



# Work Package 1

**Identification and mapping of existing industrial (fuel producing) complexes in Europe**

## **Final results**

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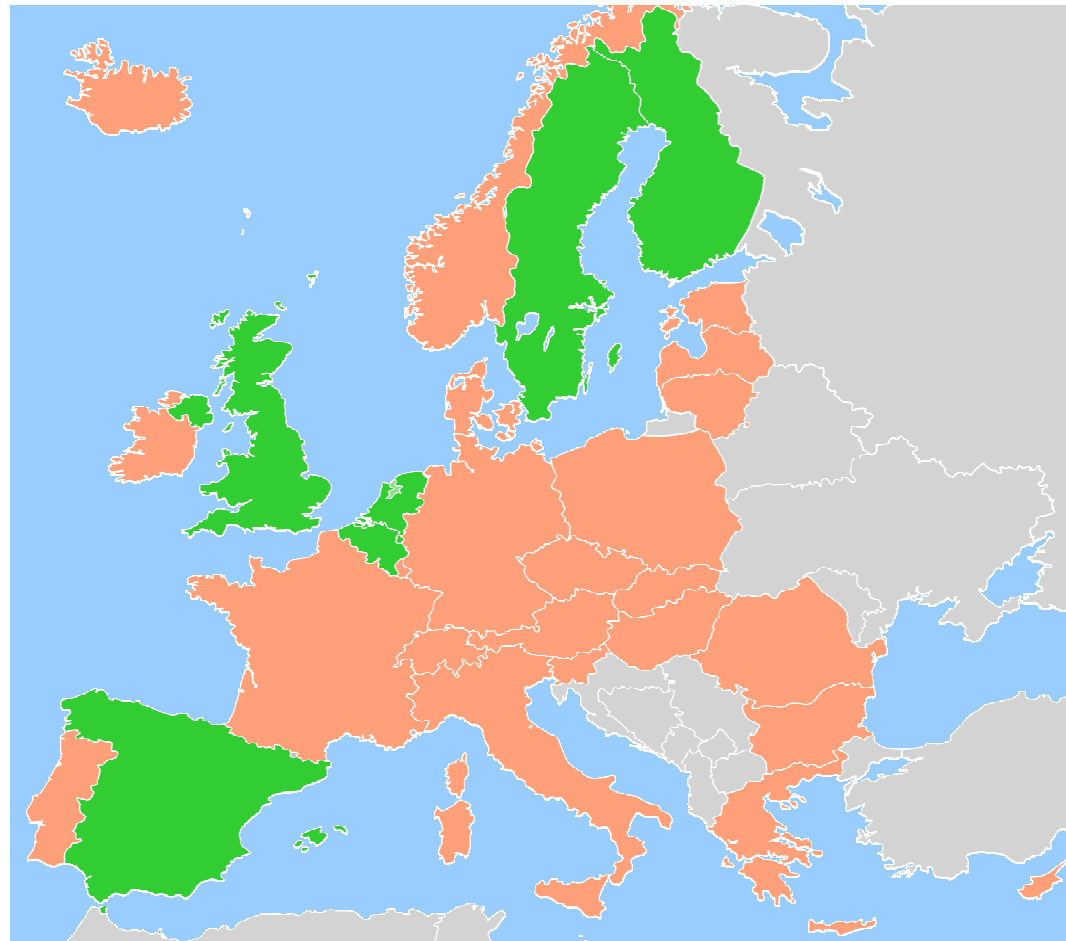
# Methodology (1)

- Data collection regarding the existing industrial (fuel producing) complexes in different biomass-related market sectors
- Harmonisation of data collection by developing a questionnaire



## Methodology (2)

Survey mainly limited to partner-related countries, giving a sufficient overview of the existing complexes over the whole Europe.

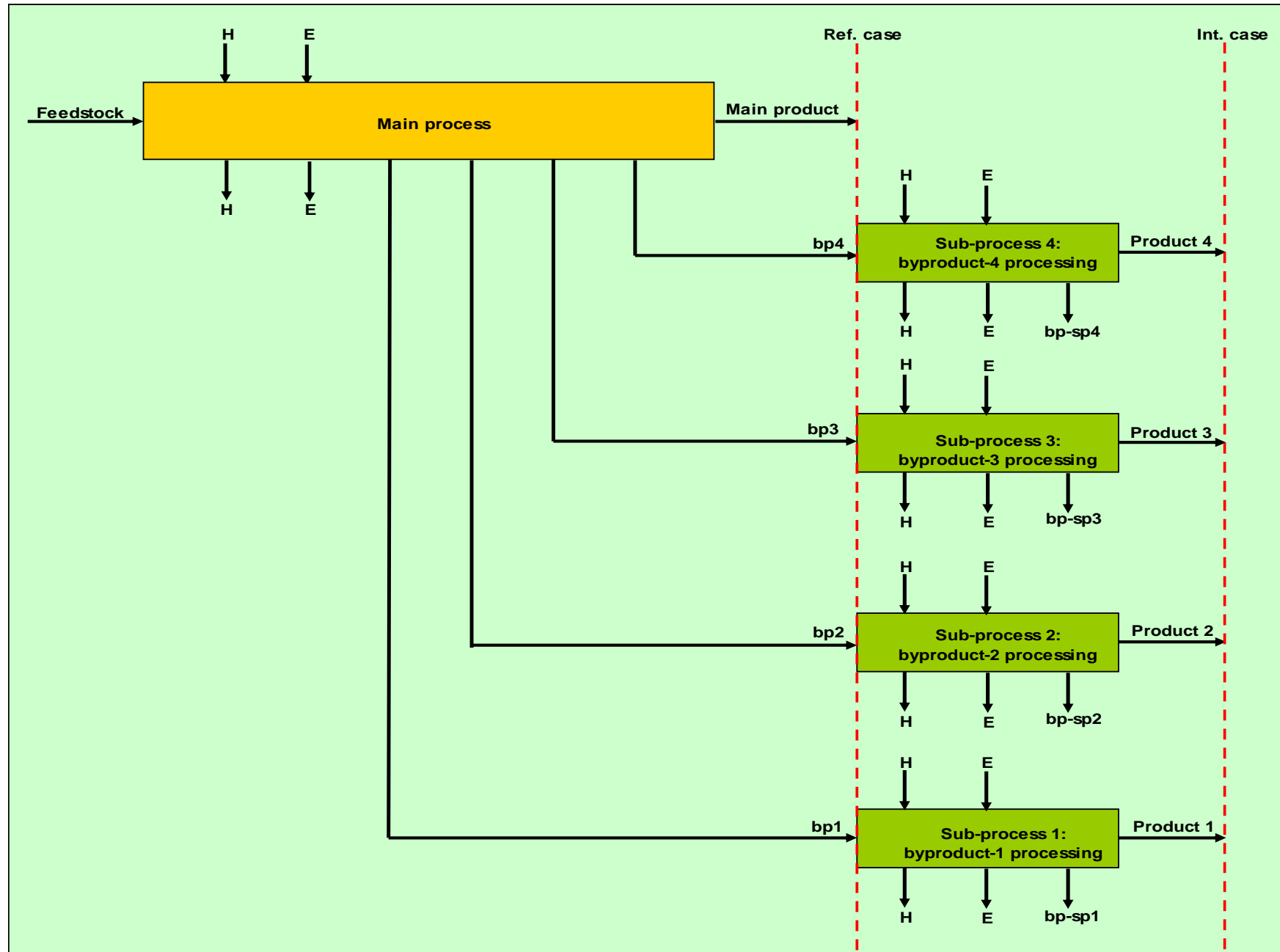


# Methodology (3)

- 366 industrial (fuel producing) complexes identified
- Definition of the reference case(s) per market sector
- Reference case: a realistic representative (feedstock, scale, process) of the related sector
- Description of the reference case(s), including a block diagram with the main overall mass and energy flows



# Modeling tool: ECN Biorefinery Model



# Results WP1 per market sector

- Definition of the reference case(s)
- Definition of the Integrated biorefinery case(s)

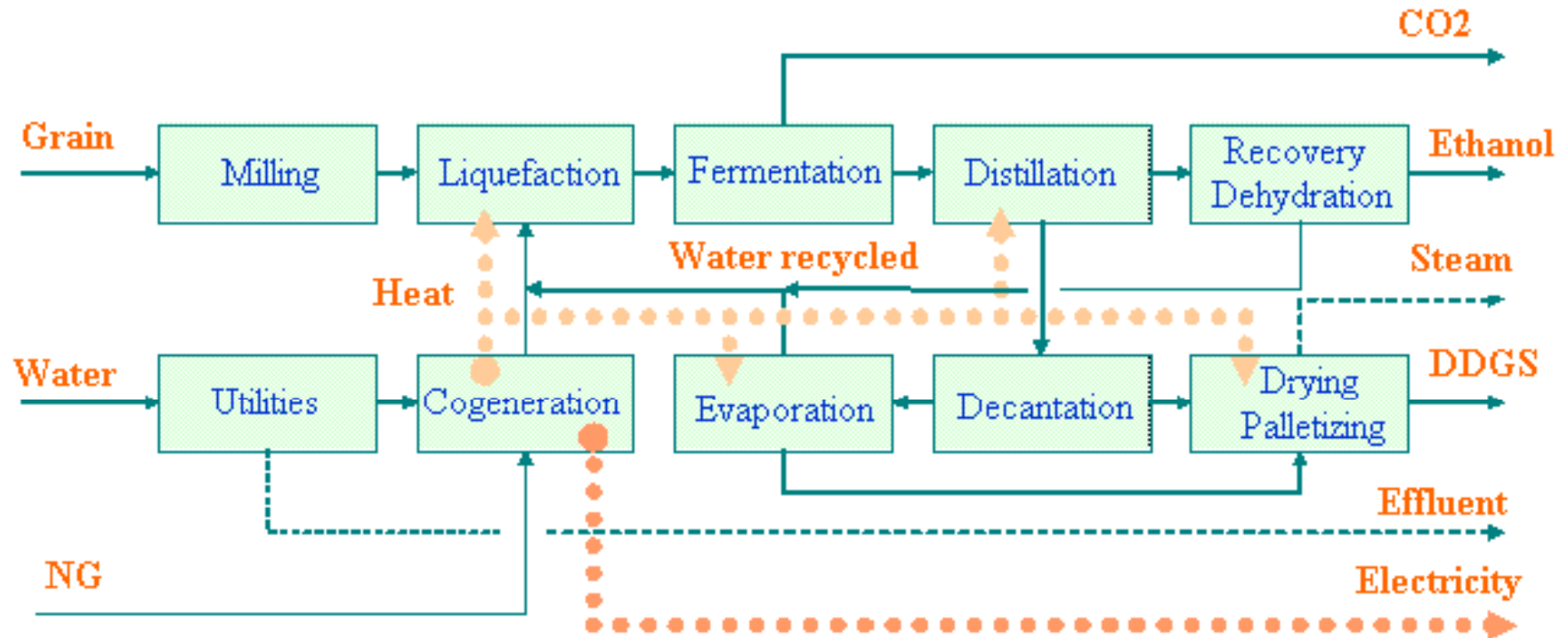




# Bioethanol sector



# Reference case

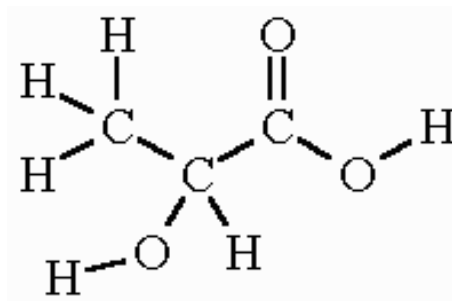


DDGS: Distillers Dried Grains with Soluble



# Integrated biorefinery case

- Lactic acid production by fermentation of stillage
- Protein-rich stream as the second added-value product



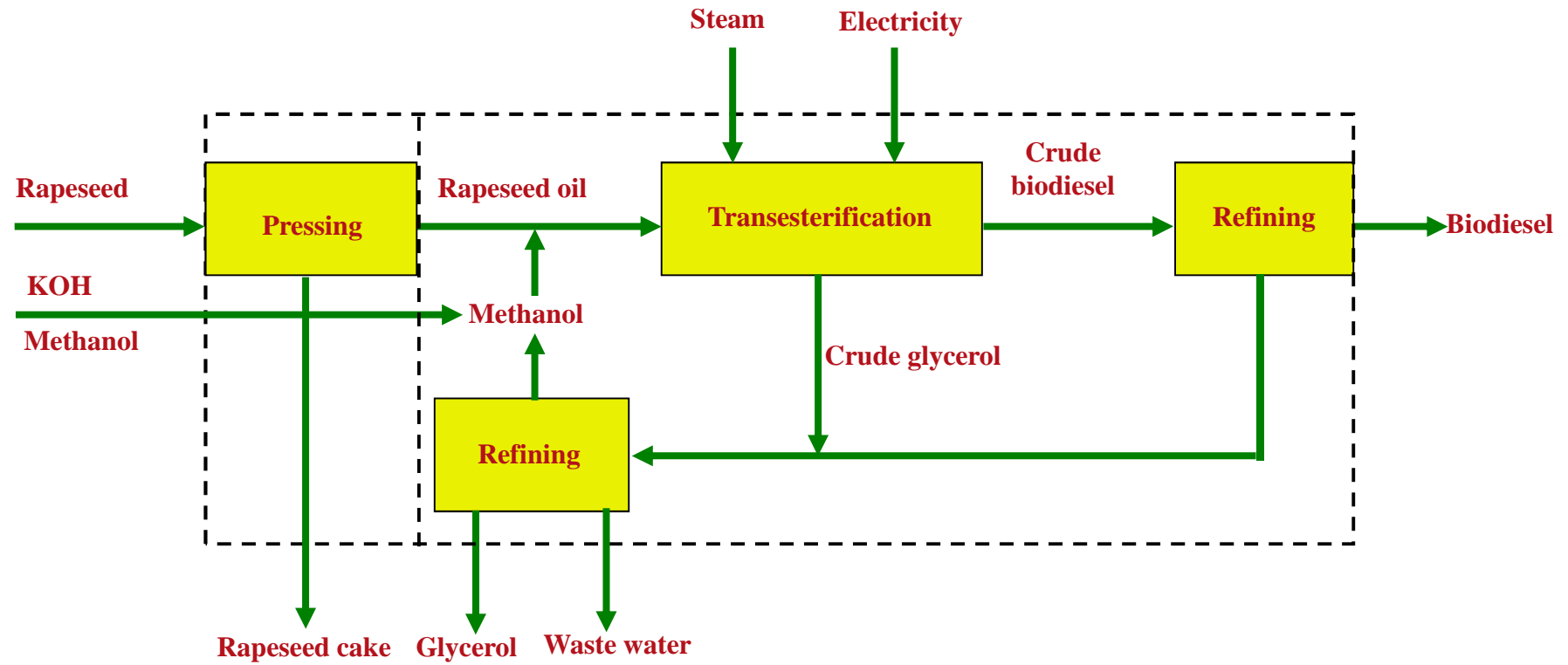
Lactic acid  
(2-hydroxypropanoic acid)





# Biodiesel sector

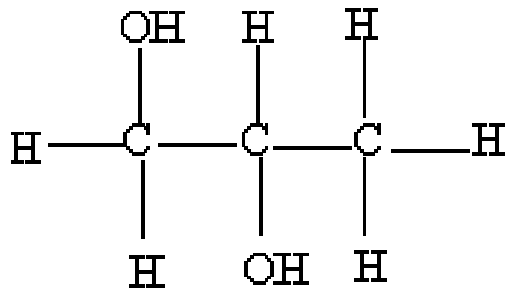
# Reference case



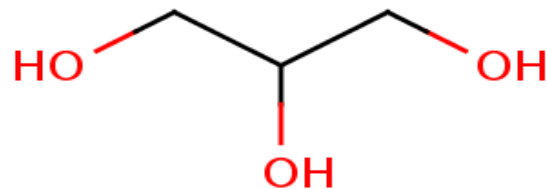
# Integrated biorefinery cases

- 1,2 propanediol as a bulk chemical through catalytic hydrogenolysis of glycerol
- Epichlorohydrin as a specialty chemical through catalytic hydrochlorination of glycerol
- Lactic acid production from glycerol through chemical routes

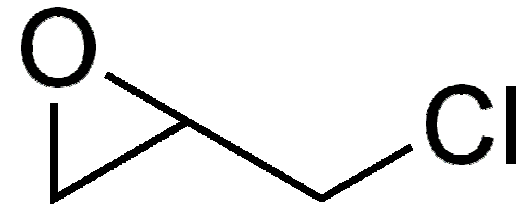
1,2 propanediol



glycerol



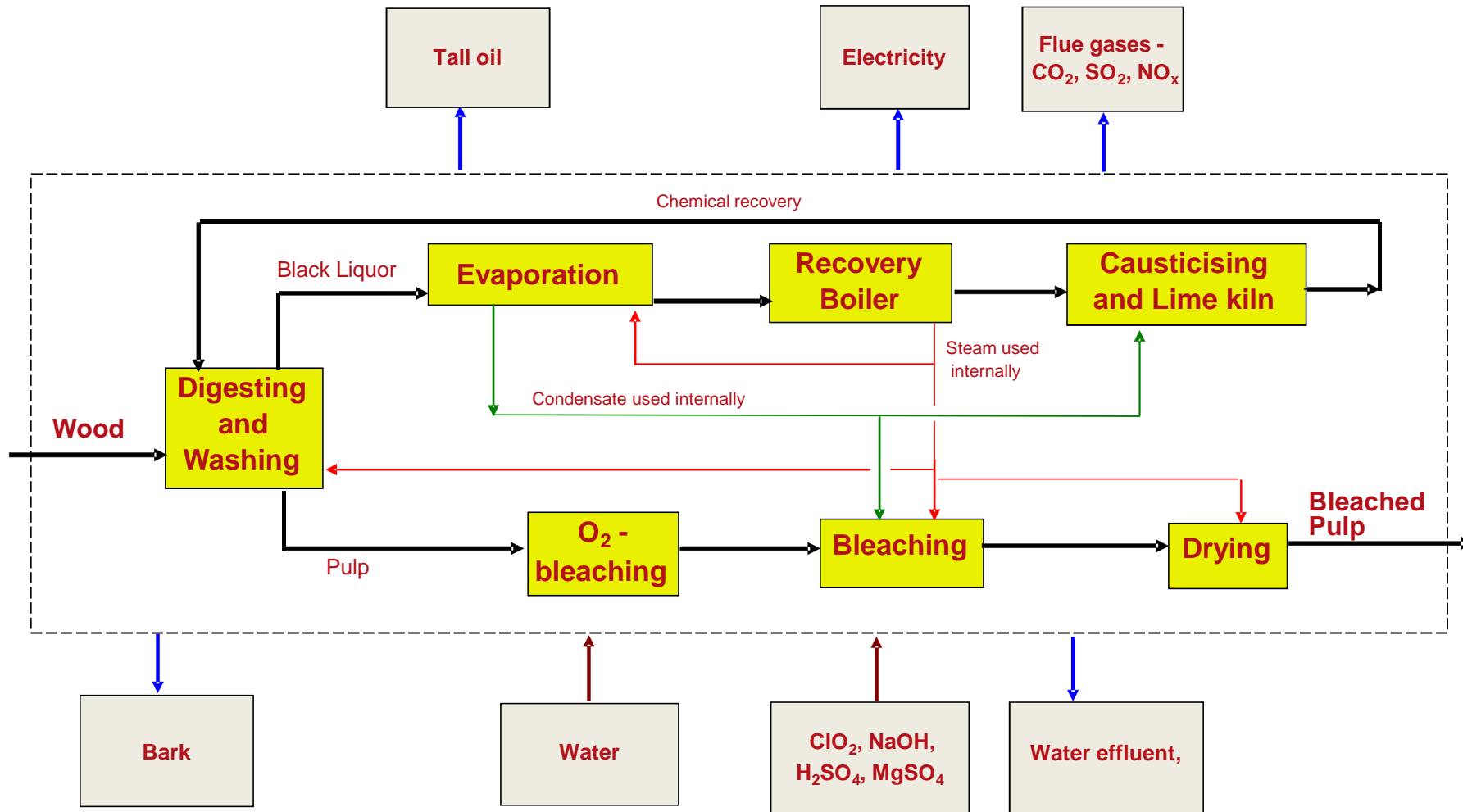
Epichlorohydrin



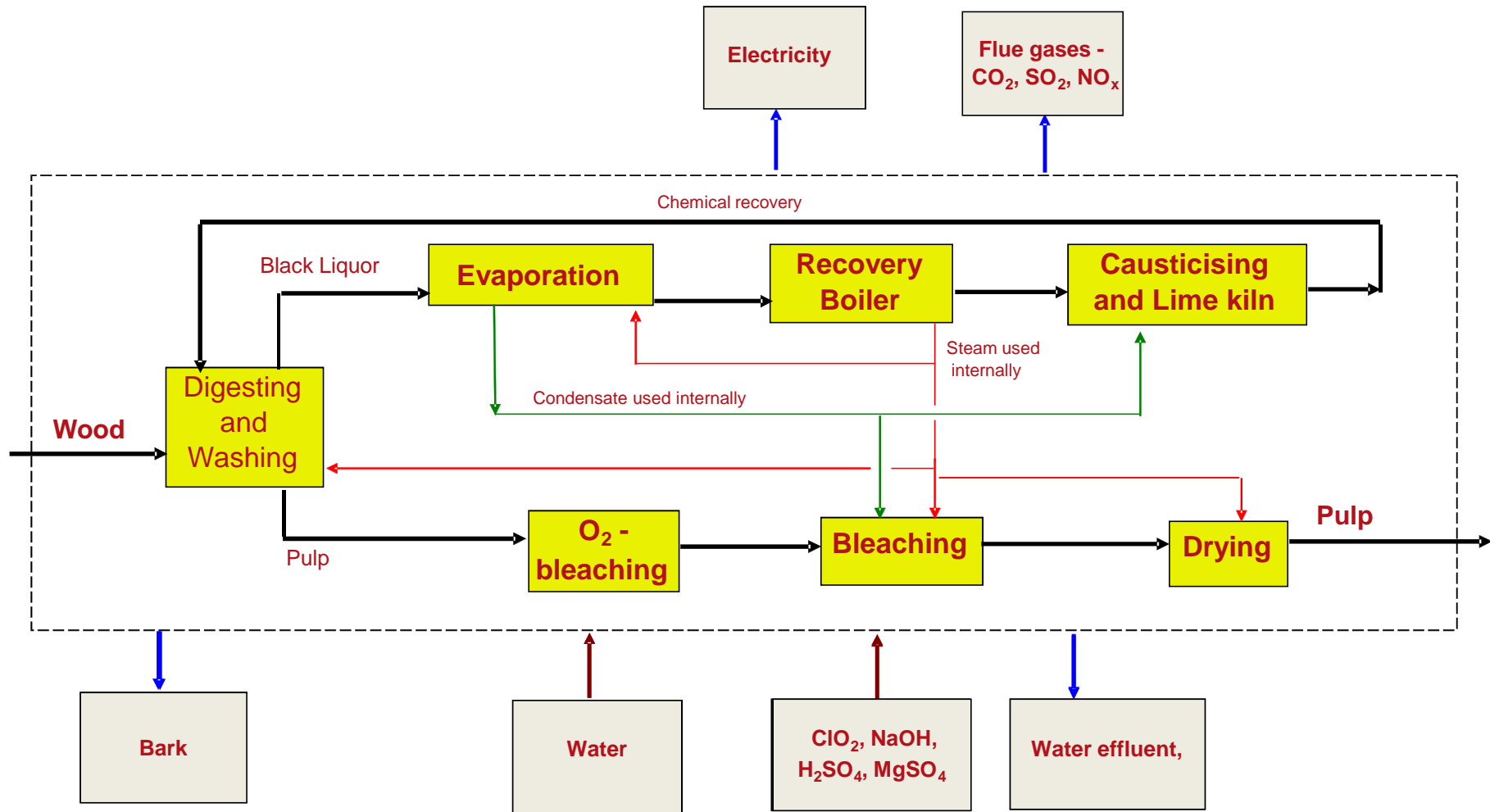


# Pulp & paper sector

# Reference case: softwood based



# Reference case: hardwood based





# Integrated biorefinery cases

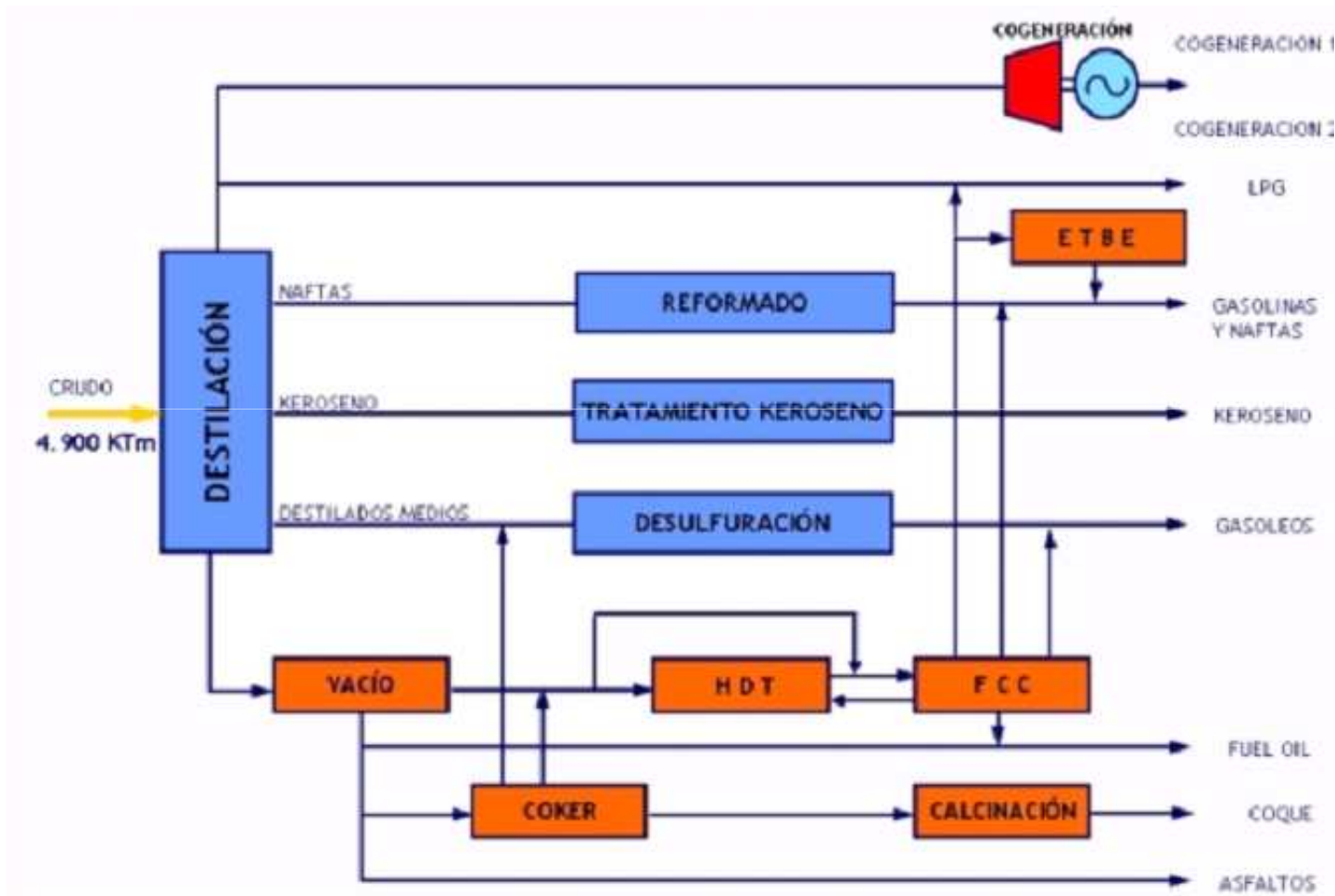
- Black liquor gasification with DME or methanol as added-value products
- Lignin extraction: pelletised lignin as a fuel for heat applications
- Ethanol / lactic acid production from cellulose stream





# Conventional oil refinery sector

# Reference case: Repsol's Coruña Refinery





## Integrated cases (2)

- Co-processing of vegetal oil in the hydro-desulphurisation (HDS) unit
- Co-processing of vegetal oil in the fluid catalytic cracking (FCC) unit
- Added-value products: gasoline, diesel, and kerosene





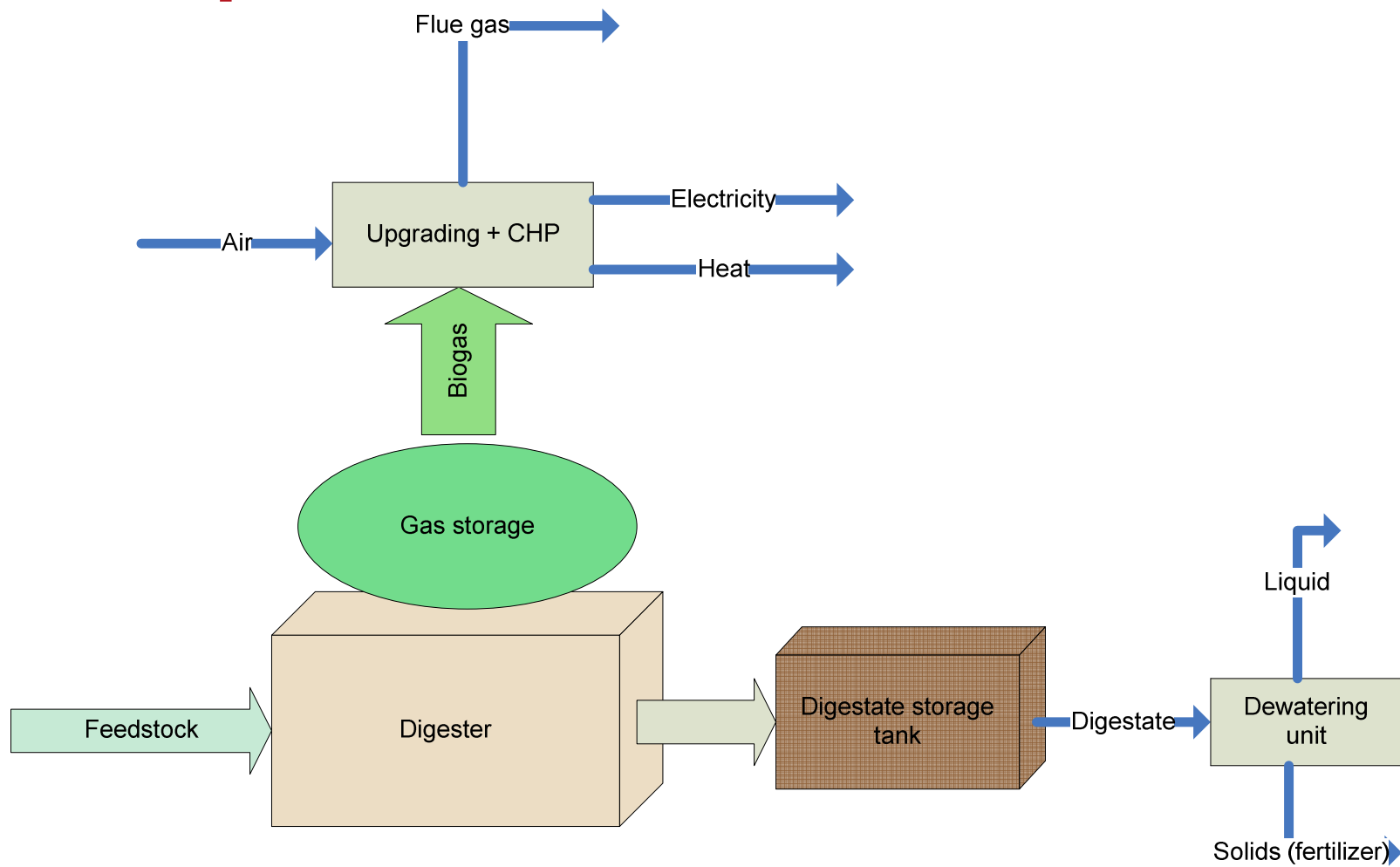
# Power sector

# Reference cases

- Small-scale power production based on anaerobic digestion of grass
- Medium-scale power production based on biomass combustion
- Large-scale power production based on biomass integrated gasification combined cycle (BIGCC) technology

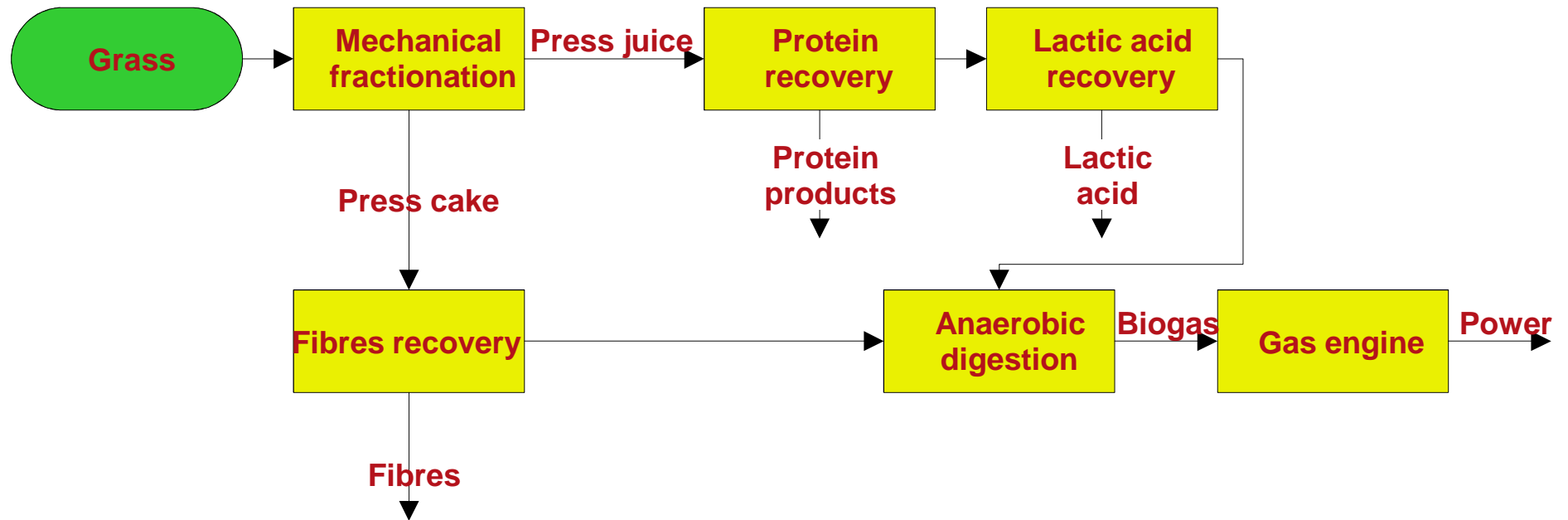


# Reference case small-scale power production

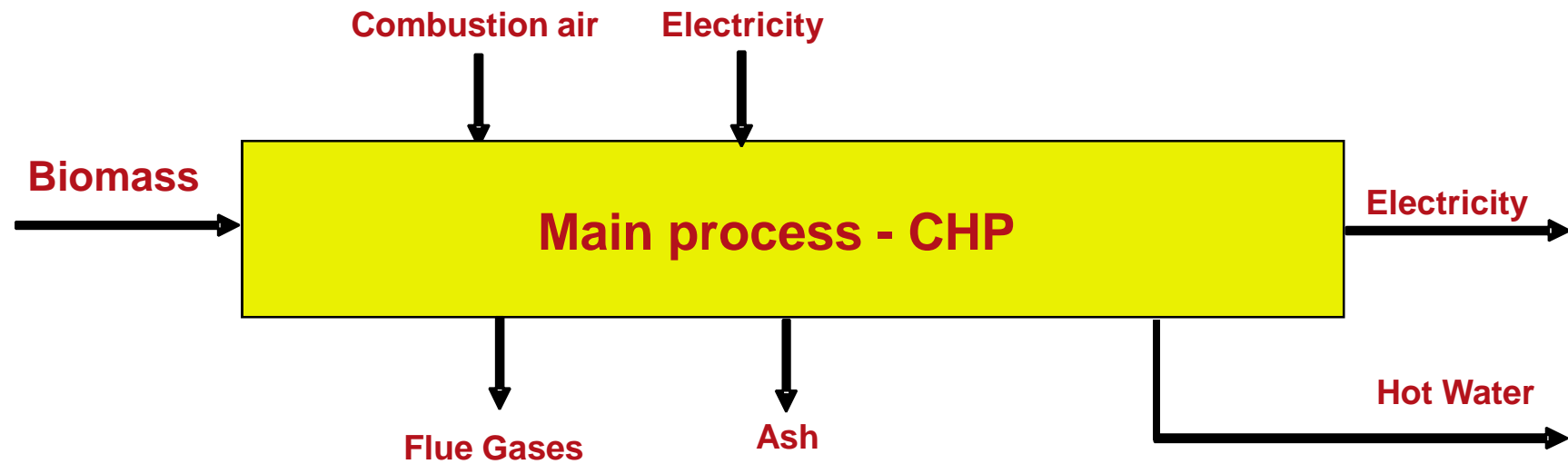




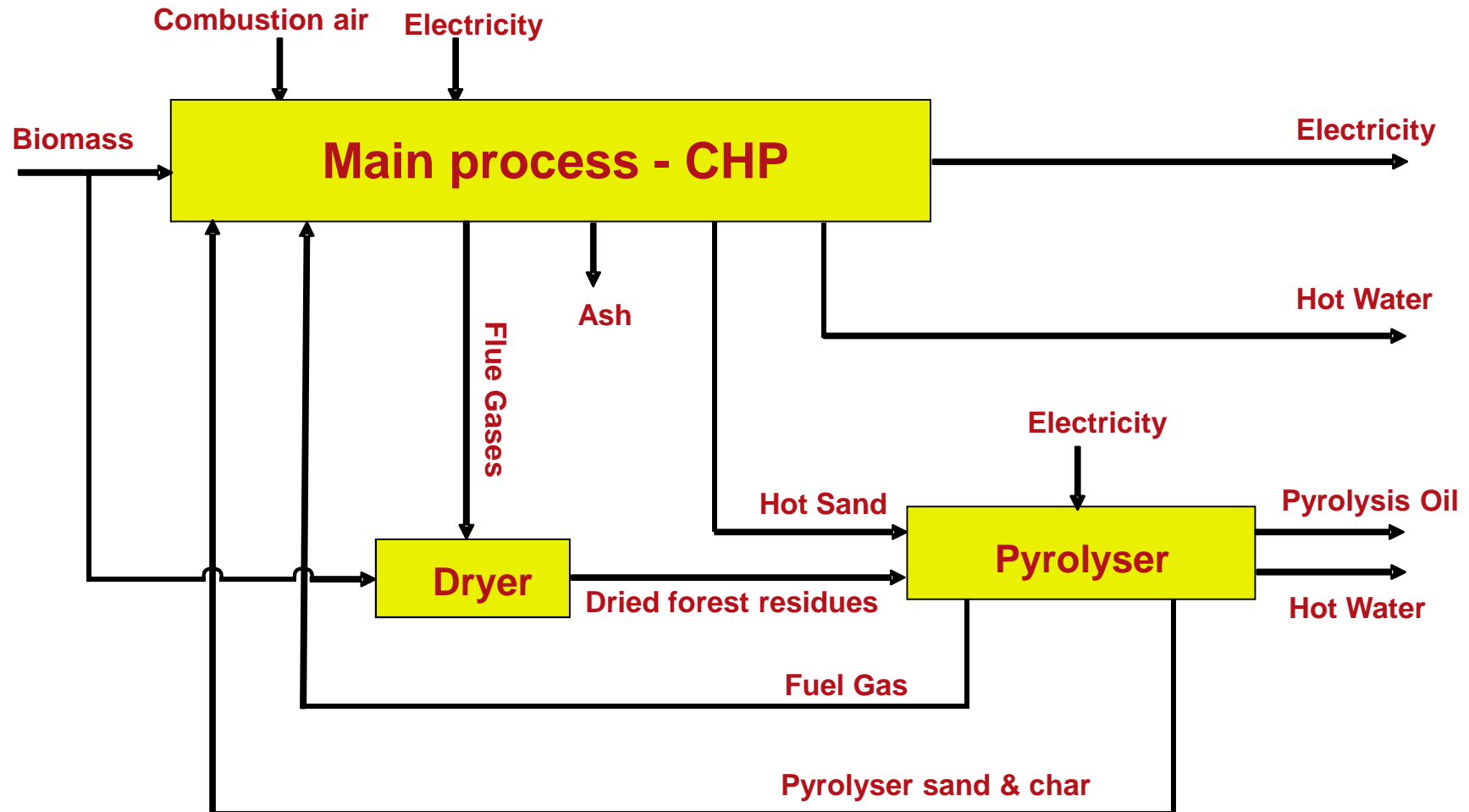
# Integrated case: green biorefinery



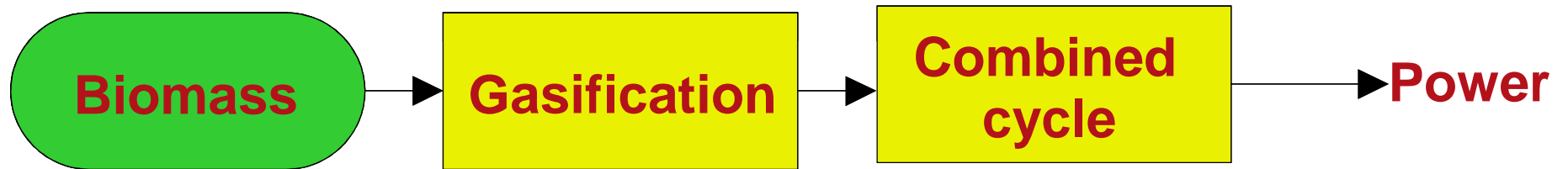
# Reference case medium-scale power production



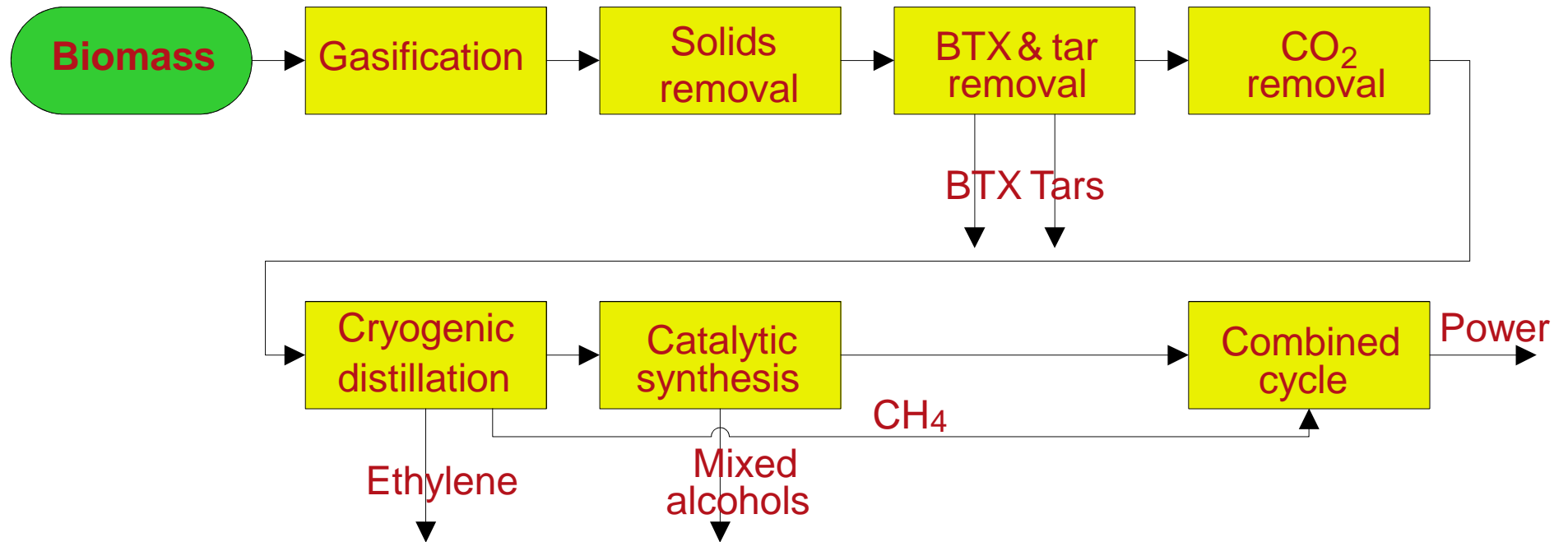
# Integrated biorefinery case



# Reference case large-scale power Production (BIGCC)



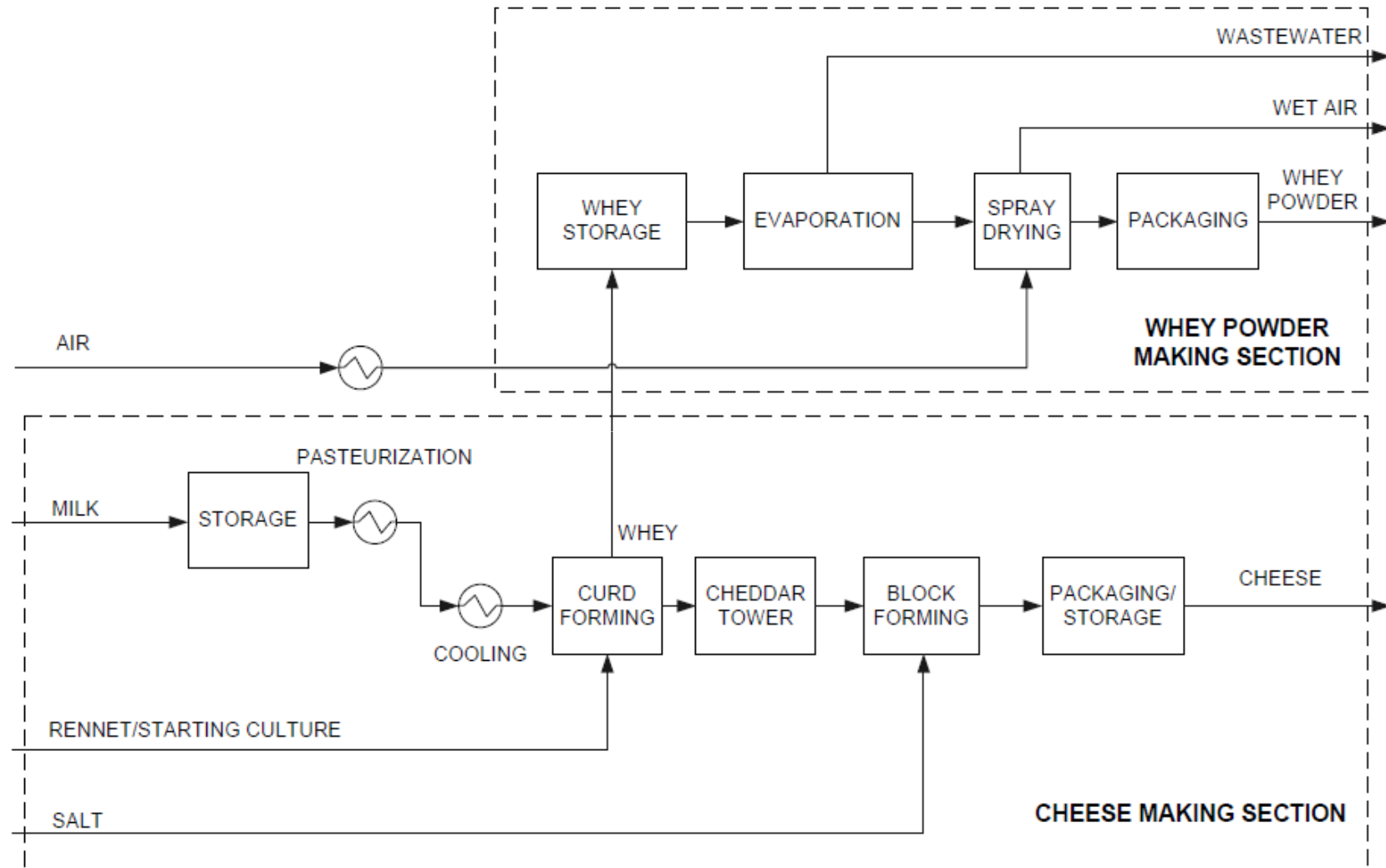
# Integrated biorefinery case





# Food industry sector

# Reference case cheese production process



# Integrated biorefinery case

- Lactic acid production by fermentation of whey
- High protein content (<80%) stream as the second added-value product

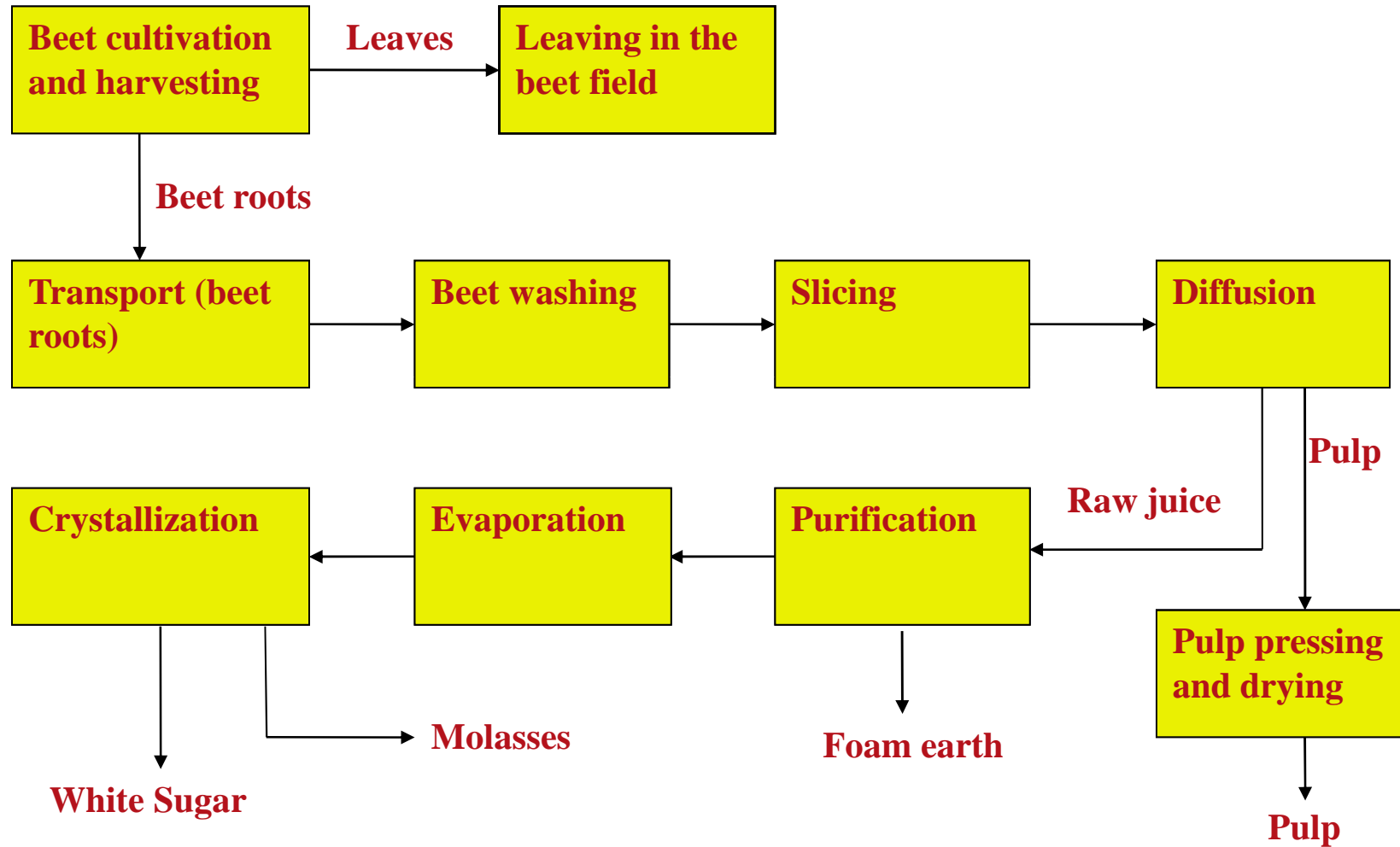






# Agrosector

# Reference case sugar production industry

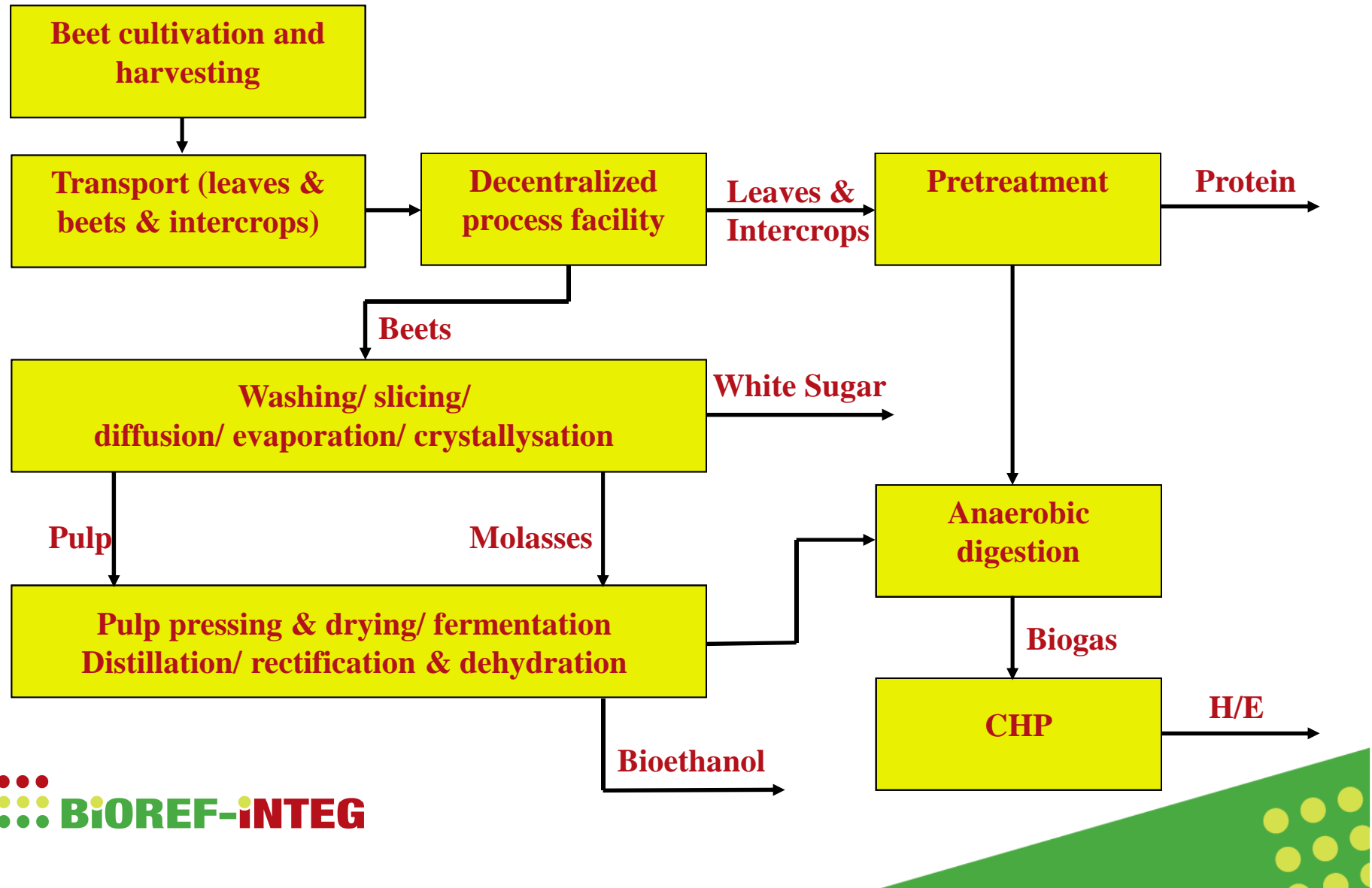


# Integrated biorefinery case (1)

- Lactic acid production by fermentation of beet pulp
- High protein content (up to 40%) stream as the second added-value product



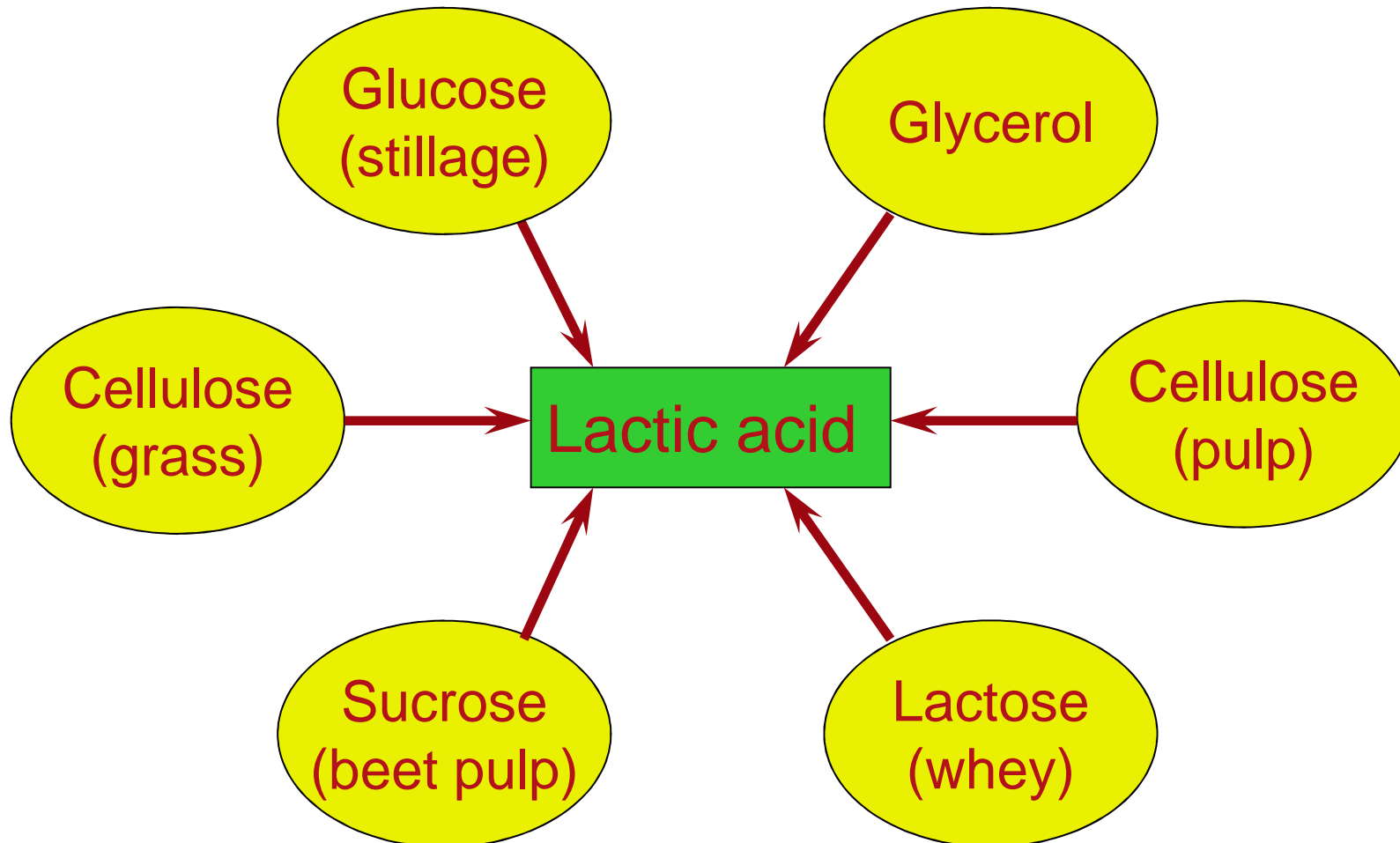
# Integrated biorefinery case (2)



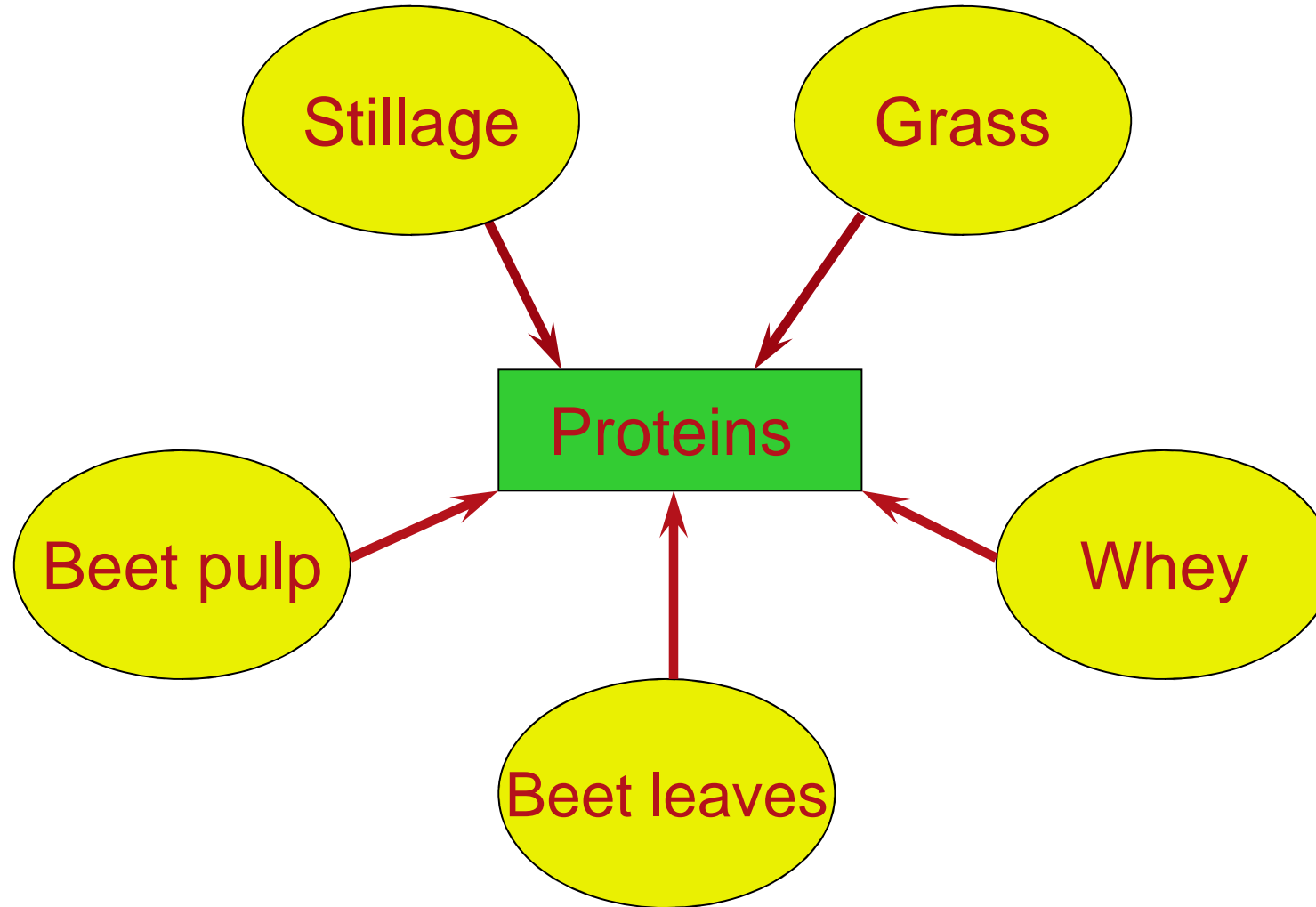


# Case studies

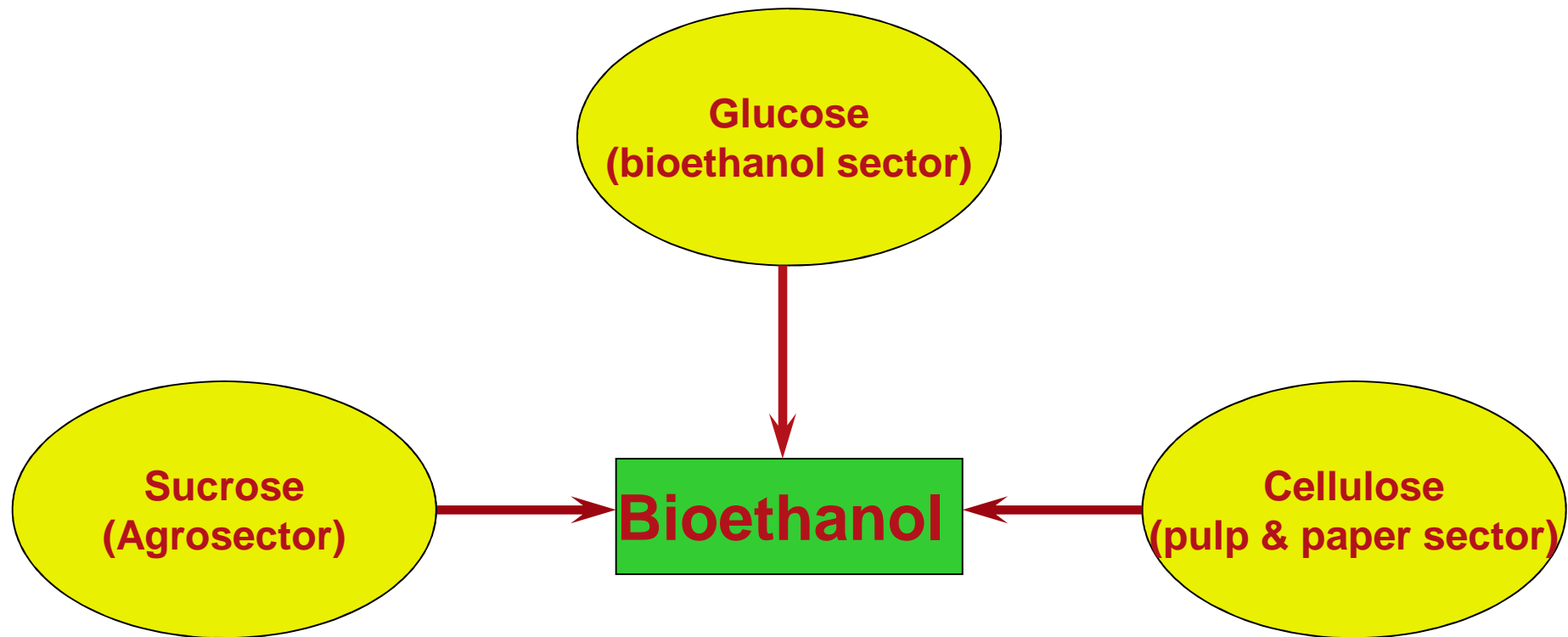
# Case study 1: Lactic acid production



# Case study 2: Protein production

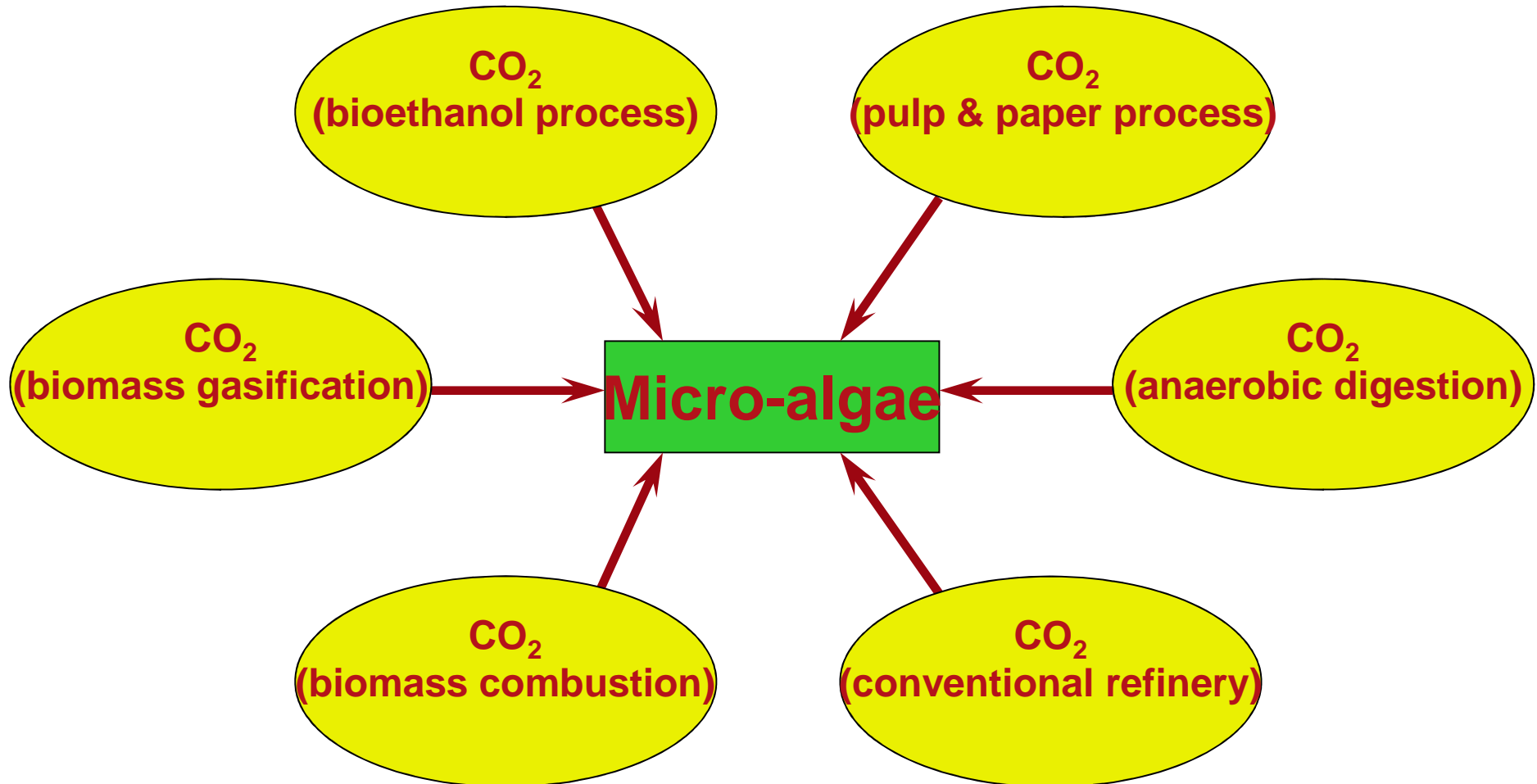


# Case study 3: Bioethanol production





# Case study 4: Micro-algae production



**Thank you for your  
attention!**

