



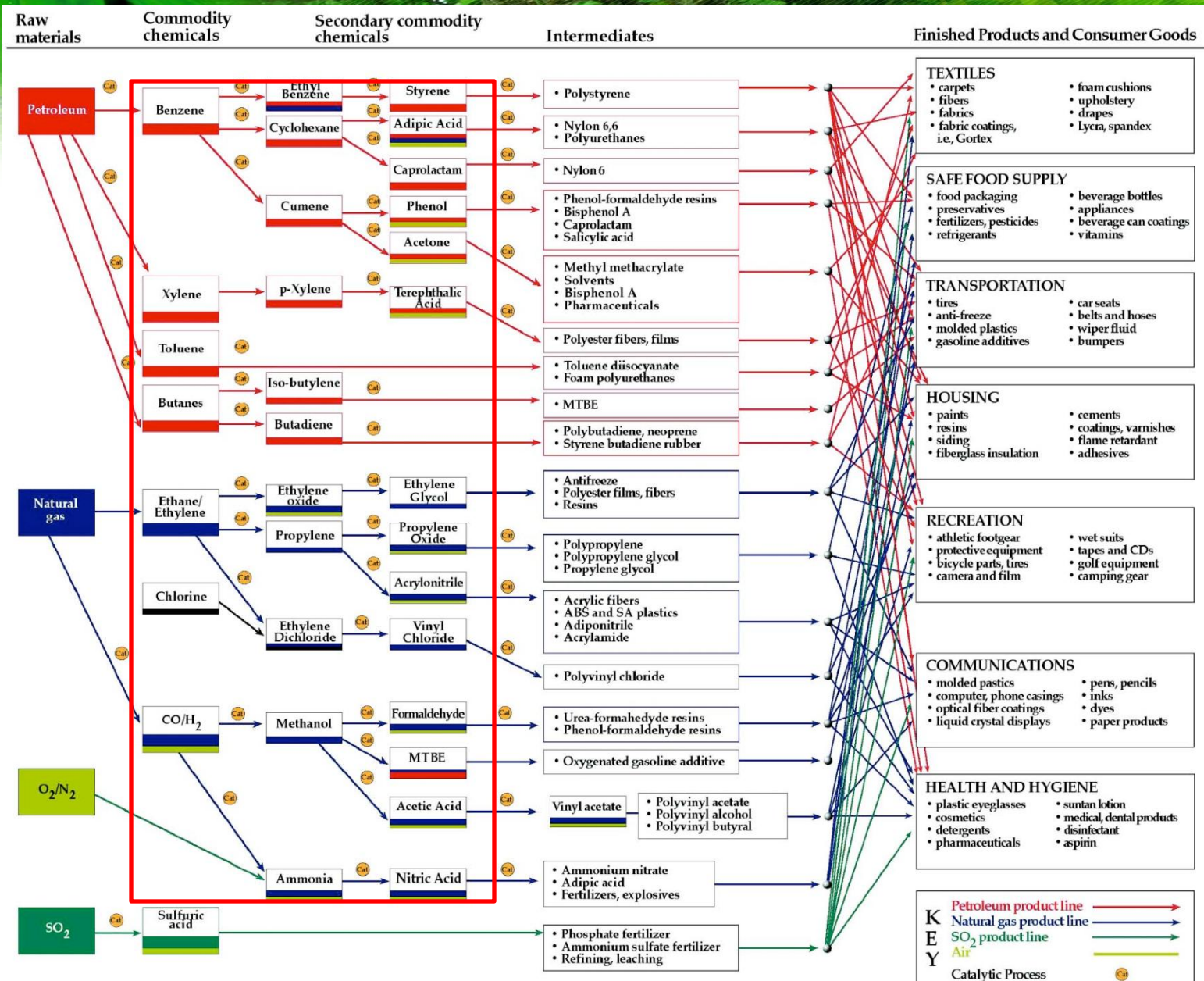
Biomass and Biorefinery : what can be really expected?

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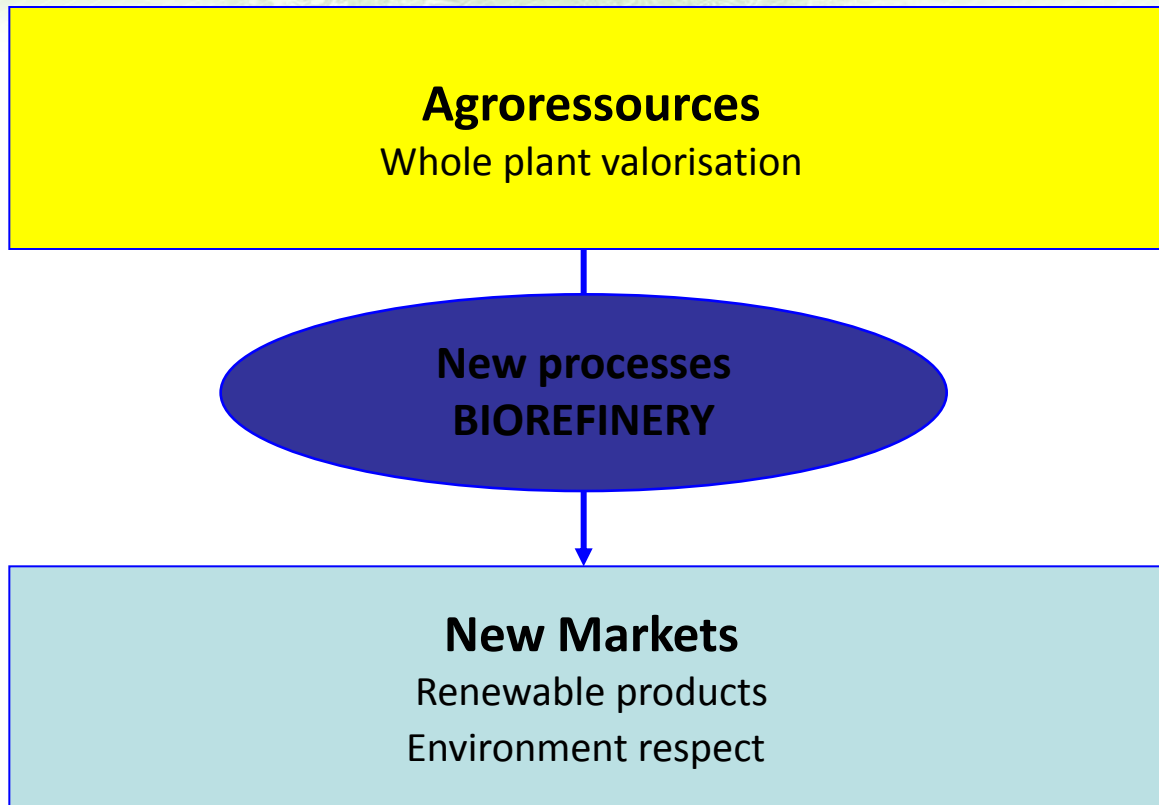


Pdt French Competitiveness cluster « Industries and Agroresources »

Oil based refinery



Biomass application



Biorefinery concept

Access to biomass

Biomass

New industrial needs

Renewable carbon
Environment friendly
products

New industrial tools

Biomass Green Chemistry
White Biotech

Markets

Bio Molecules

Chemical intermediates,
green glue, biolubricants,
green surfactants

Bio Materials

Plant fibres & Biopolymers
for
Building, Textile, Plastics,
Transport, Packaging

Bio Energy

Biofuels 2G & 3G,
heat & electricity

Bio Ingredients

Food Ingredients,
Cosmetic Ingredients
Bio-Actives, Nutraceuticals

Sustainable Development

Plant biorefinery

PLANTS = BIOMASS

EXTRACTION - SEPARATION

FRACTIONATION - CRACKING

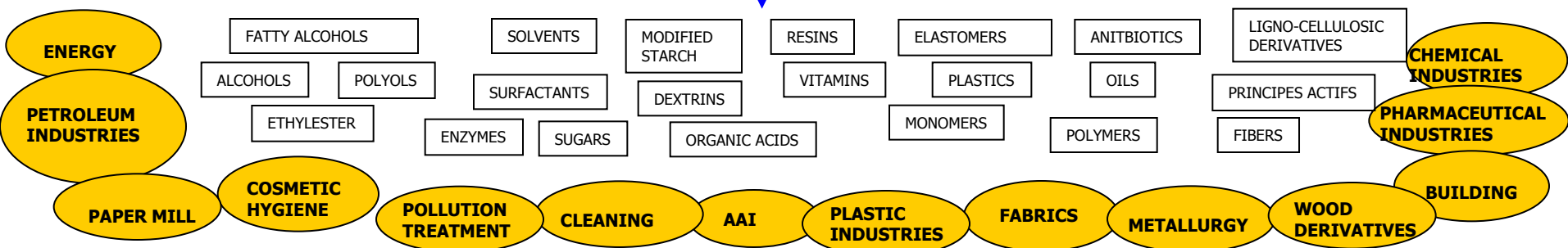
FONCTIONALISATION

**AGRO-INDUSTRIAL PRODUCTS
(INTERMEDIATES)**

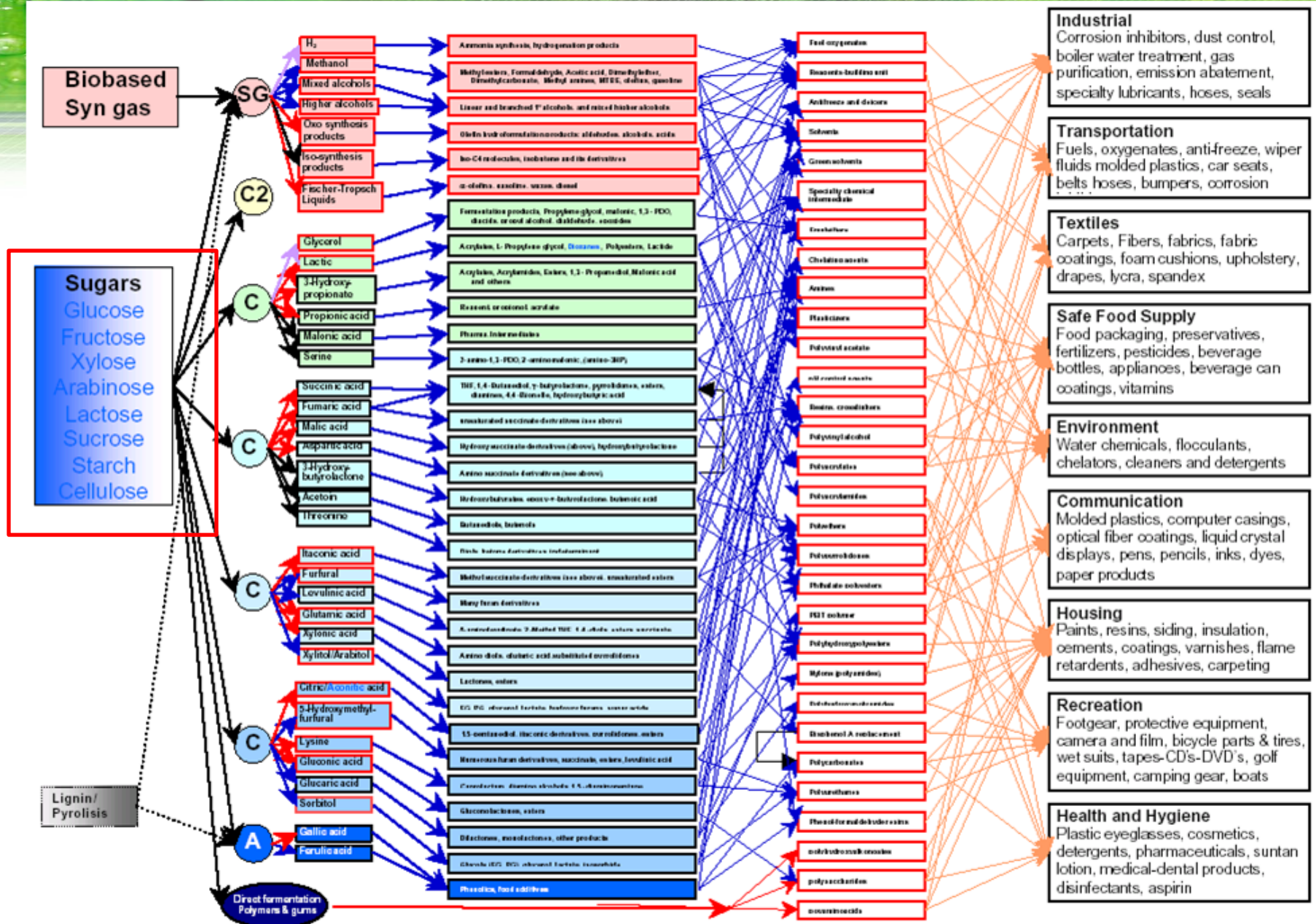
FORMULATION

1st Transformation

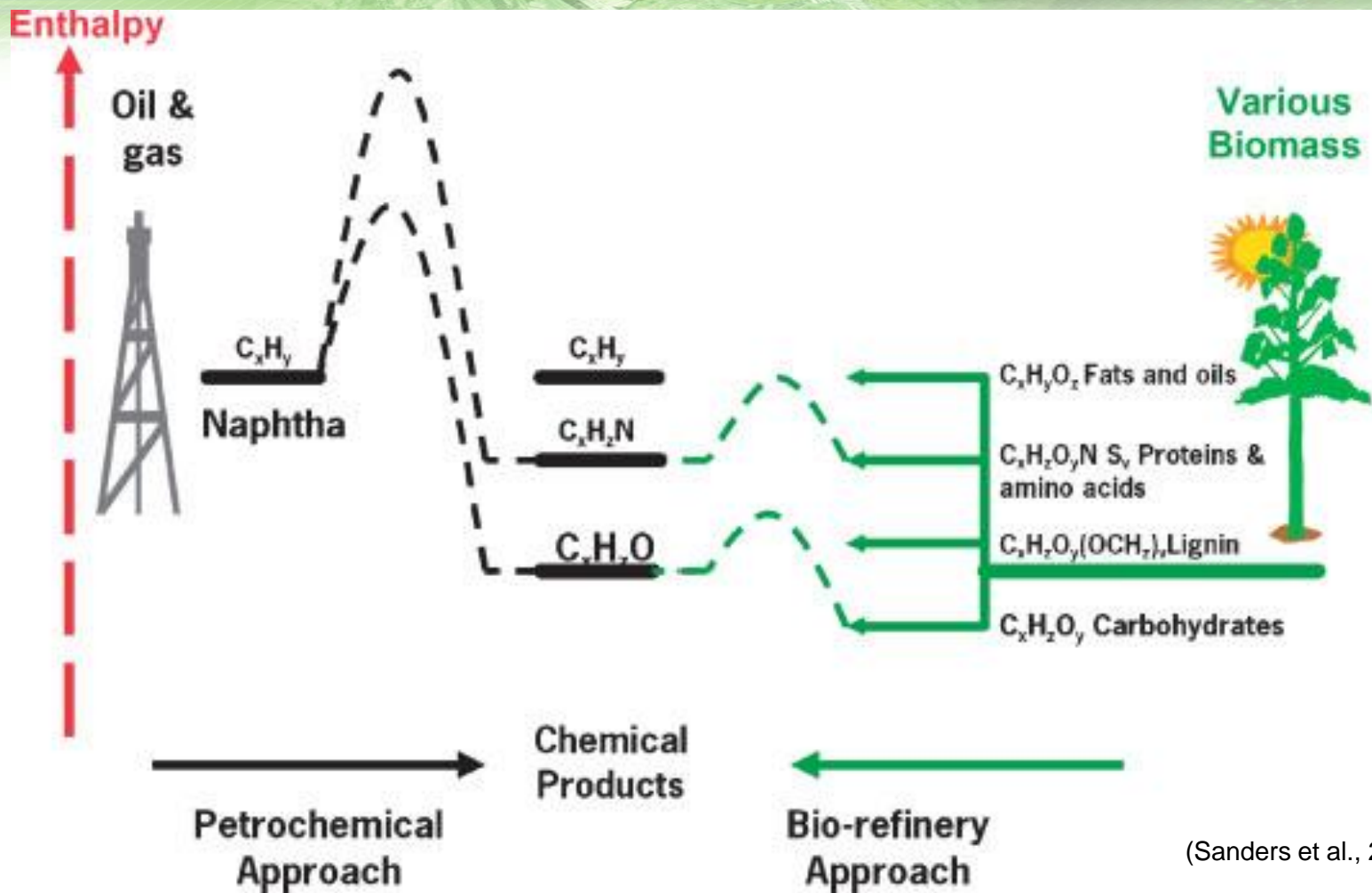
2nd Transformation



Plant biorefinery

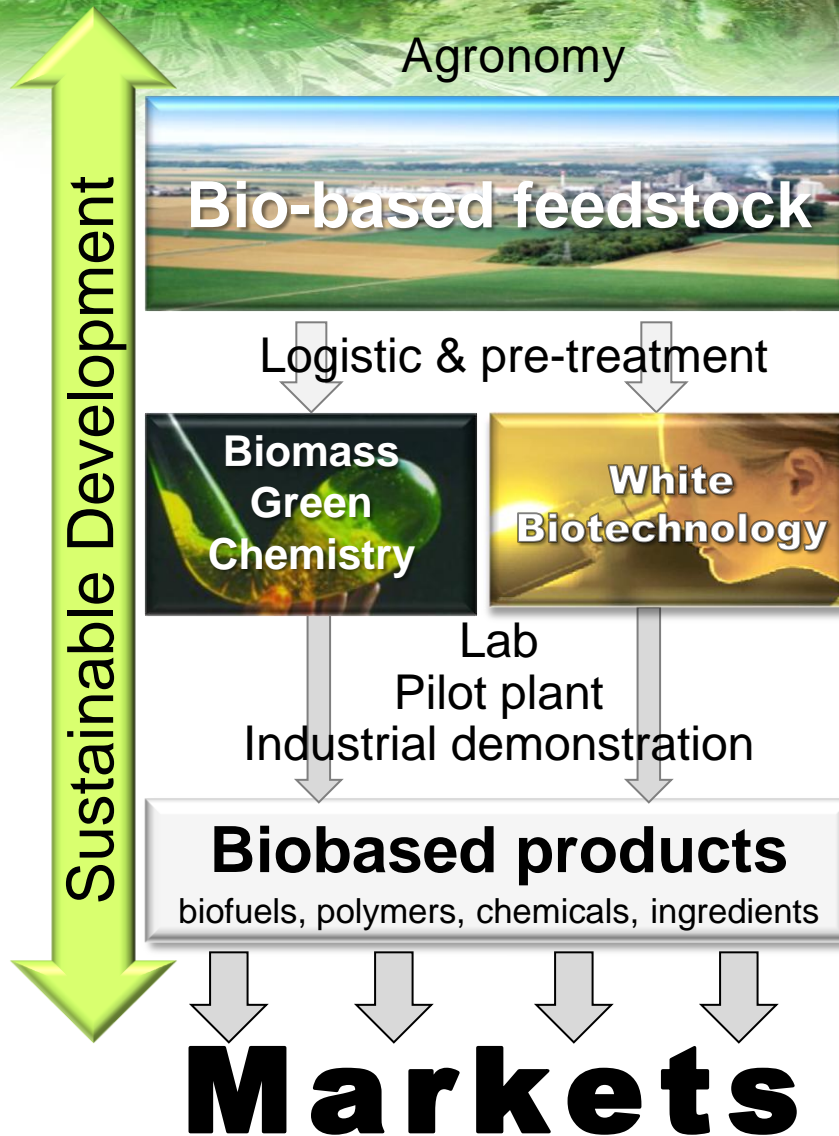


Petrochemistry and Biorefinery



(Sanders et al., 2007)

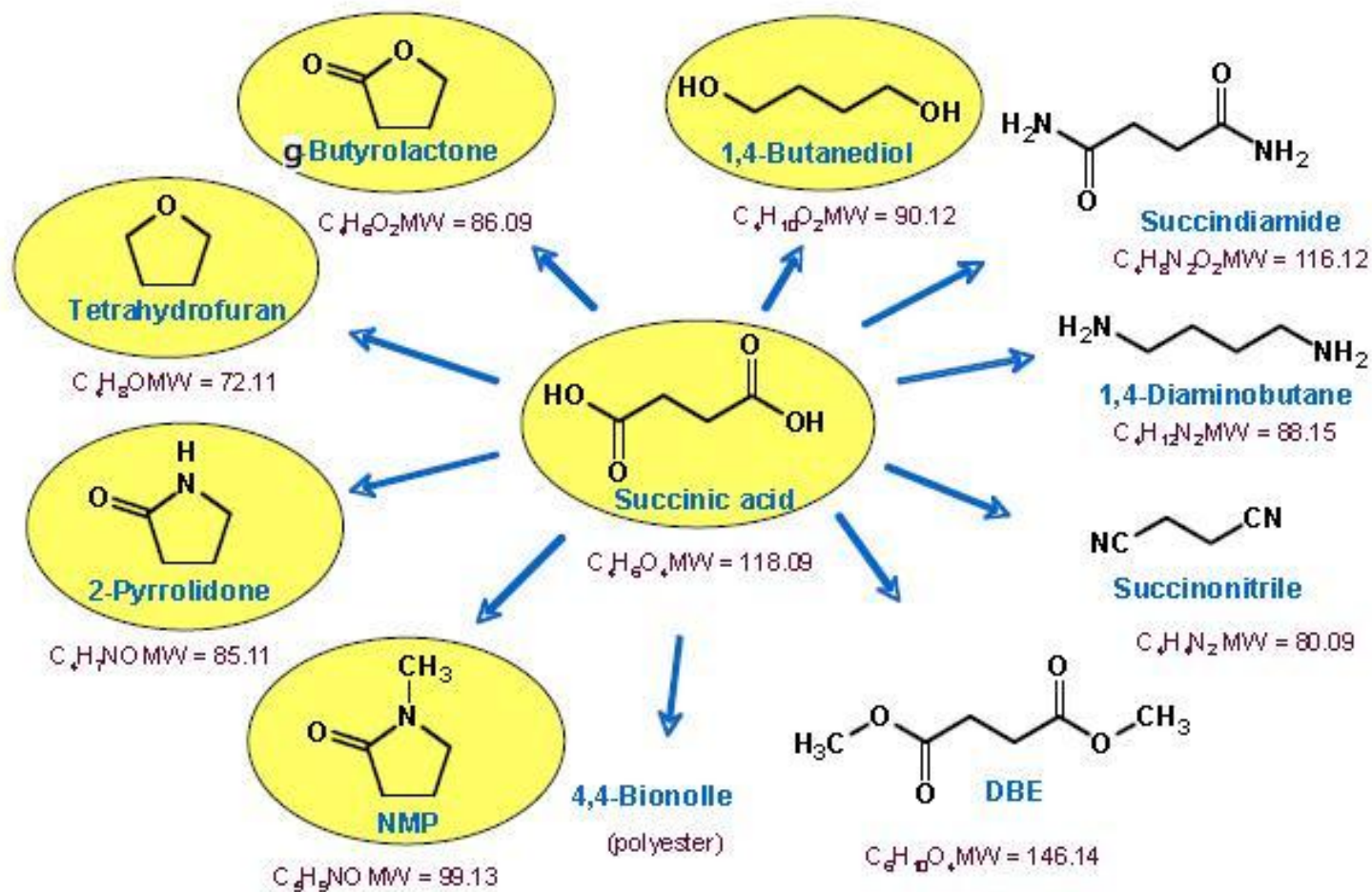
Strategy to develop biorefinery



Building blocks for chemistry

Building Blocks
1,4 succinic, fumaric and malic acids
2,5 furan dicarboxylic acid
3 hydroxy propionic acid
aspartic acid
glucaric acid
glutamic acid
itaconic acid
levulinic acid
3-hydroxybutyrolactone
glycerol
sorbitol
xylitol/arabinitol

Succinic acid



Succinic acid : a new step toward integrated biorefinery

Sugar Refinery



OUTPUT
Sucrose

Wheat Processing Mill



OUTPUT
Glucose

Cellulose Hydrolysis Pilot



OUTPUT
C5 & C6 sugars

Bioethanol plants



Succinic acid plant



CO_2

Diethyl
succinate

Biorefinery: toward an industrial metabolism

"Les Sohettes"

Bazancourt - Pomacle

BUSINESS UNITS AND SYNERGIES

- 1 **WATER Synergy** : Recovery of condensate
Chamtor uses 90 000 M3 of surplus condensate during the beet-campaign.
Advantage : less pumping in the groundwater and energy recuperation.
- 2 **STEAM Synergy**
A reciprocal steam help.
Advantage : industrial tools are secured.
- 3 **EFFLUENTS Synergy**
Purification, storage, spreading.
Advantage : under controlled and comprehensive agronomic approach.
- 4 **PRODUCTS synergy**
Products or co products from one plan are raw materials for another one.

- 5 **R&D Synergy**
Research programs are led in cooperation with A.R.D.'s shareholders.
- 6 **ENERGY Synergy**
Bioethanol production based on sugar beet/wheat.
* Energy Synergy : use of steam obtained by cogeneration.
+ Energy Synergy : bioethanol production.
- 7 **ORGANIZATION Synergy**
Within the frame of the IAR cluster, it exists organization synergies, i.e. assistance in the construction and operation facilities, training programs ...
- 8 **Drilling Synergy**
Production of raw water.

