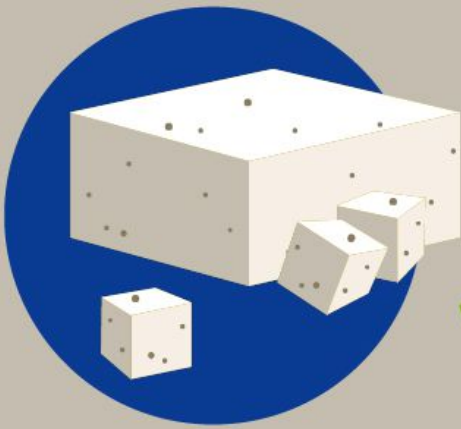
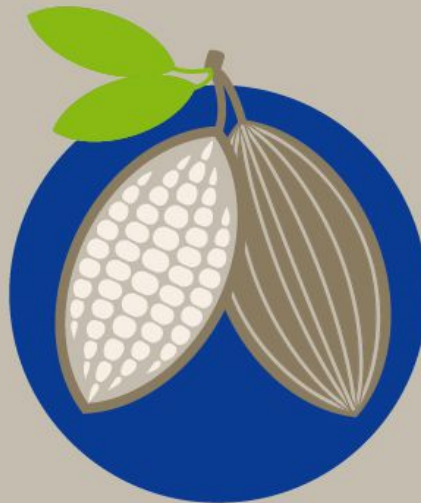


What is solid-state fermentation?

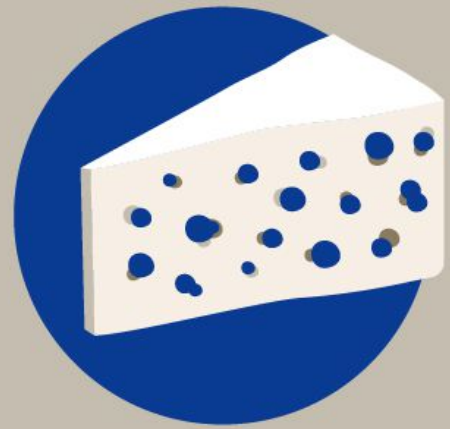
Solid-state fermentation is a centuries-old method used to produce foods.



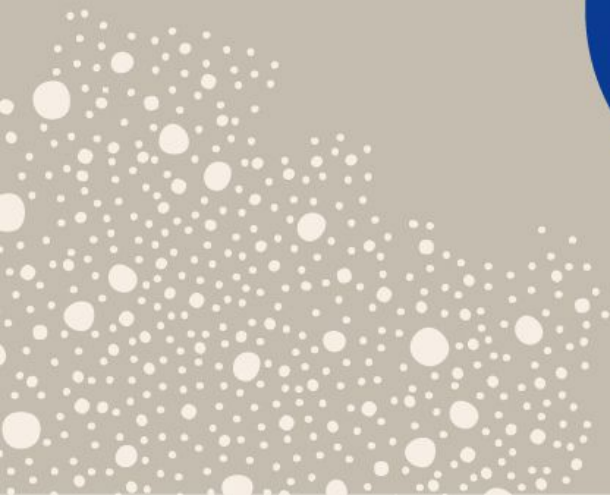
Tofu



Cocoa



Blue cheese





Solid-state fermentation

Filamentous fungi or other microorganisms grow on solid materials.



Filamentous fungi



Bacteria



Yeast

Substrates



Wheat bran



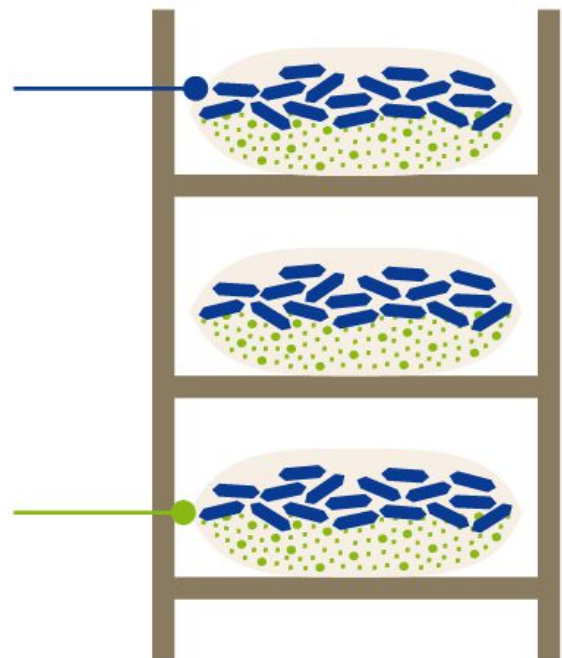
Rice husk



Sugarcane bagasse



Winery waste

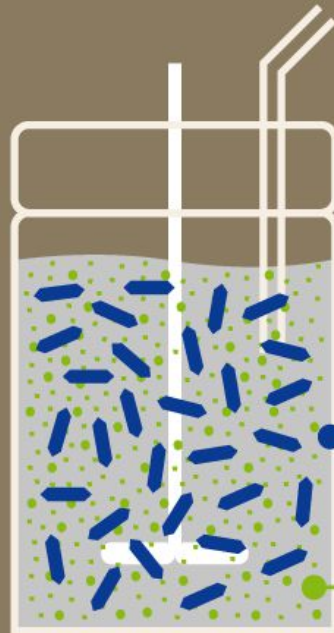


A solution for recycling agro-industrial waste

Submerged fermentation

Unlike submerged fermentation, solid-state fermentation only uses a small amount of liquid.

VS



Culture medium

Microorganisms

Substrate

Solid-state fermentation has a low environmental footprint

The carbon footprint associated with solid-state fermentation appears to be ^{UP TO} **50%** *less than that observed in submerged fermentation*.*



Solid-state fermentation uses less water than submerged fermentation to produce fungal biomass.



Using less water also means that less energy is required to dry the substrate.



Natural matrices and additives further reduce the environmental impact.



In the context of a circular economy, a smart approach to obtaining valuable products from waste and by-products.

*Economic analysis and environmental impact assessment of three different fermentation processes for fructooligosaccharides production par Mussato & al ; 2015

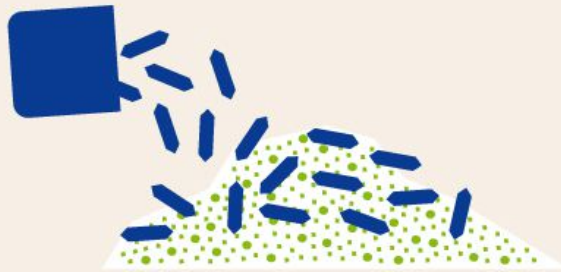
How does solid-state fermentation work?



Step 1

Substrate preparation

Substrate is prepared to have the right conditions for optimal fungal growth.

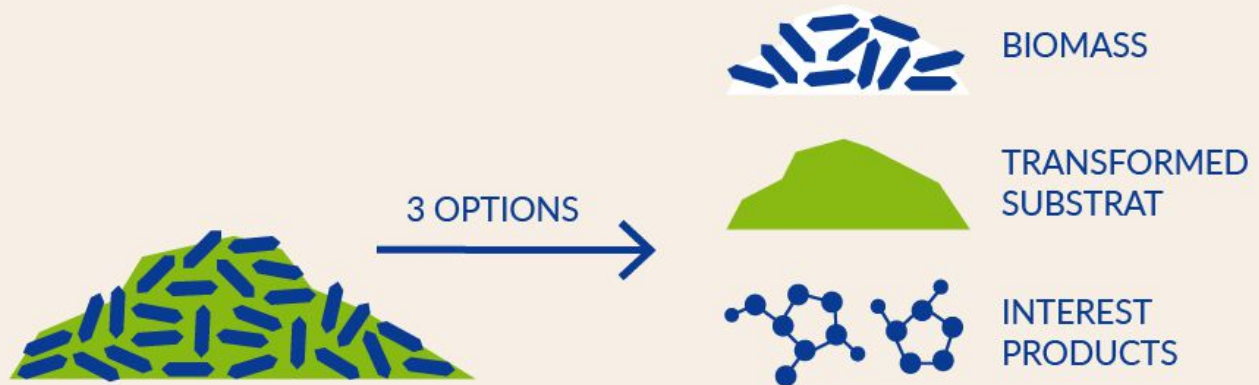


Step 2

Substrate inoculation & fungal multiplication

Sterilised substrate is inoculated and incubated to give the fungus time to grow.

How does solid-state fermentation work?



Step 3

Obtaining the desired products

The process leads to three options :

- Separation of microbial biomass from the solid substrate (filtration, centrifugation or sedimentation)
- Extraction of the interest products (solvent extraction, precipitation or chromatography)
- Recovery of the solid substrate transformed by the microorganisms

Different applications of solid-state fermentation

Solid-state fermentation has applications across many industries. Different applications may use the resulting microorganisms, their enzymes or the modified substrate.





The fermentation process has modified the substrate. This substrate can be used in various industries :

- Food production
- Protein-enriched Feeds
- Agro-industrial wastes biodegradation
- Biofertilizers

The living microorganisms
can be used to produce :

- Biocontrol products
- Probiotics
- Meat analogs
- Starter cultures

