USING FOOD WASTE IN CIRCULAR BIOECONOMY

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PHD BACKGROUND

→ BC and MSc in Environmental Engineering

→ 3rd PhD fellow, Aarhus University:

Circular Bioeconomy: Increasing the Value in Food Waste Based Biorefineries

- → **collect and valorize high-value products from food waste**
- → **assessing environmental and economic feasibility**
- → **update frameworks to further carbon neutral production**

Main Supervisor: Prof. Marianne Thomsen, mth@

AARHUS UNIVERSITY

CBIO CENTRE FOR CIRCULAR BIOECONOMY

DECISIVE

Co-supervisor: Lorie Hamel
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tbi Toulouse Biotechnology Institute Bio & Chemical Engineering

CAMBIOSCOP Carbon management towards low fossil carbon use

MAKE OUR PLANET GREAT AGAIN

COLLABORATION WI

CAMBIOSCOP
Carbon management towards low fossil carbon use

Collaboration with Cambioscope:

1. Teigiserova, D.A**.** Hamelin, L. Thomsen, M. **Towards transparent valorization of food surplus, waste and loss: Clarifying definitions, food waste hierarchy, and role in the circular economy**. *Science of The Total Environ*, IF 6.5. DOI: 10.1016/j.scitotenv.2019.136033

Exchange: February-April 2020

2. Teigiserova, D.A Tiruta-Barna, L. Ahmadi, A. Hamelin, L. Thomsen, M. **A step closer to circular bioeconomy for citrus peel waste: a review of yields and technologies for green extraction of essential oils and limonene***(submitted).*

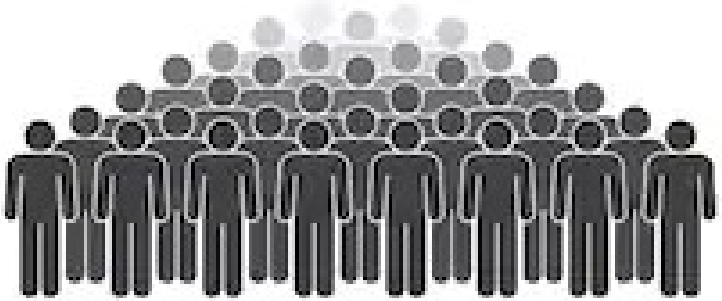
3. Teigiserova, D.A Tiruta-Barna, L. Ahmadi, A. Hamelin, L. Thomsen, M. **How to create local circular bioeconomy: integrating scale-up process design into the life cycle and economic assessment for cascading biorefinery of orange juice residues**. (*in preparation*)

THE NEED FOR NEW FRAMEWORK

- Global: 1.3 billion tonnes of edible food is lost or wasted (FAO,2011)
- EU-28: 88±14 m SIONS, 2016)
- Over 8% GHG are waste
- 25% of all water used by agriculture
- 23% of all cropland
- SDG 12.3 "half food waste and losses"

No specific guidelin

8713 times



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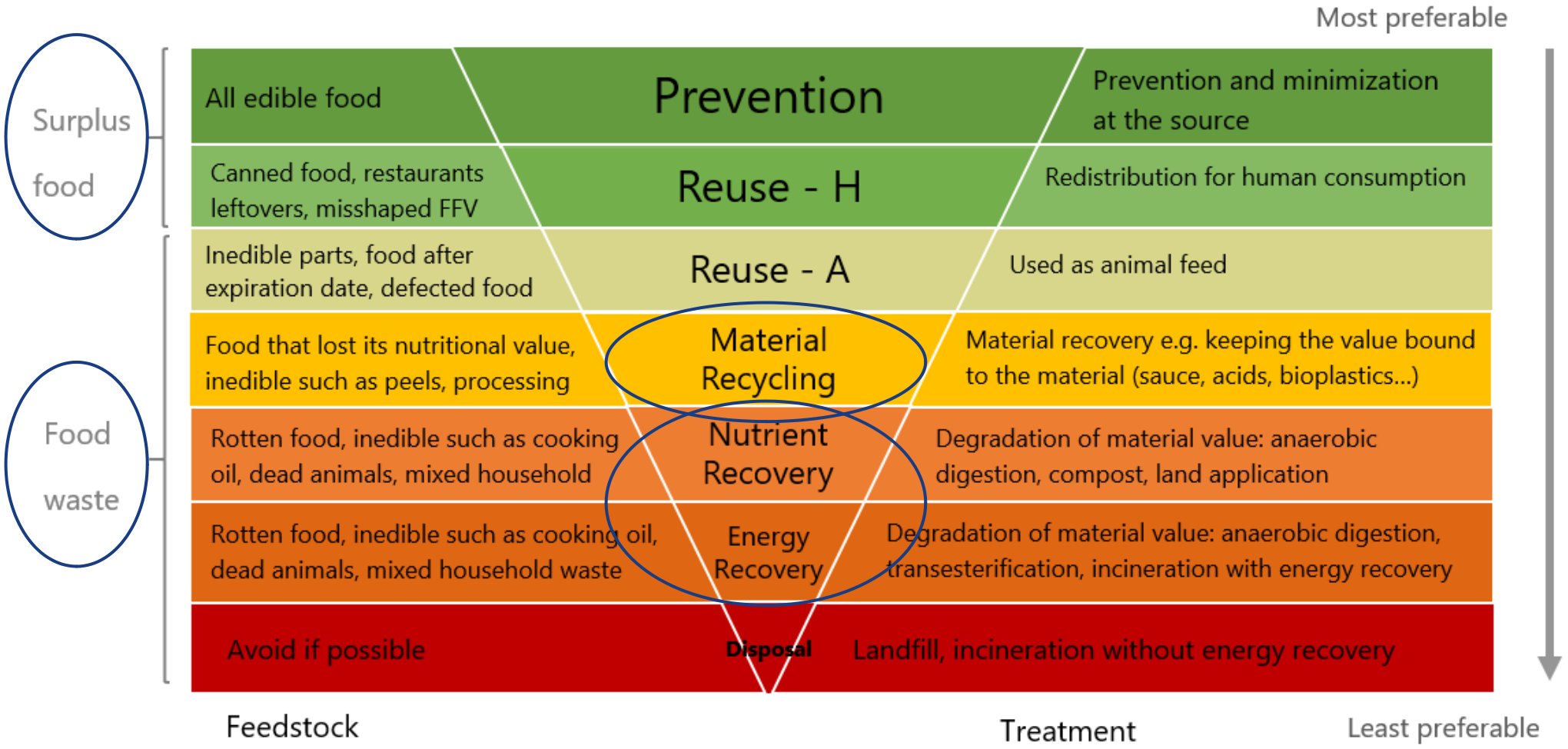
1st publication: New frameworks

UPDATED FOOD WASTE PYRAMID



Reference: Teigiserova, D.A., Hamelin, L., Thomsen, M., 2020. Towards transparent valorization of food surplus, waste and loss: Clarifying definitions, food waste hierarchy, and role in the circular economy. Sci. Total Environ. 706, 136033. https://doi.org/10.1016/J.SCITOTENV.2019.136033

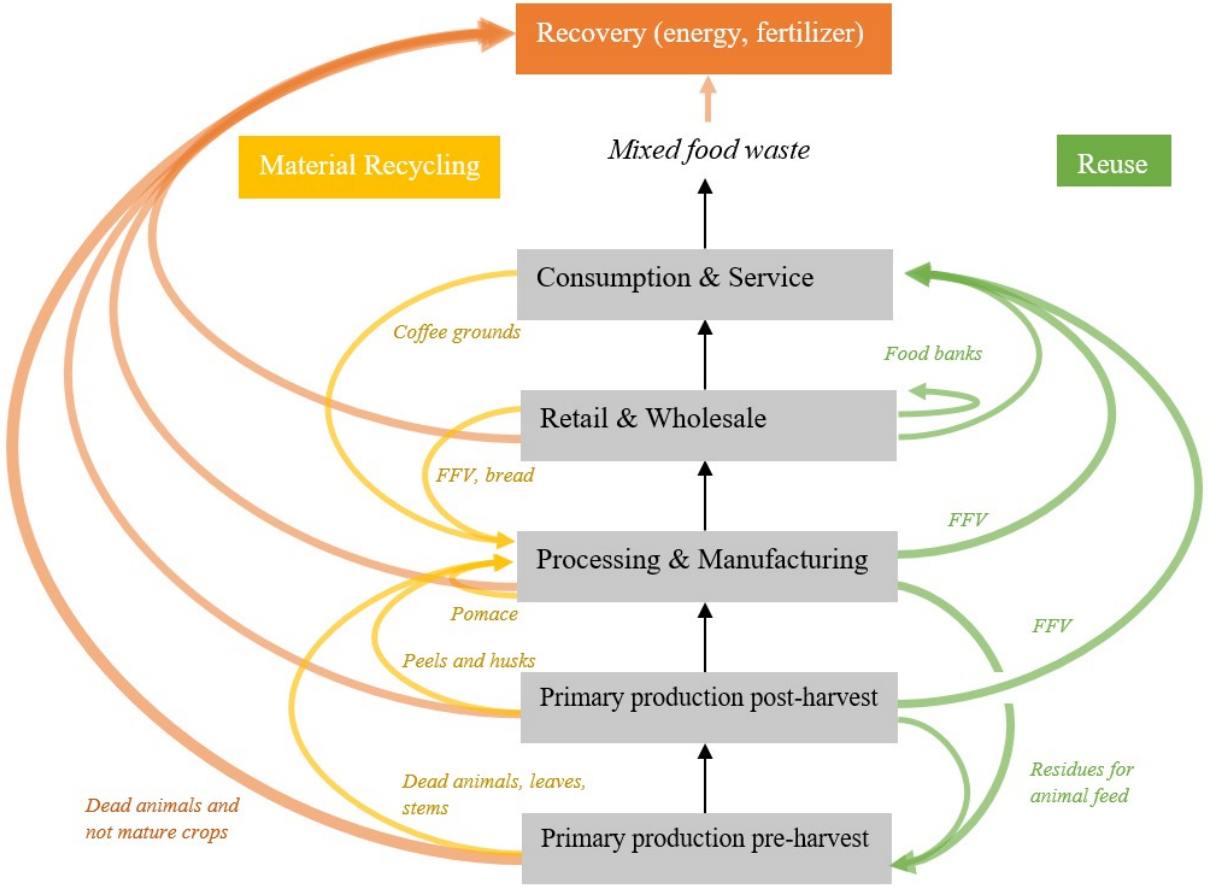
1st publication: New frameworks

NEW COMPREHENSIBLE CATEGORIES

Edible	Inedible	
Avoidable	**Unavoidable**	**Partly Avoidable**
I. All edible food i.e. surplus food → Keep in the food supply chain	II. Naturally inedible (ex. bones, pits, leaves) → Material recycling	IV. Became inedible due to natural causes (crops damaged due weather) → Material recycling, Nutrient and energy recovery
	III. Processing waste residues (ex. apple pomace, tea leaves) → Material recycling	V. Became inedible due to bad management (ex. damaged due to bad storage, transportation) → Material recycling, Nutrient and energy recovery

Reference: Teigiserova, D.A., Hamelin, L., Thomsen, M., 2020. Towards transparent valorization of food surplus, waste and loss: Clarifying definitions, food waste hierarchy, and role in the circular economy. Sci. Total Environ. 706, 136033. https://doi.org/10.1016/J.SCITOTENV.2019.136033

CIRCULAR ECONOMY FRAMEWORK



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CASE STUDY

WHAT SUSTAINABLE FEED UNEXPLORED BIOMASS WE CAN USE?

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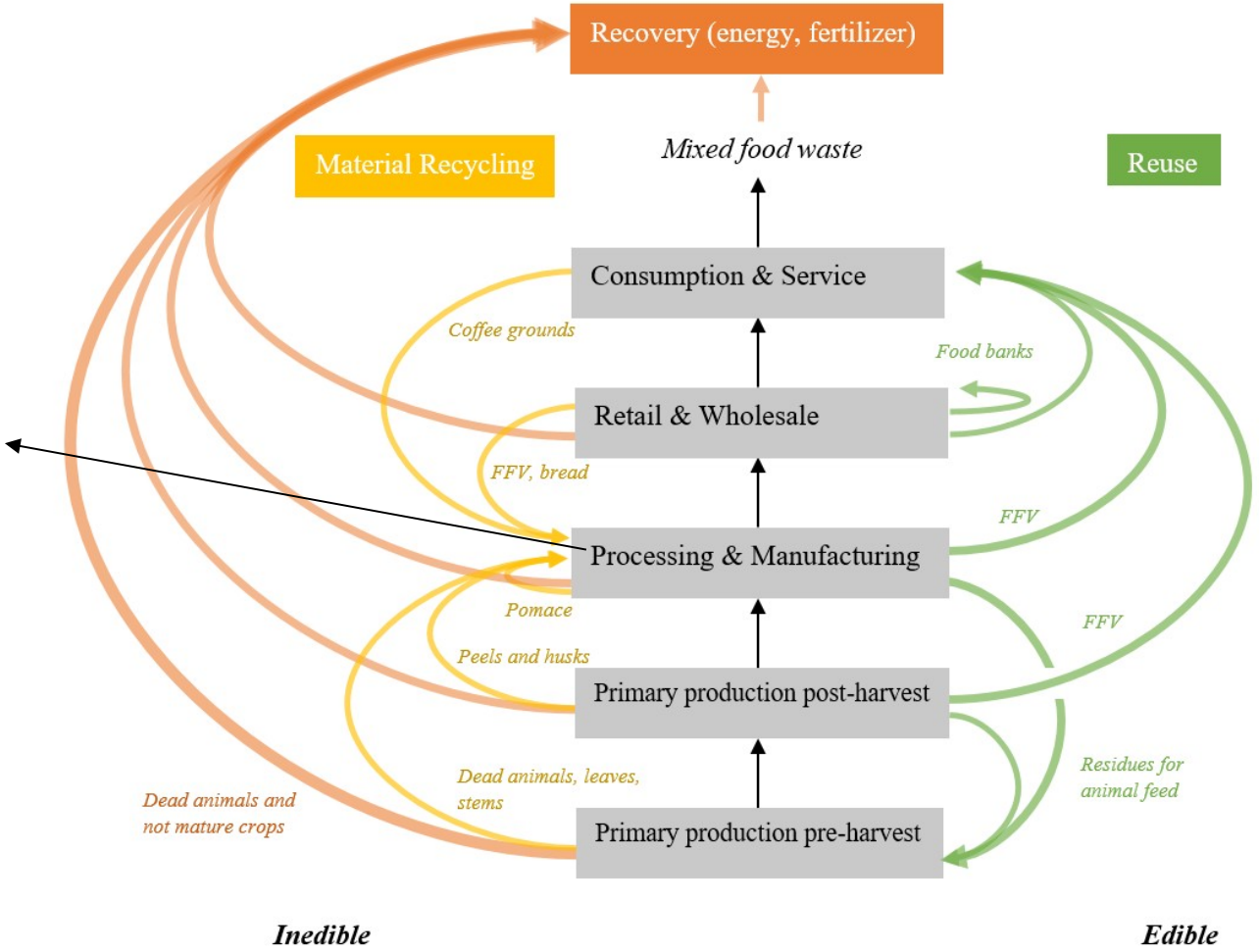
ORANGE PEEL CASE STUDY

500 million litres /year

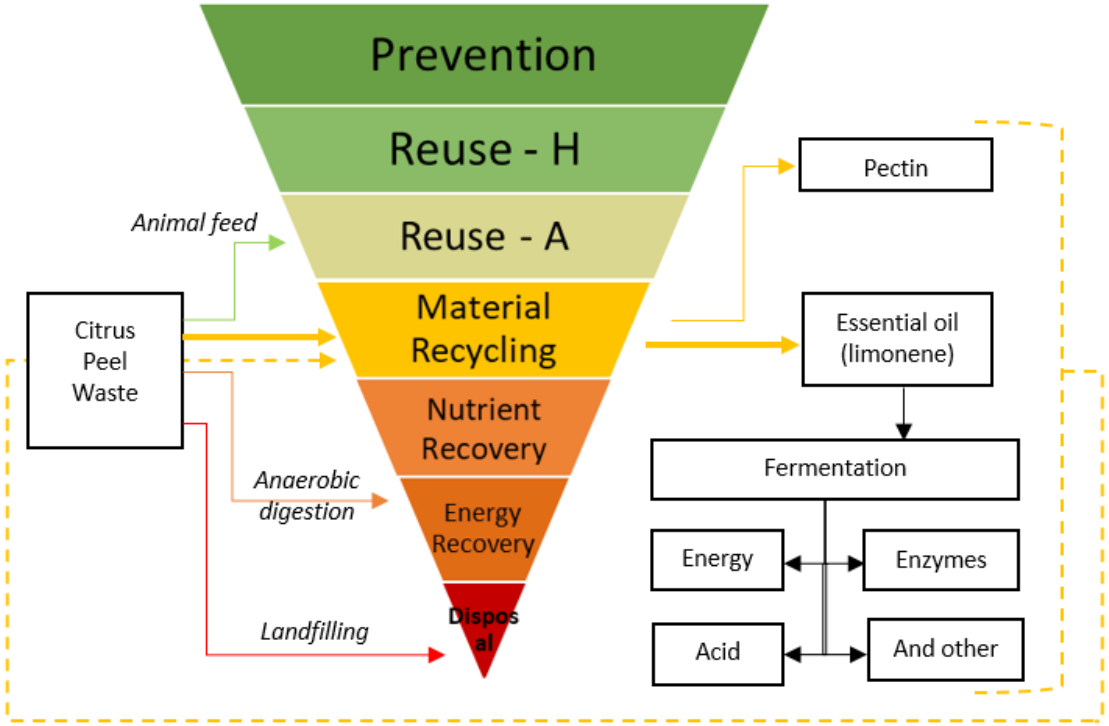


2nd publication: Limonene

ENSURING SUSTAINABLE BIOECONOMY

→ ***66*** *quantified examples with harmonized data by* ***9*** *green technologies*

→ *Economies of scope*



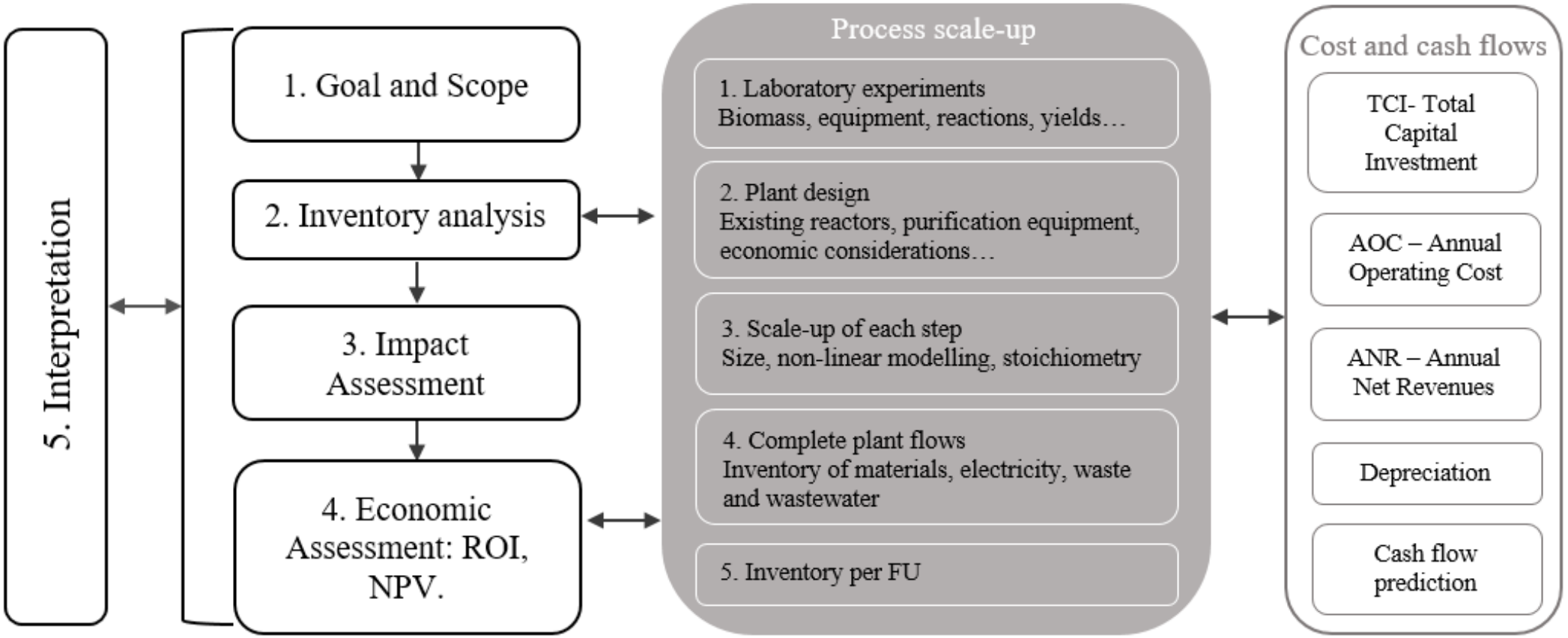
Results:

Cold press
→ establish at plant level
→ low yields

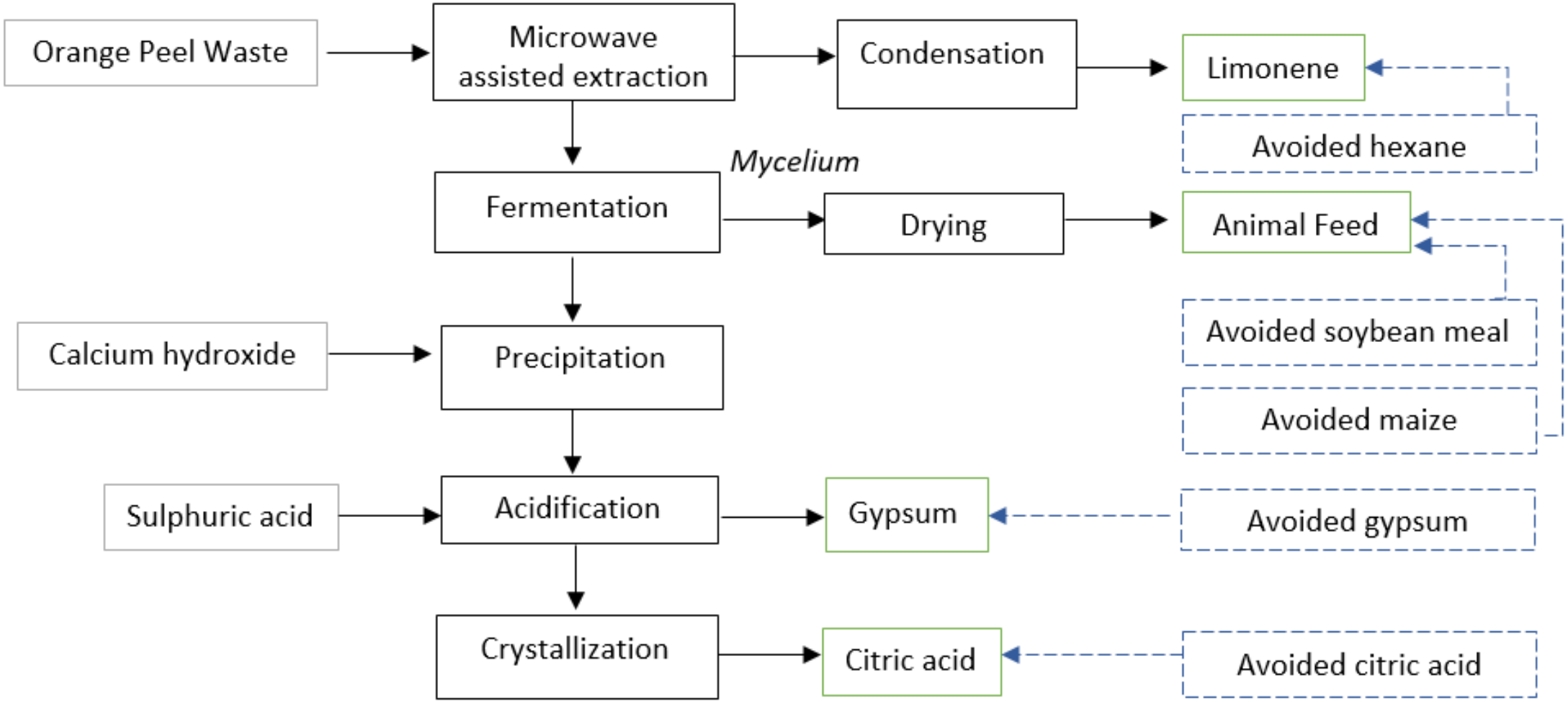
Solvent-free microwave extraction → novel technology
→ "easy" scale-up
→ high yields

SCALE-UP

→ We need more detailed technology data for: Environmental and Economic Assessment

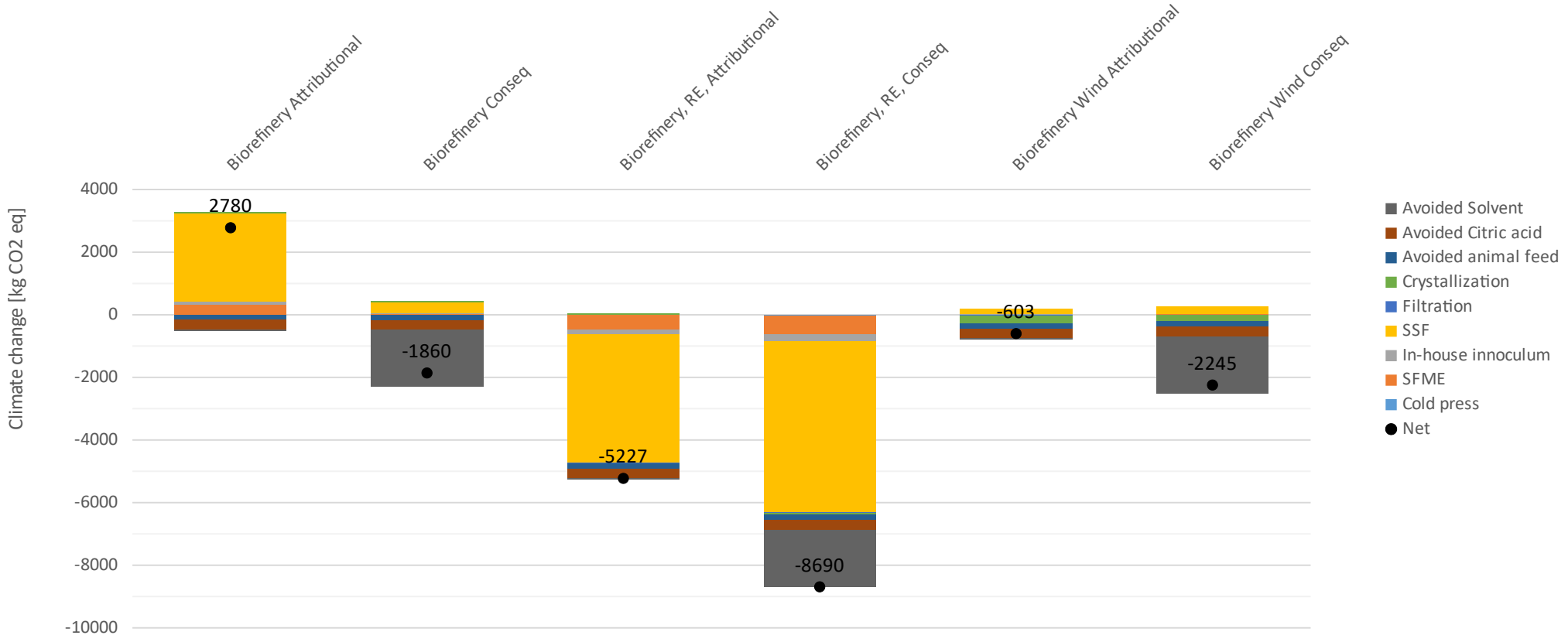


CASCADING PRODUCTION



3nd publication: Assessment

PRELIMINARY RESULTS ENVIRONMENTAL



THANK YOU.

Any questions later→ d.tgsrv@gmail.com