



Research perspectives on biofuels

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Fig. 1. The global food and fuel crisis.

World Vision, 2008. Global Food Crisis. World Vision, New Zealand. Available from: <http://www.bendib.com/newones/2008/march/small/3-29-Oil-vs-Food.jpg> (accessed 07.15.).

Biofuels can be controversial !





Biofuel research:

Investigates new options in terms of

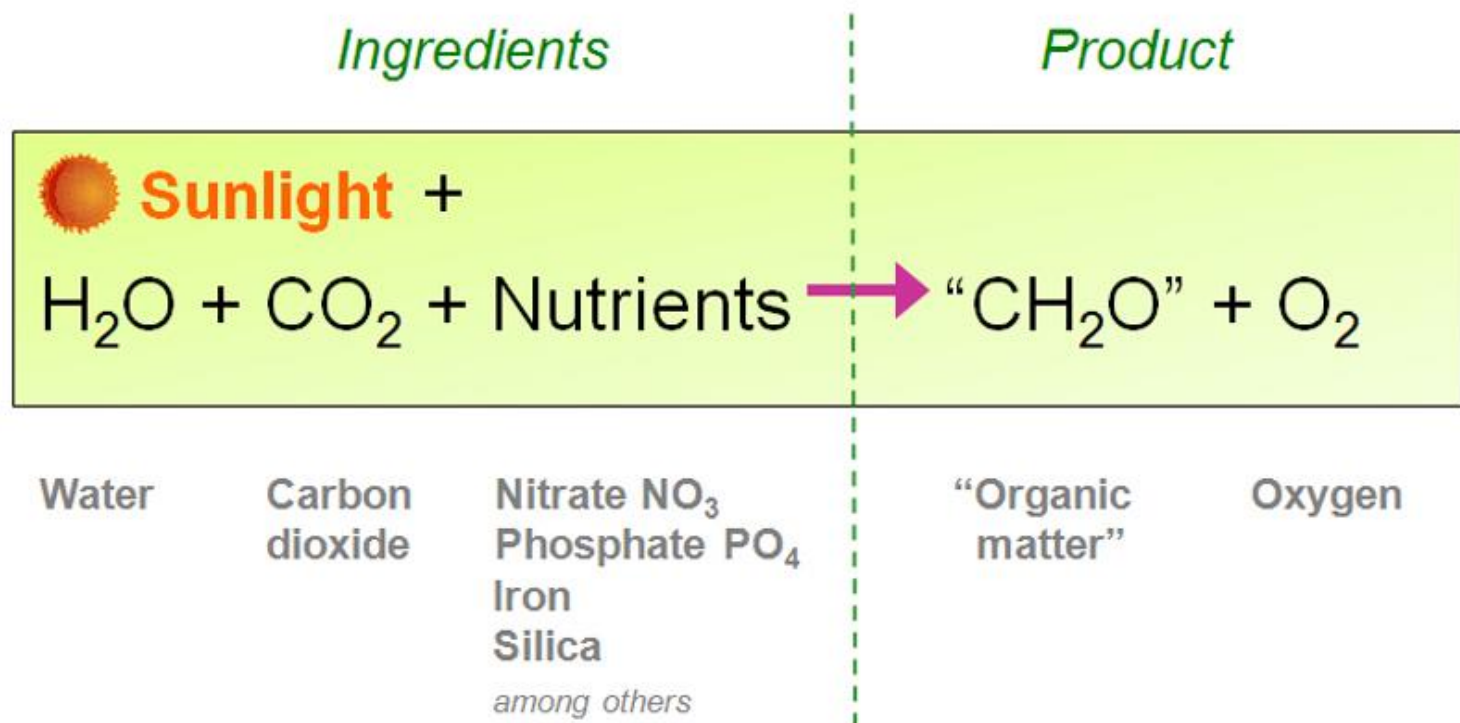
- Sustainable feedstocks
- New biofuel types
- More efficient conversion routes
- Improving product quality
- Reducing production costs





Where does the energy in biofuels come from ?

Photosynthesis

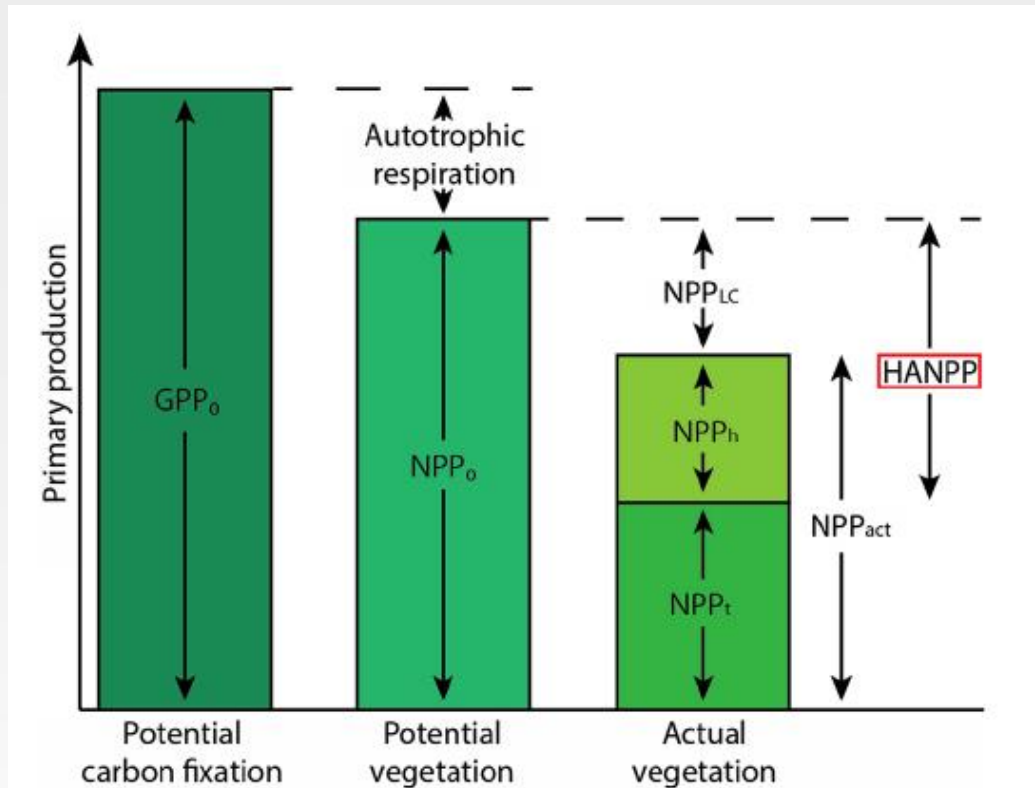


http://earthguide.ucsd.edu/eoc/special_topics/teach/sp_climate_change/p_photosynthesis.html





How much biomass produced and how much used by people ?



HANPP: Human appropriation of net primary production

Fig. 3. The standard definition of human appropriation of net primary production (HANPP), graphically represented. Terms are defined in Section 2.6.1. Figure adapted from [42].

A.K. Ringsmuth et al. / Renewable and Sustainable Energy Reviews 62 (2016) 134–163





Research focus on feedstocks:

- Residues and wastes – already harvested
 - Agricultural residues
 - Forestry residues
 - Municipal wastes
 - Sewage sludge
- Energy crops
- Algae and microalgae

Biomass should be used efficiently !





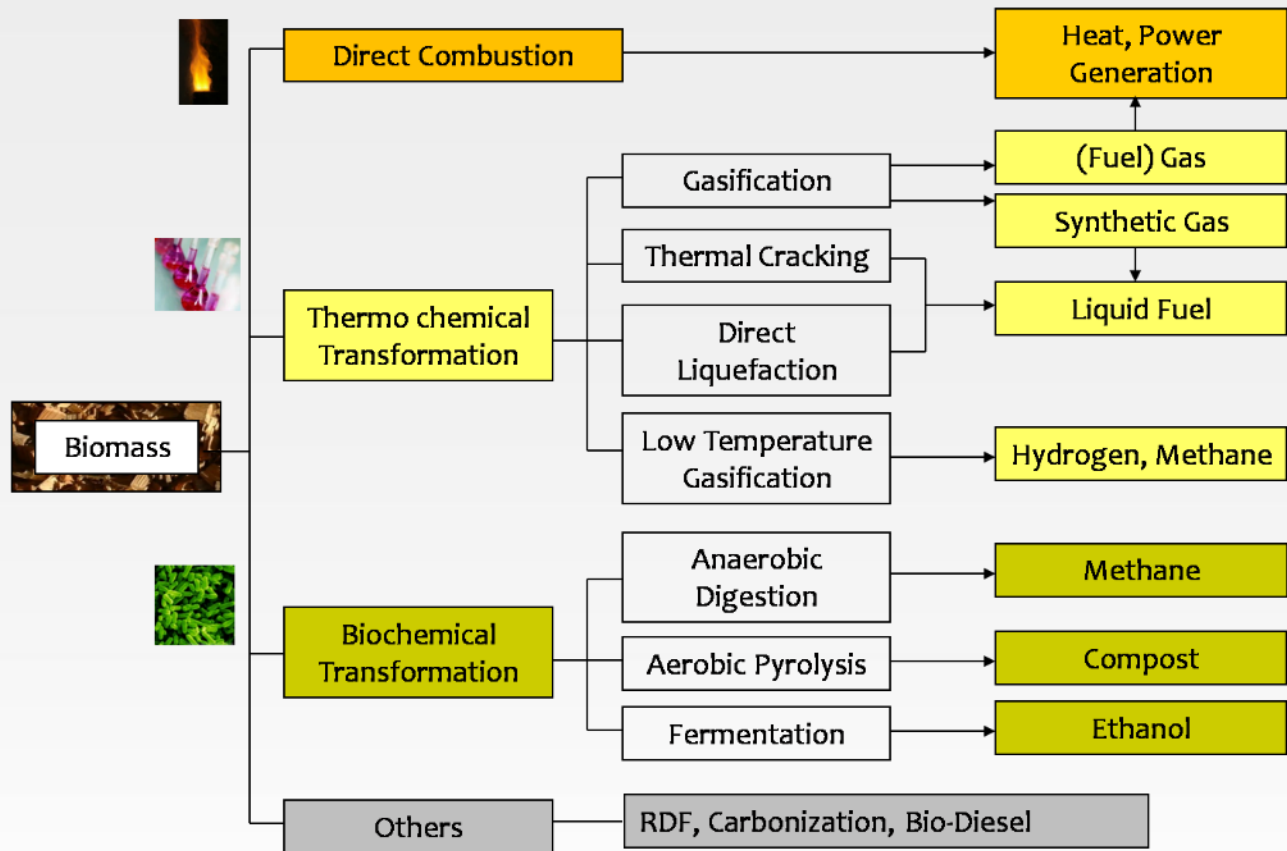
Opna pilotanlegg for mikroalgar på Mongstad

<http://www.uib.no/aktuelt/102681/opnar-pilotanlegg-mikroalgar-p%C3%A5-mongstad>





New biofuel types and more efficient conversion routes





Thermochemical conversion processes: A very exciting chemical research field !

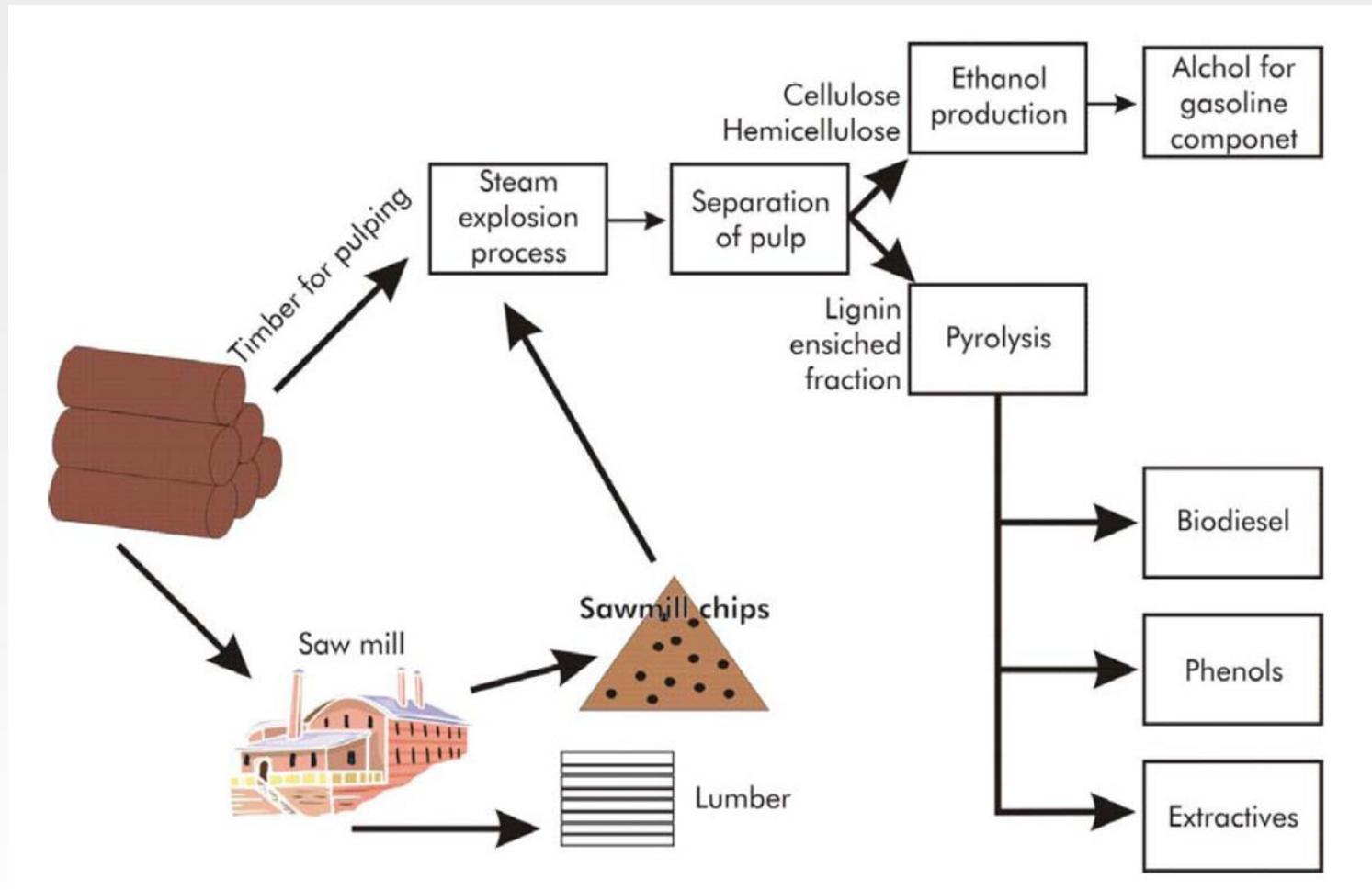
At the Department of Chemistry, UiB:

- Converting lignin to biofuel components and chemicals
- Developing new, unique catalysts for producing aromatic hydrocarbons from lignin-based biooils



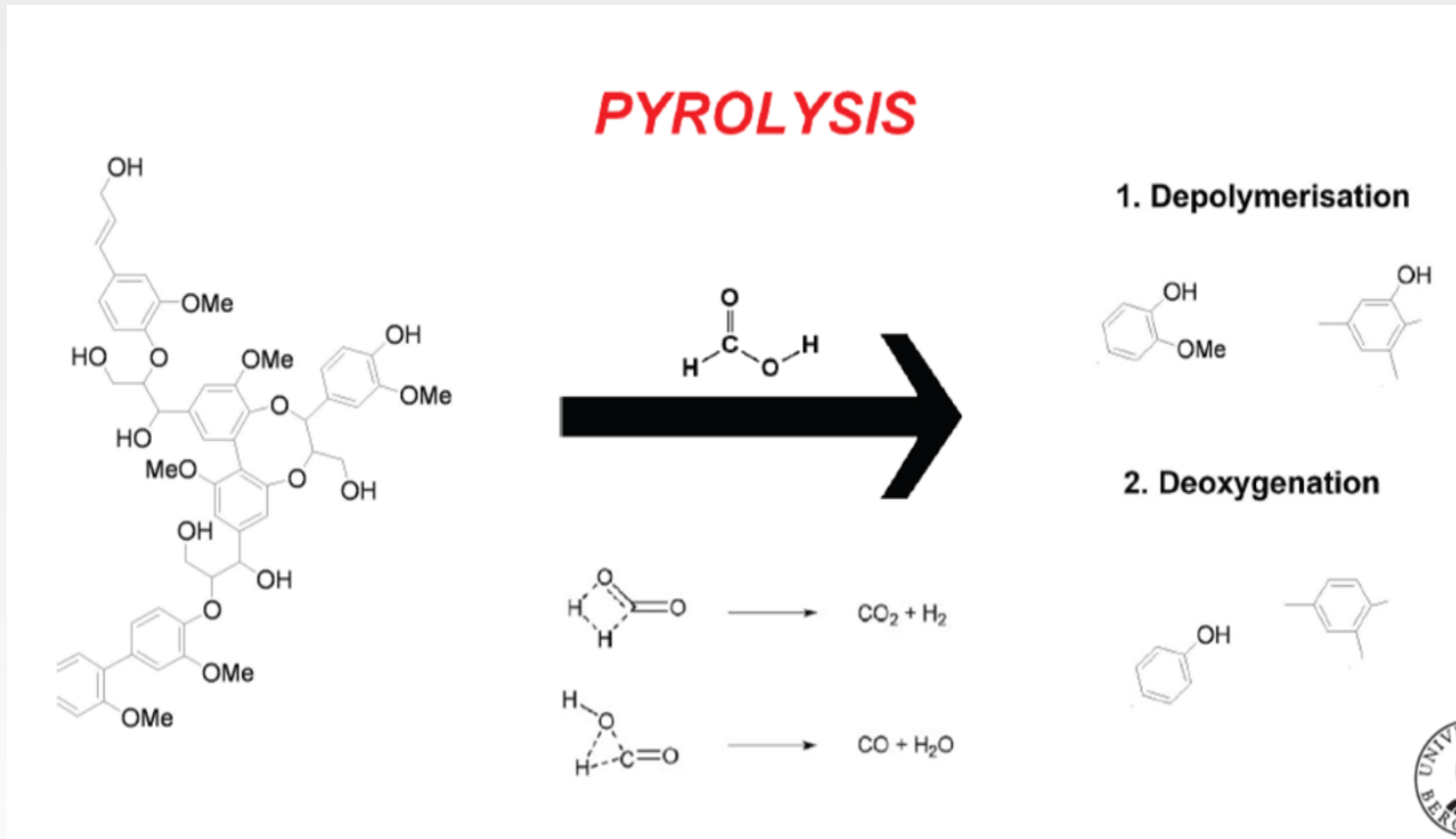


Lignin is a residue from pulping and bioethanol production





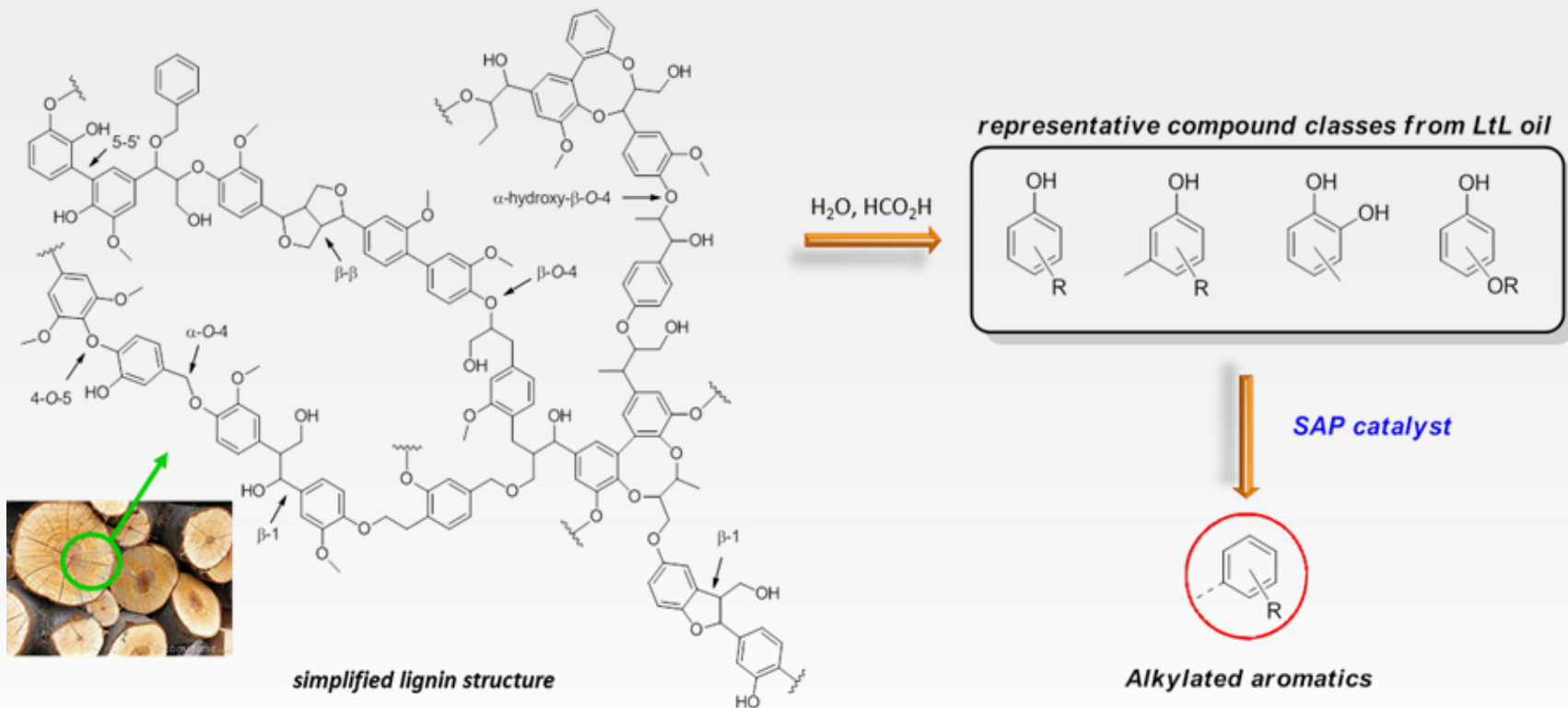
Lignin to liquid conversion LtL





Renewable Aromatic Hydrocarbons for Fuel Blending from Lignin by Novel Homogeneous Catalysis

Project NFR EnergiX program – New concepts





Improving product quality and reducing production costs

Lots of work needed – preferably in academic-industrial cooperation.

Financing is a BIG problem – we get lost in "the valley of death"



The vision: A biorefinery – like refineries in the oil industry

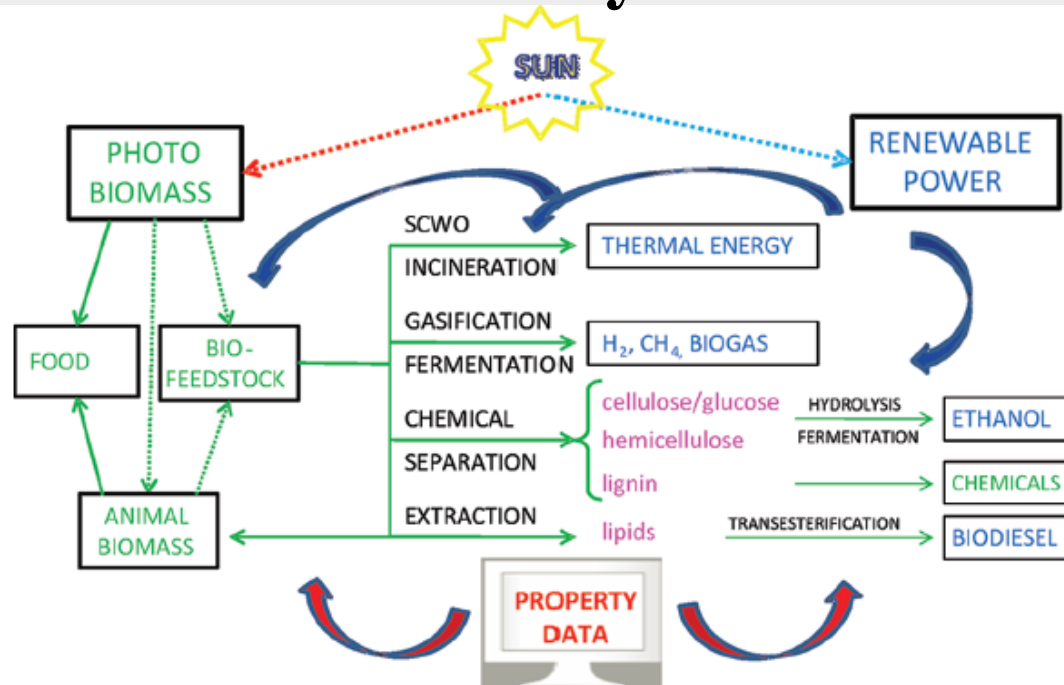


Figure 1. Block diagram of a sustainable biomass refinery. Text: green, main raw materials, feedstocks, and chemical products; blue, main renewable energy/fuels; pink, intermediates. Arrows: green, (pre)processing; red (solid), integrating connections provided by thermophysical property databases; blue (solid), suggested use of the renewable power for biomass processing.

Anitescu & Bruno, Energy Fuels 2012, 26, 324-348



**Thank you for your
attention !**



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