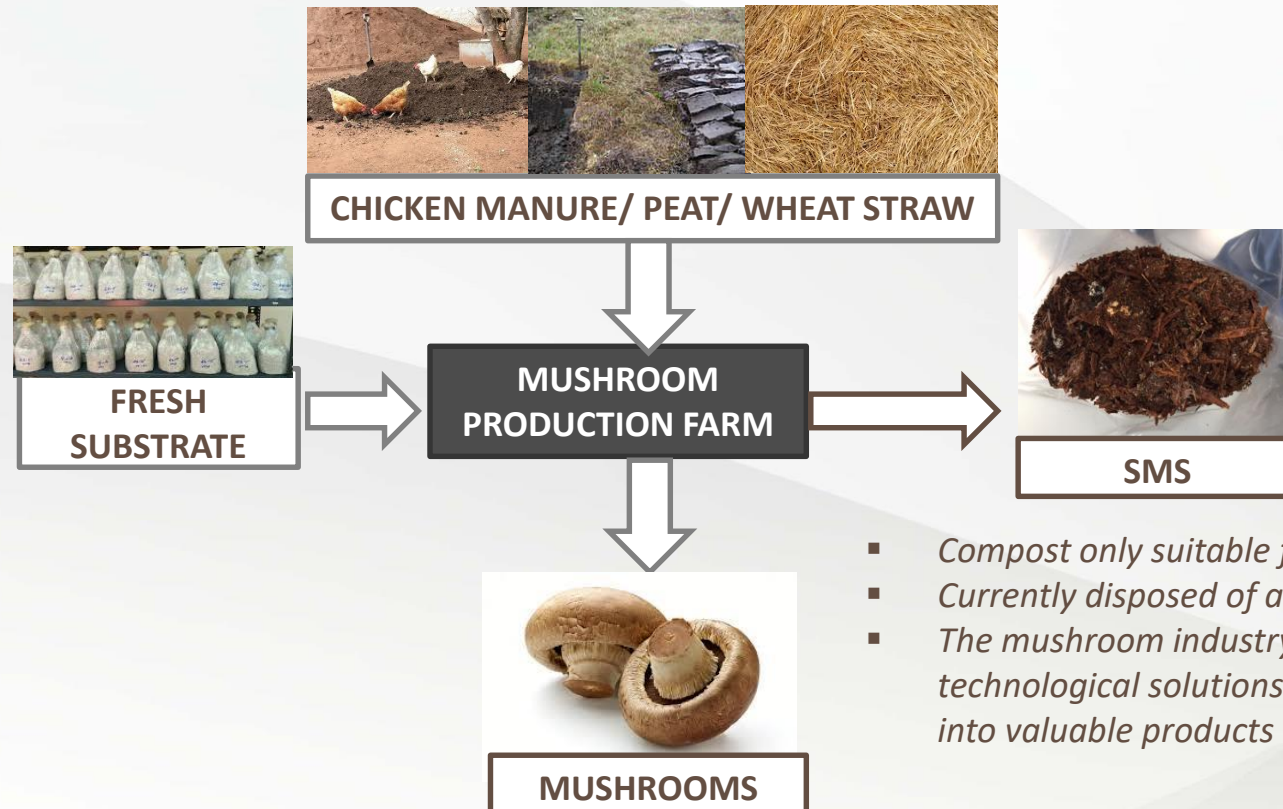
- To demonstrate an innovative and resource-efficient **biorefinery concept** for mushroom compost conversion;
- **To create valuable bio-based products** from mushroom compost and other lignocellulosic feedstocks;
- To achieve a **20% overall cost-reduction** in the enzymatic hydrolysis process;
- **To reduce disposal costs** for mushroom compost and generate a new income stream for mushroom producers.







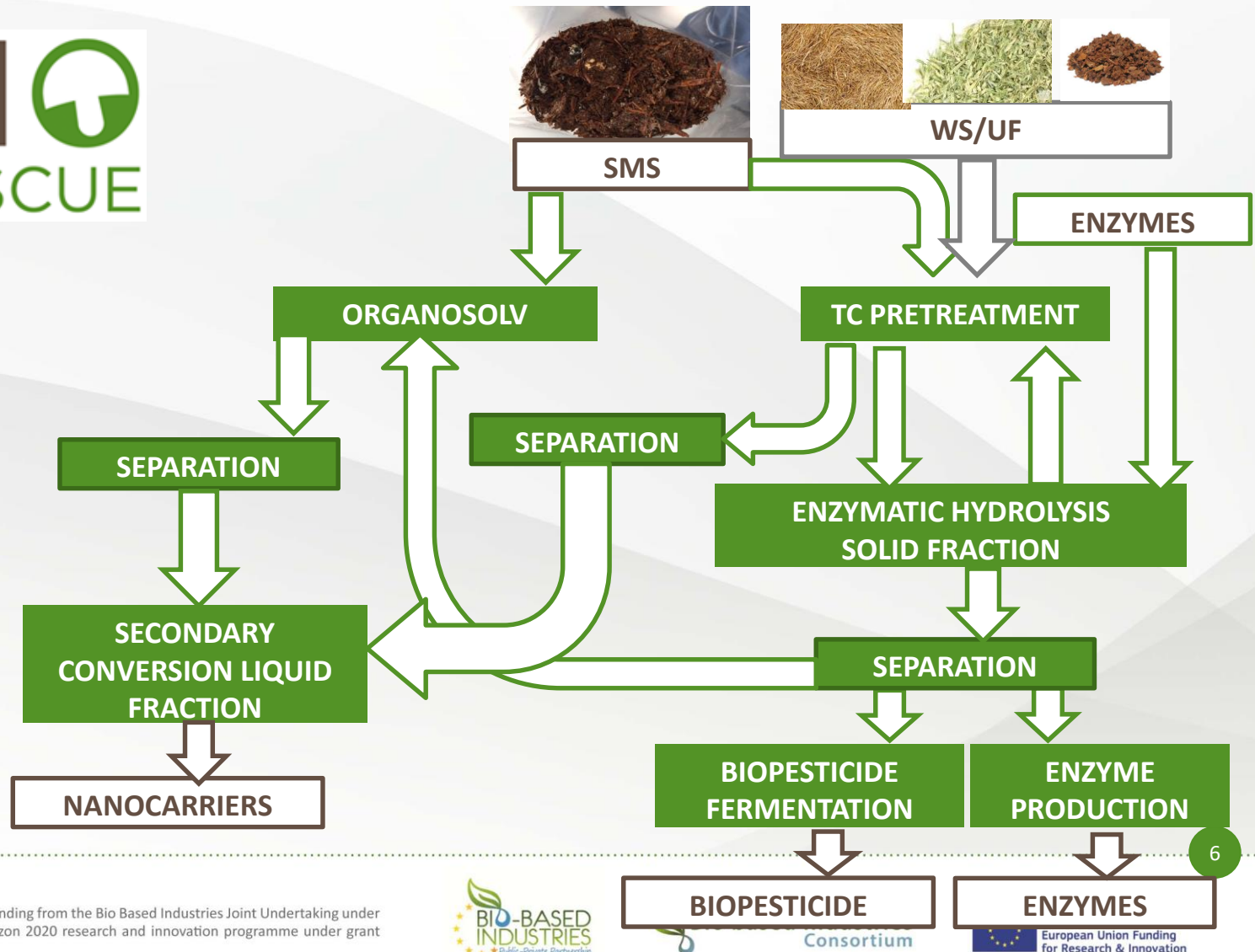
## BASE CASE STUDY: MUSHROOM PRODUCTION FARM



- Compost only suitable for one to three harvests;
- Currently disposed of at high cost;
- The mushroom industry lacks adapted technological solutions to upgrade this compost into valuable products



## BIOrescue CASE STUDY: BIOREFINERY FROM SMS AND UF





## WP1. Project coordination & Management



## WP7. Dissemination & Exploitation of results



## WP6. Environmental, resource, techno-economic and social impact assessment



## WP4. Primary conversion



## WP5. Secondary conversion



## WP2. Supply, cultivation & assessment



## WP3. Fractionation & Separation





# THE NOVEL BIOREFINERY PROCESS

- 1. Characterisation of biomass feedstocks**
- 2. Separation and fractionation**
  - a) Extraction
  - b) Biomass pretreatment
- 3. Enzymatic hydrolysis**
- 4. Chemical and biochemical conversion**
- 5. Environmental, resource, techno-economic and social assessment**



# THE NOVEL BIOREFINERY PROCESS

## 1. Characterisation of biomass feedstocks (WP2)

- Analysis of the composition of mushroom compost;
- Assessment of the availability of other underutilised agricultural feedstocks in mushroom producing regions;
- Development of rapid methods for real-time evaluation of biomass feedstocks.



# THE NOVEL BIOREFINERY PROCESS

## 2. Separation and fractionation (WP3)

Innovative two-step fractionation process for mushroom compost.

### a) Extraction

Novel methodology for the extraction of high added value components.

### b) Biomass pretreatment

Optimisation of the thermochemical pretreatment process for mixtures of mushroom compost and wheat straw or other underutilised agricultural feedstocks.



# THE NOVEL BIOREFINERY PROCESS

## 3. Primary conversion - Enzymatic hydrolysis (WP4)

Innovative enzymatic hydrolysis process including enzyme immobilisation and recycling:

- Improved enzymes for biomass conversion;
- Shorter hydrolysis times;
- Increased resource and cost efficiency.



# THE NOVEL BIOREFINERY PROCESS

## 4. Secondary conversion: Chemical and biochemical conversion (WP5)

- **Chemical conversion:** Innovative concept for the conversion of soluble lignin and other organic compounds into nanocarriers.
- **Biochemical conversion:** More efficient biochemical conversion process via enzyme improvement, immobilisation and recovery.



# THE NOVEL BIOREFINERY PROCESS

## 5. Environmental, resource, techno-economic and social assessment (WP6)

- Environmental evaluation for new bio-based products and processes
- Techno economic assessment to determine costs and benefits of individual process chain
- Sustainability integration of all issues to describe the most sustainable pathways among the value chains compared to all reference systems.



## PROJECT INFORMATION



- 10 partners from 7 different countries
- Duration: 3 years (September 2016-August 2019)
- Coordinated by CENER with the support of Monaghan Mushrooms as Technical Coordinator
- Co-funded by the Bio-Based Industries Joint Undertaking



## CONTACT

### **Project coordinator**

Inés Del Campo

CENER – National Renewable Energy Centre

[idelcampo@cener.com](mailto:idelcampo@cener.com)

### **Communication team**

Bénédicte Julliard

Greenovate! Europe

[benedicte.Julliard@greenovate.eu](mailto:benedicte.Julliard@greenovate.eu)