



Biorefining and upcycling of agricultural side-streams using fungi

Mette Lübeck



➤ Leading to Biobased Industries

Circular Bioeconomy

No Waste
Clean water

Sustainable Bioresource Technology

Niels T. Eriksen, Peter Roslev, Niels Iversen, Cristiano Varrone, Peter Stephensen, Lars Haastrup Pedersen, Mette & Peter Lübeck

Environmental Chemistry And Toxicology

Peter Roslev & Niels Iversen

Bioremediation & up- cycling of plastic waste

Cristiano Varrone

Metabolic Performance of Farmed Insects

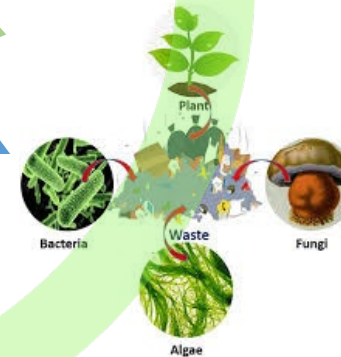
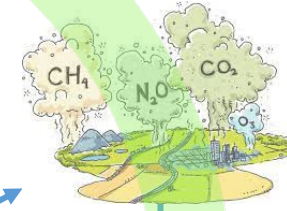
Niels T. Eriksen

Biorefining and upcycling

Mette & Peter Lübeck

Bioprocess Technology

Lars Haastrup Pedersen



SUSTAINABLE
DEVELOPMENT GOALS



Upcycling agricultural sidestreams for alternative food production

1. Green biorefining
and upcycling



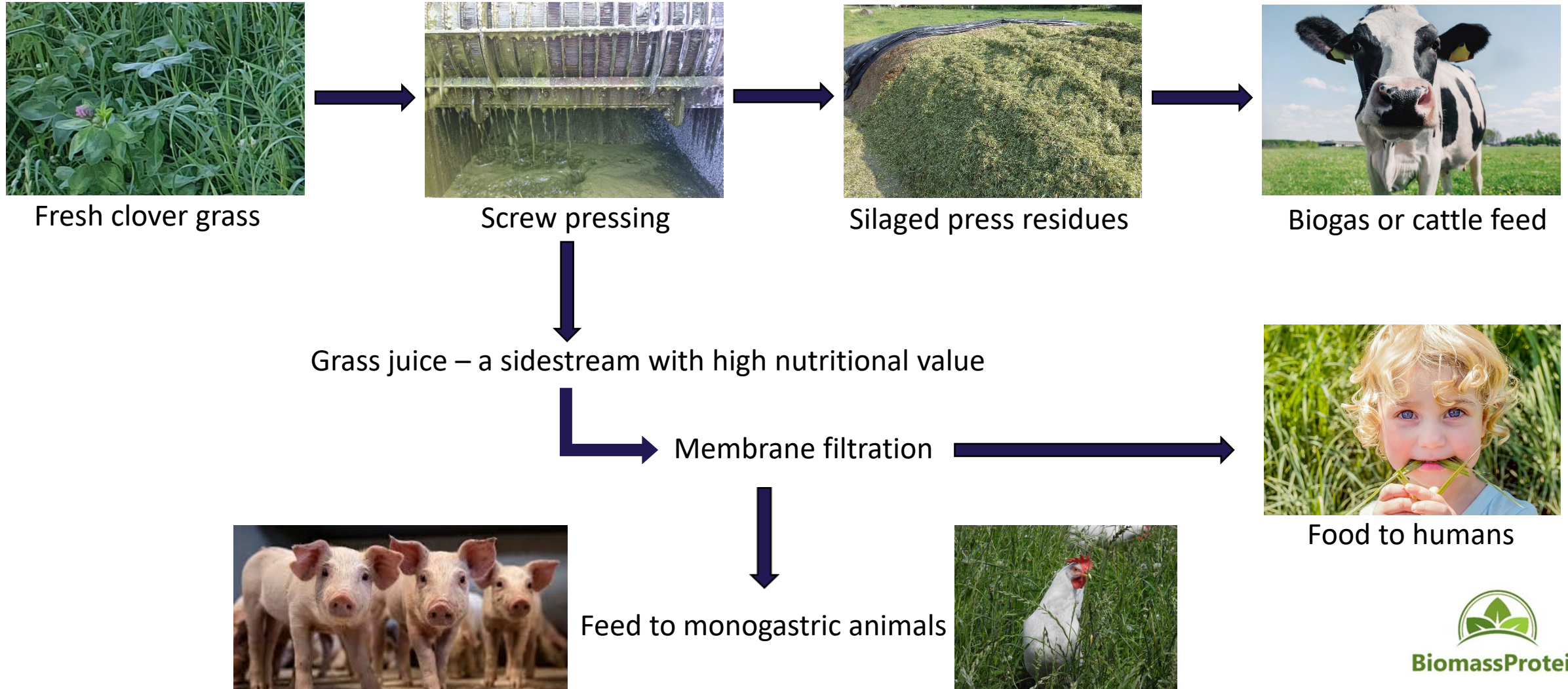
2. Upcycling
agricultural side-
streams using edible
fungi



3. Upcycling
agricultural side-
streams for fungal
precision fermentation
of animal proteins

ProteinFrontiers

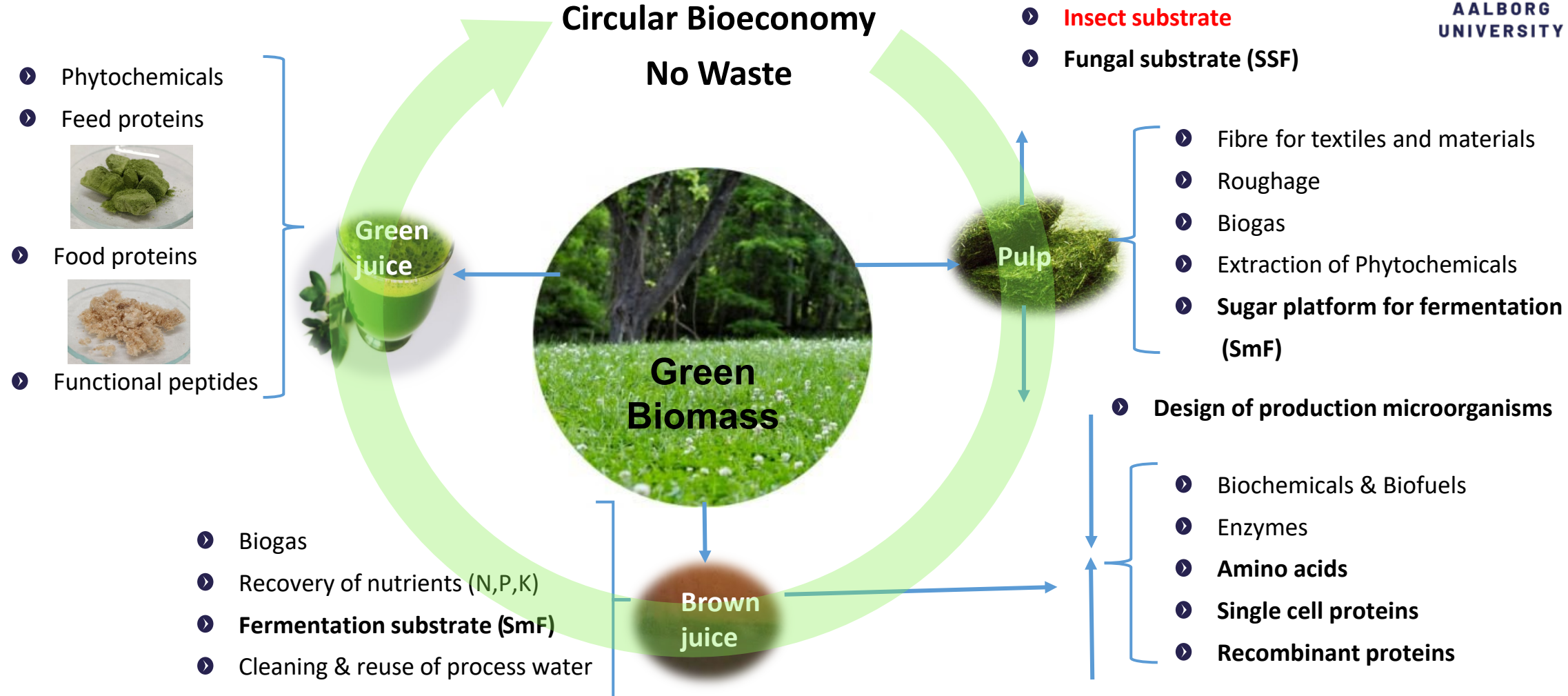
1. Green biorefining and upcycling



Green biorefining and upcycling



AALBORG
UNIVERSITY



Upcycling of side-streams using fungal fermentation

Submerged fermentation

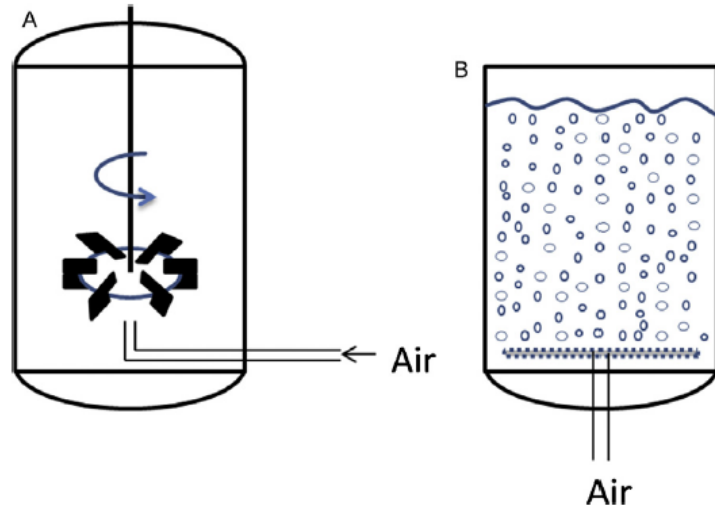


Fig. 2. SmF bioreactors, (A) Stirred tank with Rushton turbine (B) Airlift fermentor with air sparging from the bottom of the tank.

Solid state fermentation

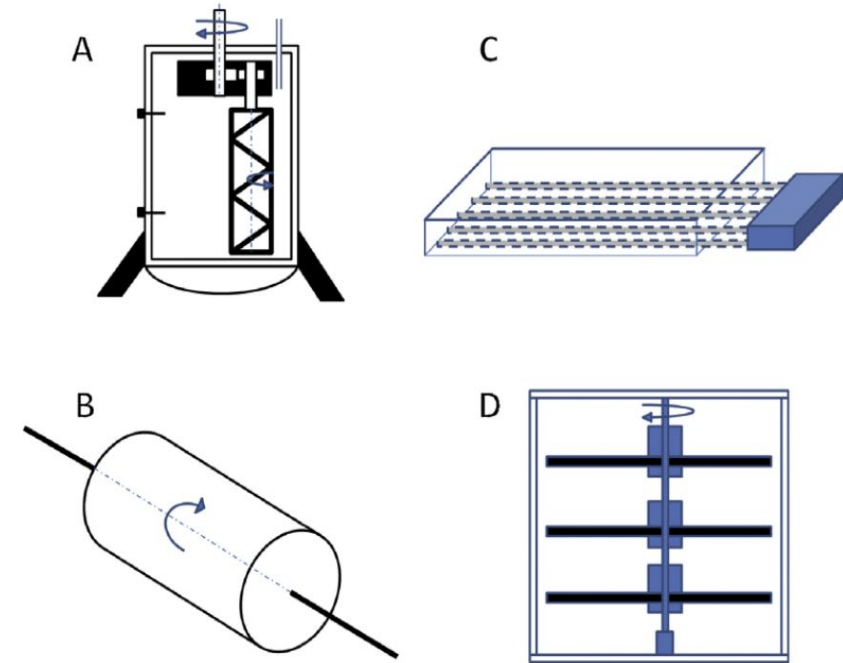


Fig. 1. SSF bioreactors, (A) standing drum reactor, designed by Lyven, having temperature control, substrate inlet, and stirring [86]. (B) Rotating drum reactor. (C) Packed bed reactor with air inlet supplied from the bottom of the tray. (D) multiple tray reactor, with rotation.

Upcycling of side-streams using microbial fermentation

Examples of solid sidestreams:

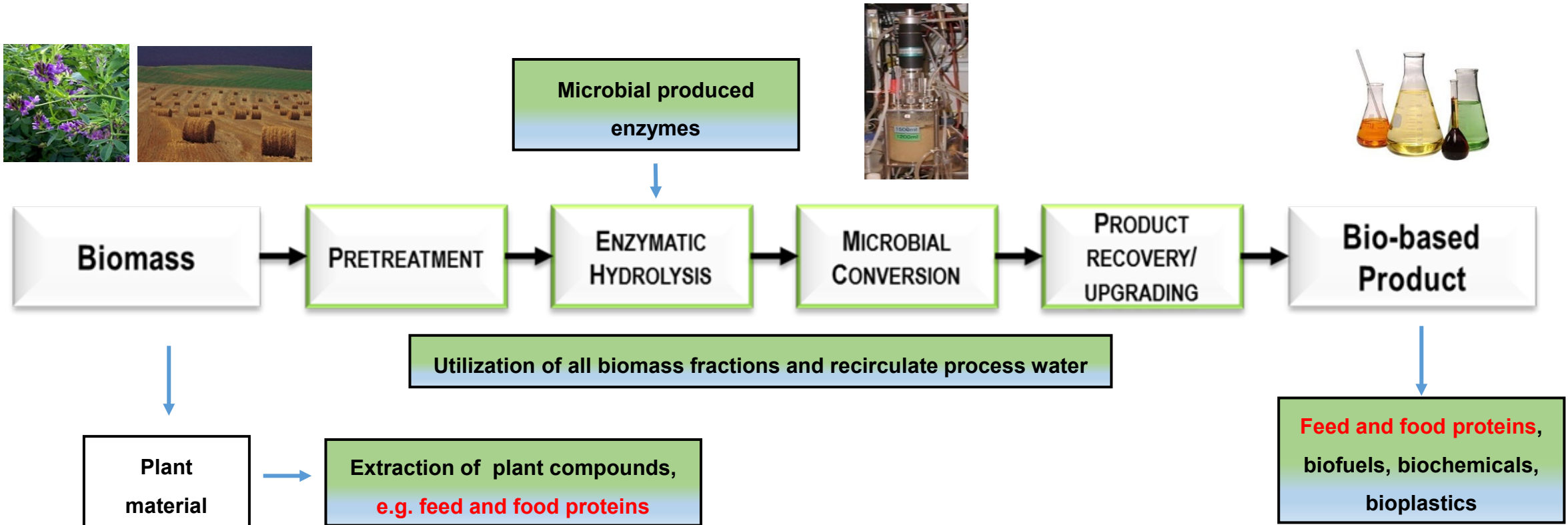
- brewers spent grains, wheat bran, wheat straw, potato pulp, potato peels, sugar beet pulp, apple pomace, grass pulp etc.

Examples of liquid sidestreams:

- molasses, vinasse, spent yeast, potato juice, brown juice (from leaf protein production)

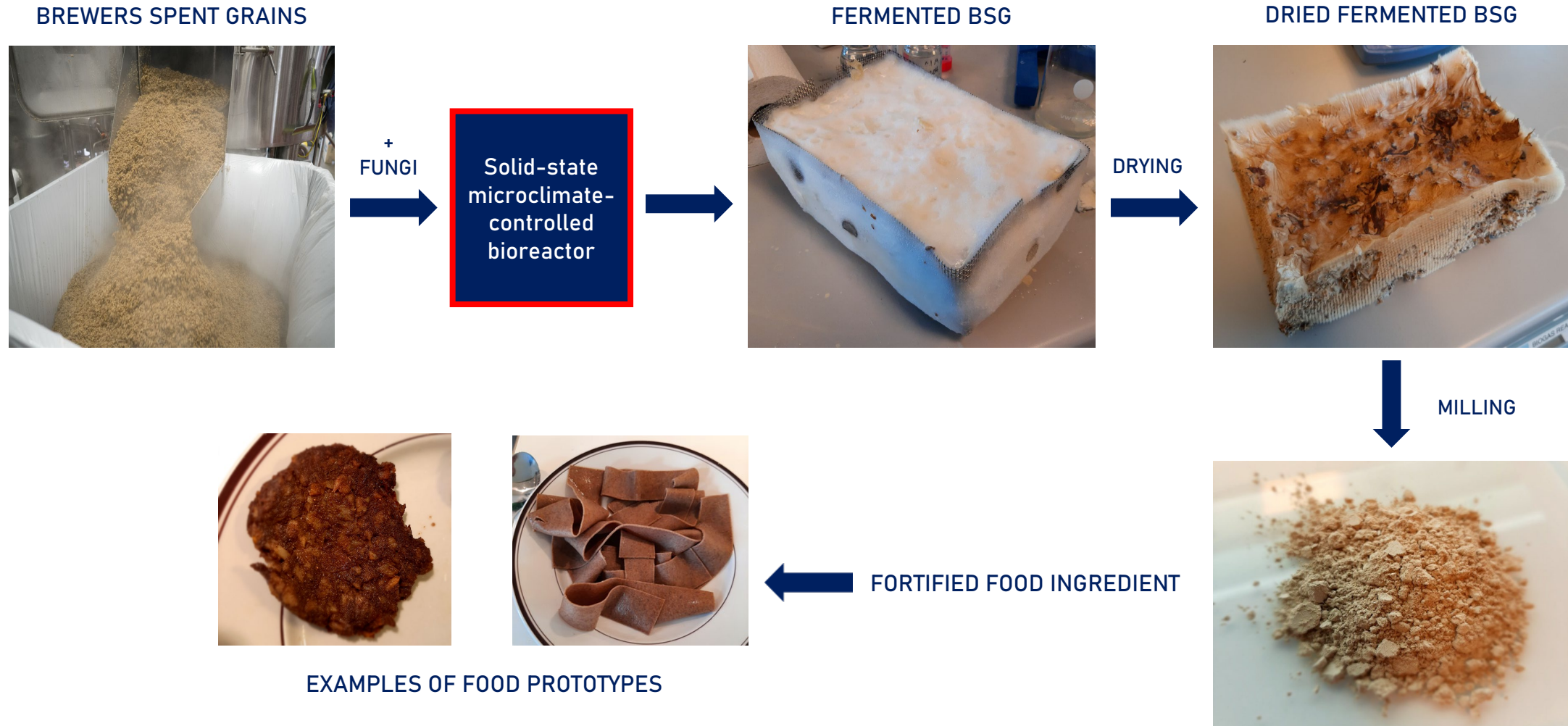
Upcycling of solid biomass & Biorefinery processes

Biorefinery is the core of a transition to renewable resource-based society and a circular bioeconomy



Biorefinery concepts covers at least 14 of 17
SDG UN goals

2. Solid-state fermentation to produce novel food ingredients.



3. Precision fermentation of e.g. whey proteins

