

# Plant-based renewable resources to reduce dependency of fossils and lower GHGs (CO<sub>2</sub> & methane)

Unlock the potential of renewable resources with bio-based solutions

*Two concrete DSM examples*

# The versatility of plant-based renewable raw materials

## Sugar to complex molecules:

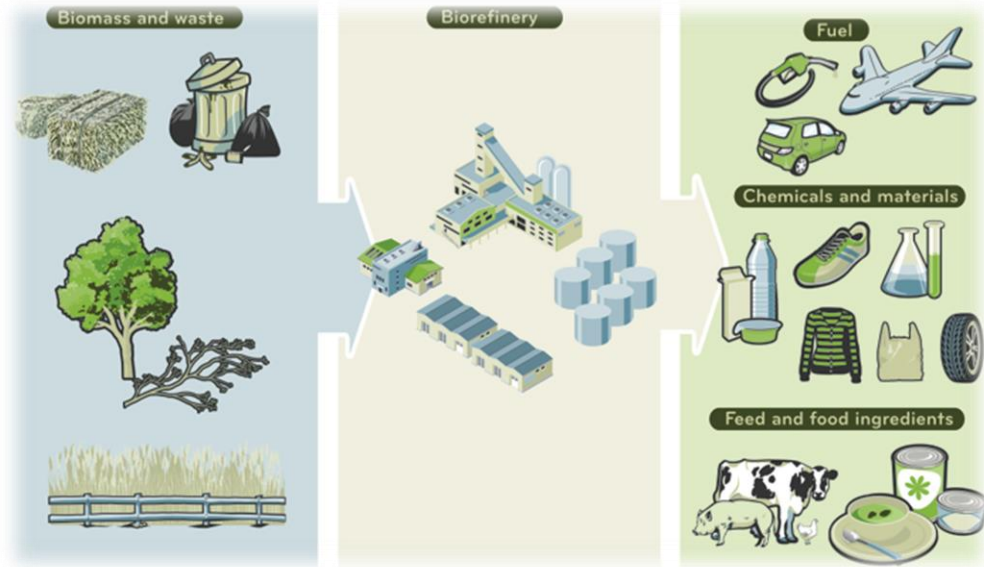
- Antibiotics;
- Proteins, enzymes, food ingredients;
- Chemicals for industrial and consumer products.

## Vegetable oils for industrial use in:

- Plastics, paints, solvents.

## Agricultural residues and bio-waste:

- Fibers, sugars, proteins, fats;
- Chemical building blocks, bio-chemicals;
- 2G-biofuels, biogas.



# Example 1 - Rapeseed protein as alternative to animal protein

## Climate benefits & raw materials efficiency:

- Reducing agriculture carbon footprint ( $\text{CO}_2$ );
- Eliminating livestock methane emissions ( $\text{CH}_4$ );
- 10 kg plant protein  $\rightarrow$  1 kg meat protein.

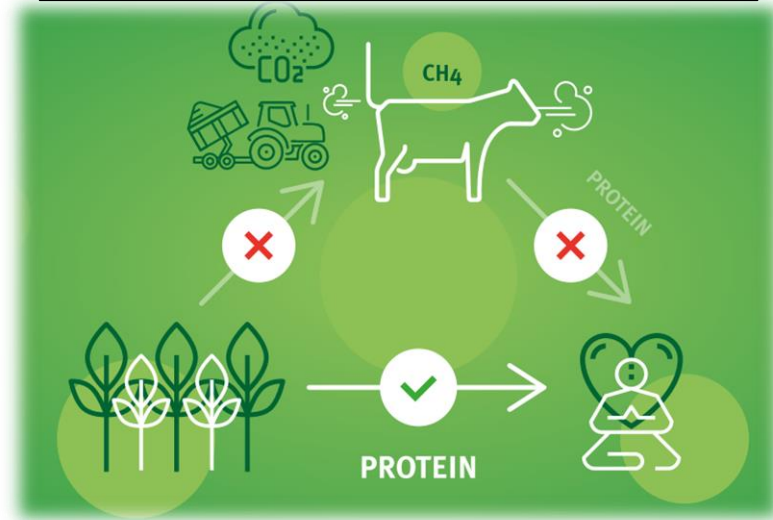
## Innovative challenges:

- De-risk scaling up;
- Application potential.

## Investment:

- 2018: 1<sup>st</sup> flagship (TRL 7-8)  $\rightarrow$  €50-100mln (limited capacity);
- 2020+: expansion to full capacity (TRL 8-9)  $\rightarrow$  needs up to €1bln;
- Financing consortium.

Total emissions livestock:  
7.1 gigatonnes  $\text{CO}_2\text{-eq}/\text{year}$  (FAO, 2013)  
=14.5% of all human-induced GHG emissions.



# Example 2 - Chemical building blocks from biomass & wood waste

## Climate benefits & raw materials efficiency:

- Replacing fossil resources;
- 2G / Lignocellulosic biomass / wood waste;
- No food crops!

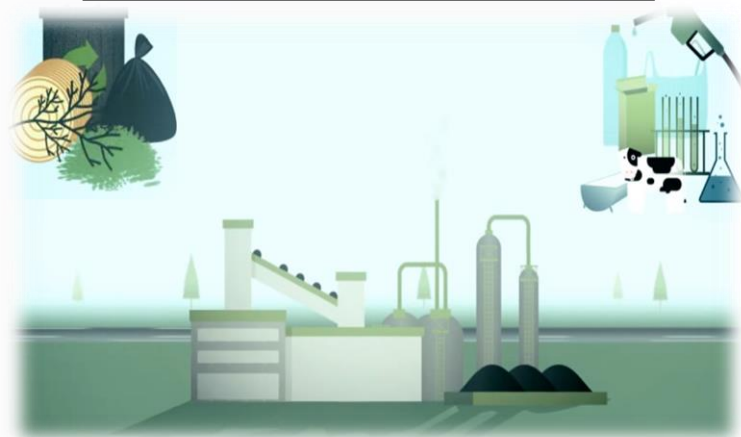
## Innovative challenges:

- Biomass / wood waste to chemicals = complex;
- Demonstrating industrial viability;
- Maximize chemicals production potentials via cascading use.

## Investment:

- Currently: JU BBI demo project (TRL 6-7);
- 2020-: large scale implementation (TRL 8-9) → needs up to bln€1;
- Financing consortium.

2G bio-fuels: 80-90% CO<sub>2</sub> reduction  
Bio-chemicals: 20-40% GHG reduction



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