



# BIOREFINING – in progress

Nationaler Workshop Biotreibstoffe,  
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# Outlook ...towards 2050

## Biorefineries are

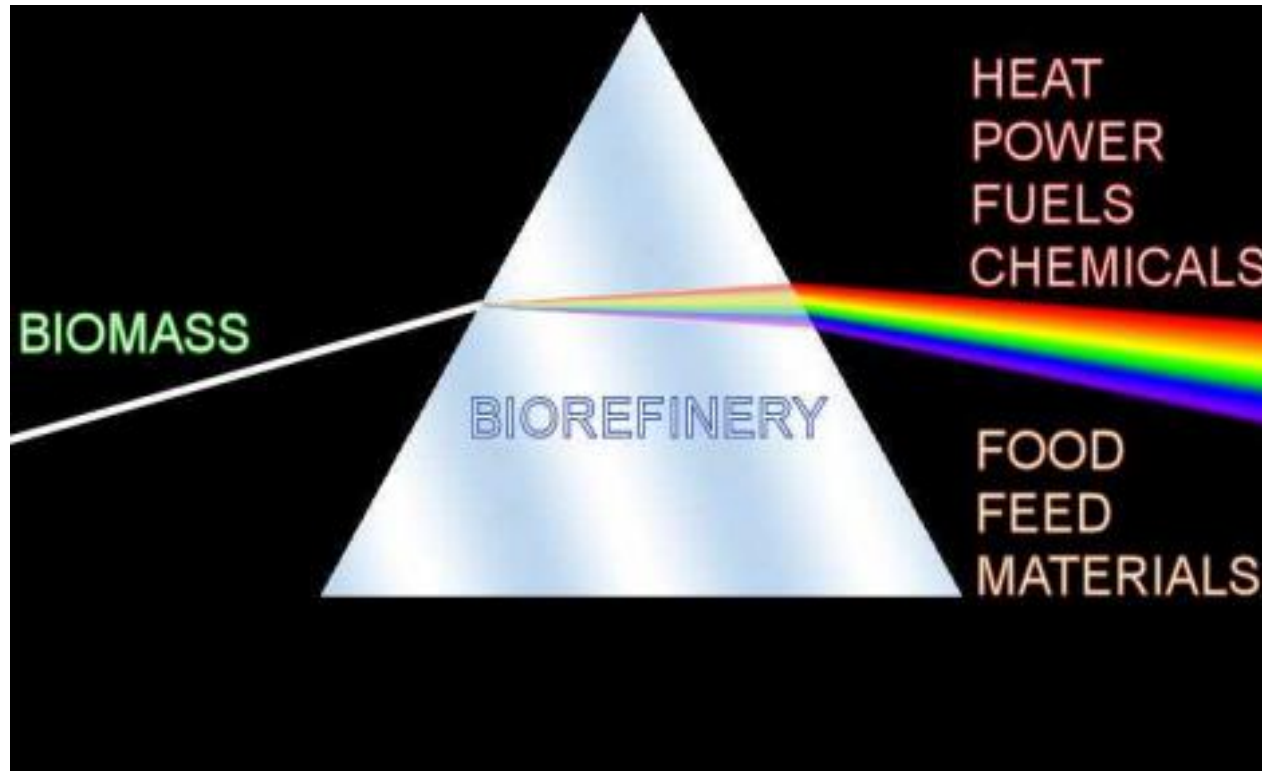
- › ... highly developed and technologies
- › ... very efficient and flexible process pathways
- › ... can produce a large range of intermediates and products
- › ... commonly used and are key technologies for our circular bio-based industry
- › ... can offer a very sound business case
- › ... we simply can't live without it

# Towards a circular economy

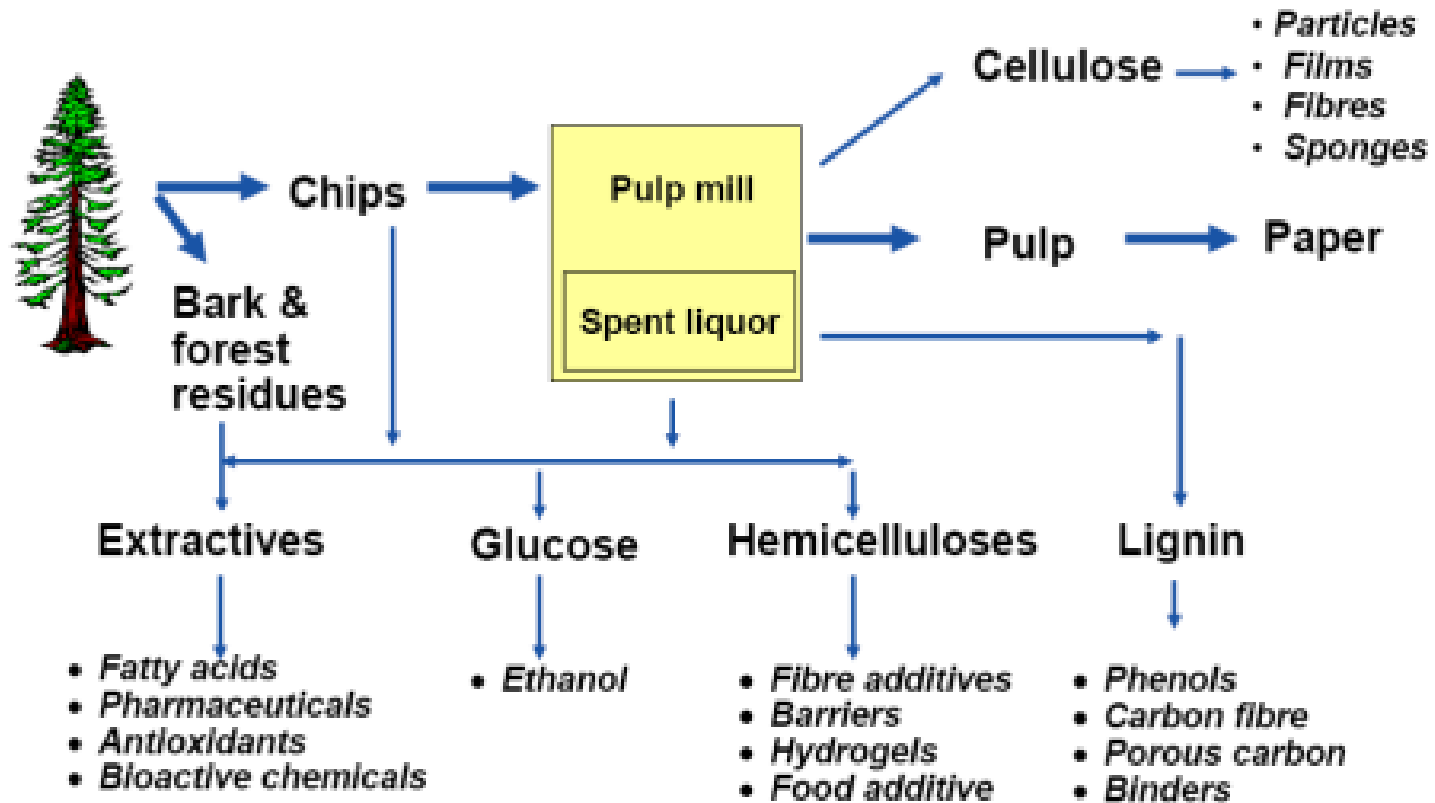
**If we take our ambition seriously to transfer into a non-fossil carbon economy we need to...**

- › set out a clear strategic approach and stick to it**
- › re-think/ re-design product processing, energy generation and life-style**
- › implement Biorefineries for sustainable processing of biomass into manifold intermediates, products and energy**

# Concept of Biorefining



# Wood Refinery lay out

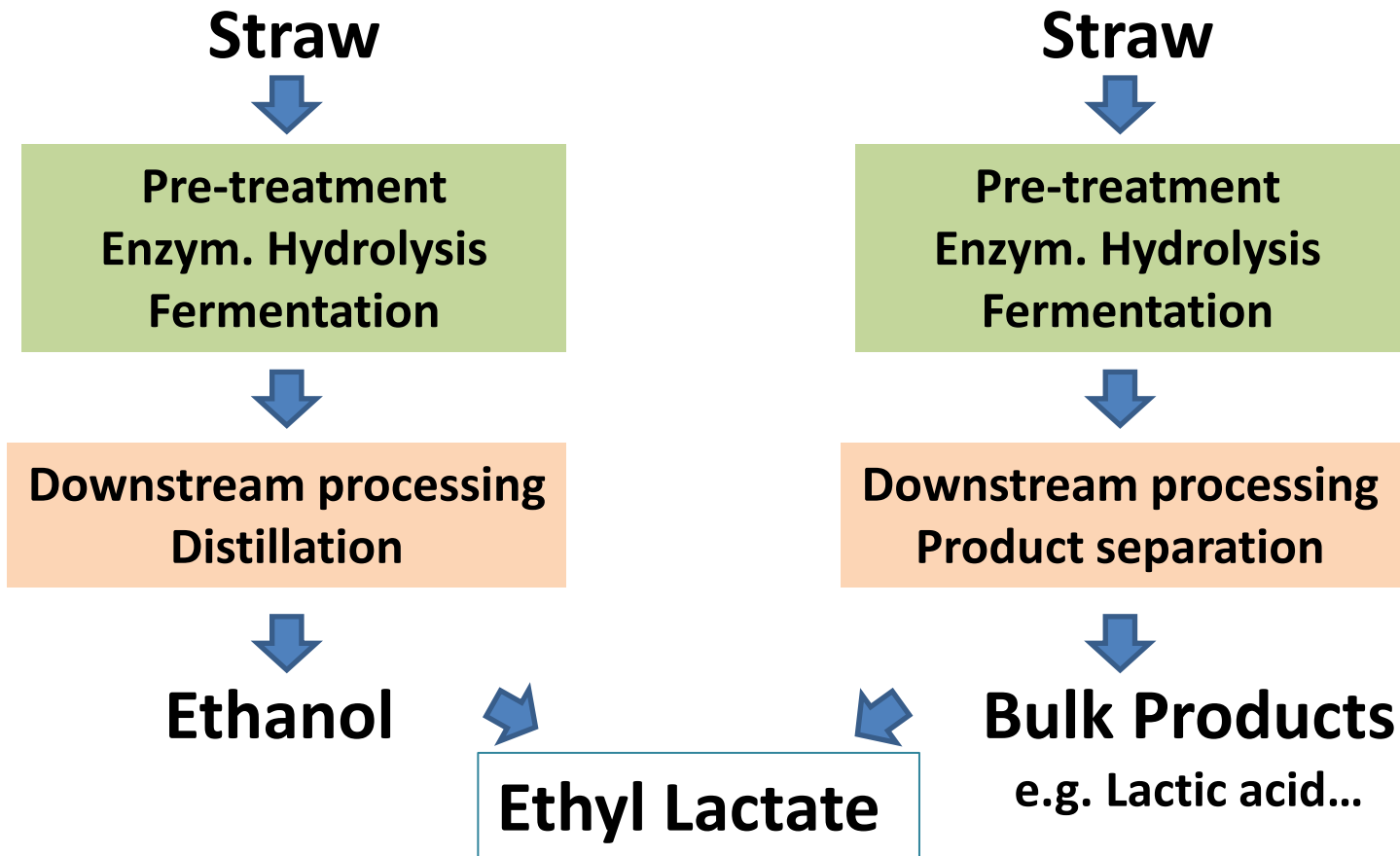


**+ Solid fuel from lignin, bark and forest residues**

# 2<sup>nd</sup> generation approach

## 2<sup>nd</sup> gen. biofuel

## 2<sup>nd</sup> gen. chemicals

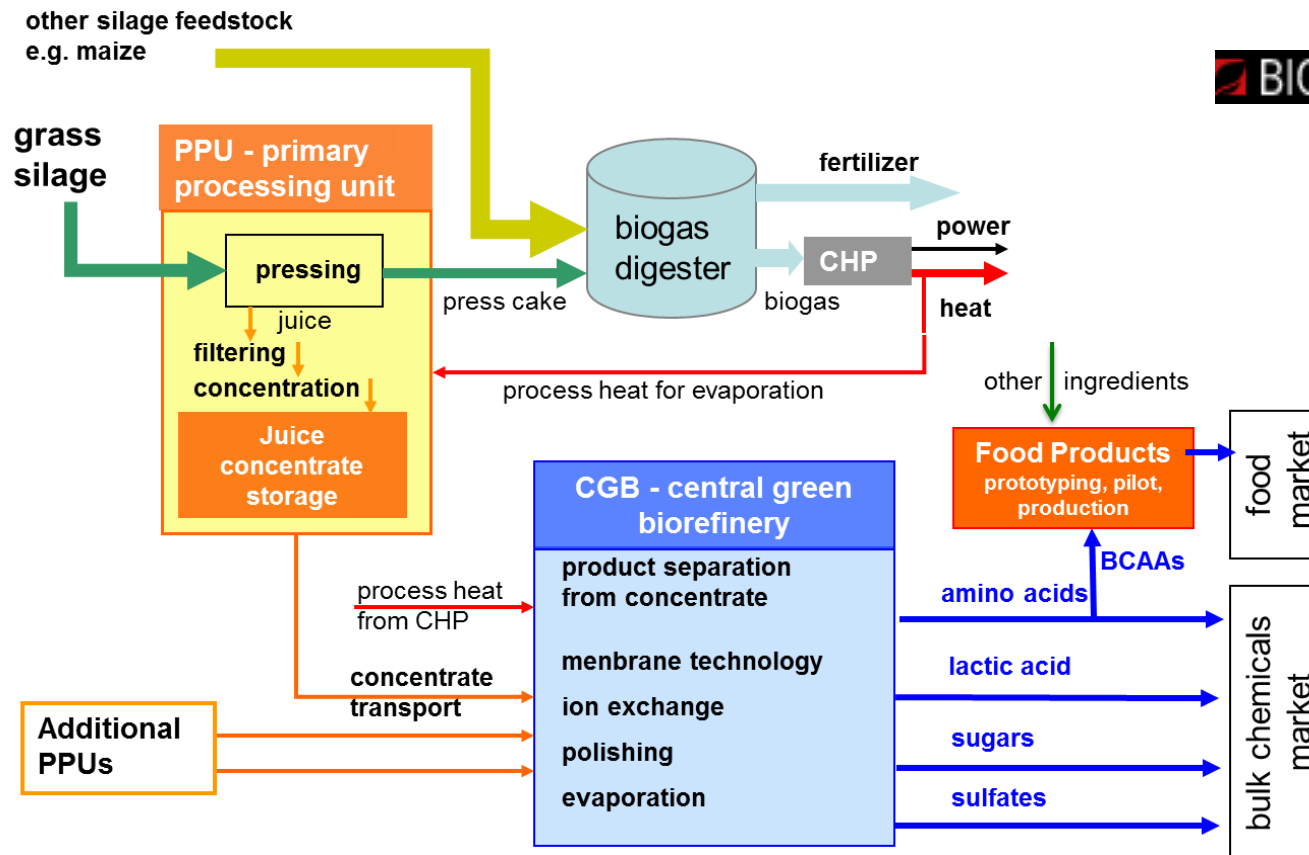


# Biogas/ Biomethan

## Biogas digesters offer opportunities...

- ▶ **Anaerobic digestion is very good end of pipe technology to valorise organic residues**
- ▶ **AD plants are regionally embedded and have a supply chain (biomass storage)**
- ▶ **Can offer synergies such as process heat, infrastructure...**
- ▶ **Are existing....and currently searching for new business cases (dependency on power feed in tariffs)**

# Example GRASSfinery



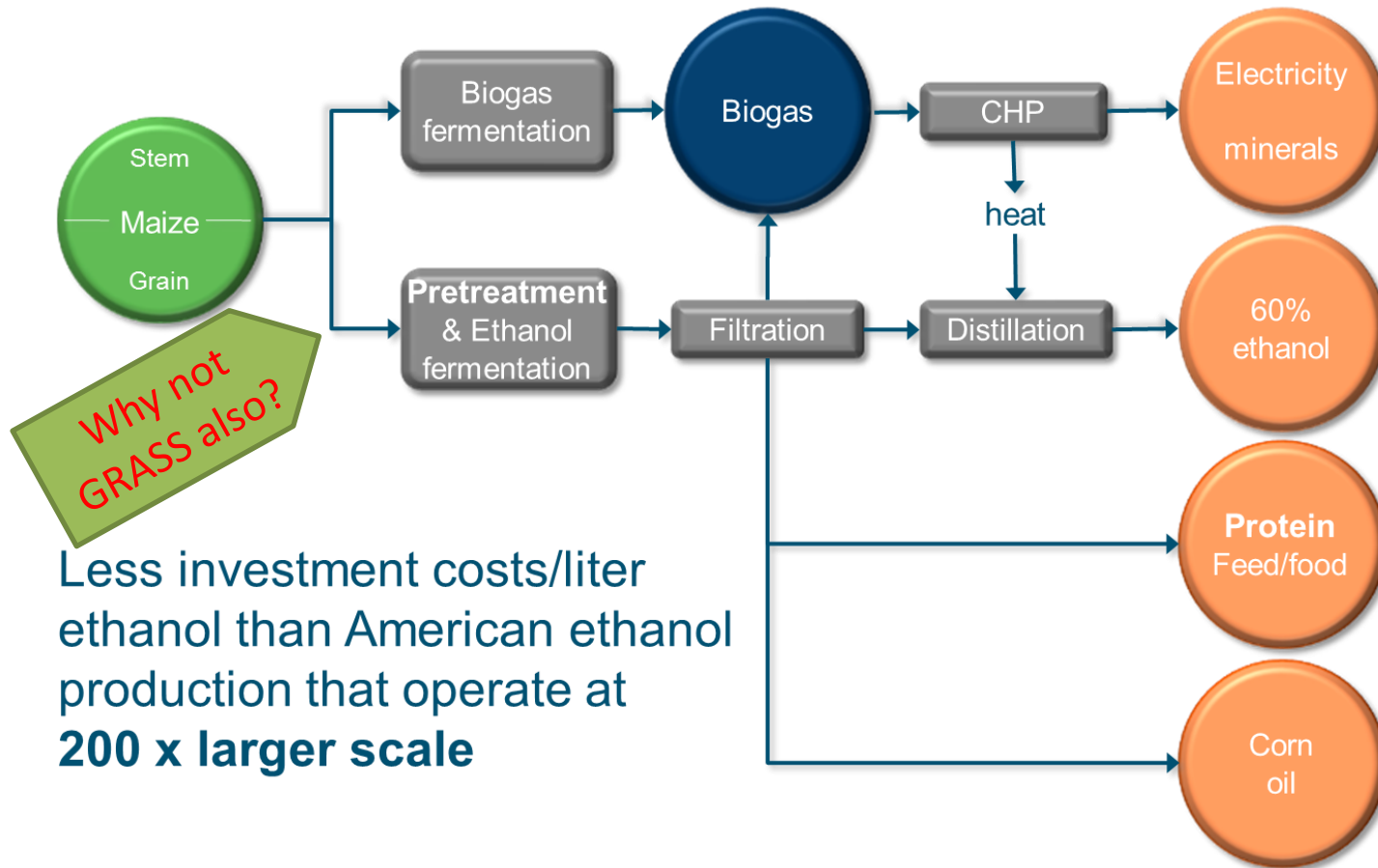


# Exampel Byosis/Zeafuels (Lelystad, NL)



Preference JP Sanders 2016

# Concept Byosis/Zeafuels



Why not GRASS also?

Less investment costs/liter ethanol than American ethanol production that operate at **200 x larger scale**

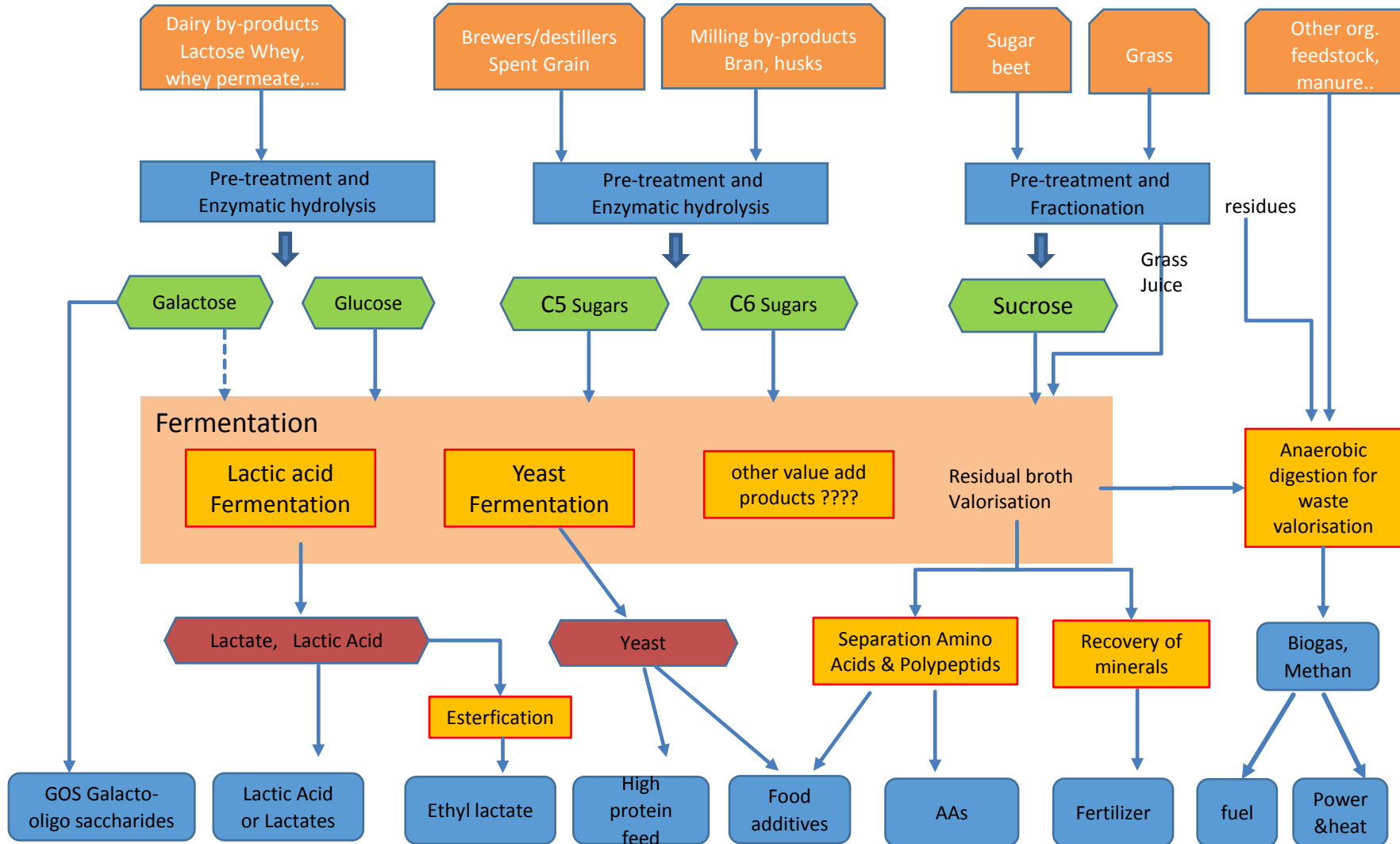
Preference JP Sanders 2016

# “Plug-on” Biorefinery

**Existing infrastructure / processing offer good opportunities for retrofitting a biorefinery concept**

- ▶ **Valorisation of processing residues**
- ▶ **Feedstock (Wastes) are already centralized**
- ▶ **Are usually available at reasonable prices**
- ▶ **E.g. food processing, milk & whey processing...**

# Multi feedstock scenarios



# Take home message

- › **Biorefineries need more development to get a significant impact to bioeconomy development -> pilot/demonstration-> market uptake**
- › **There is NO biorefinery general solution**
- › **Need of customised - regional embedded solutions**
- › **Incentives to kick-off of implementation a required**
- › **Biorefinery can significantly underpin the transfer to circular bioeconomy (but need sustainable farming)**