Biomasse et agroressources, quel développement pour la Picardie ?
10 mars 2011

Prospective des bioraffineries du végétal en Europe

par Christophe Luguel, pôle Industries et Agro-ressources (IAR)

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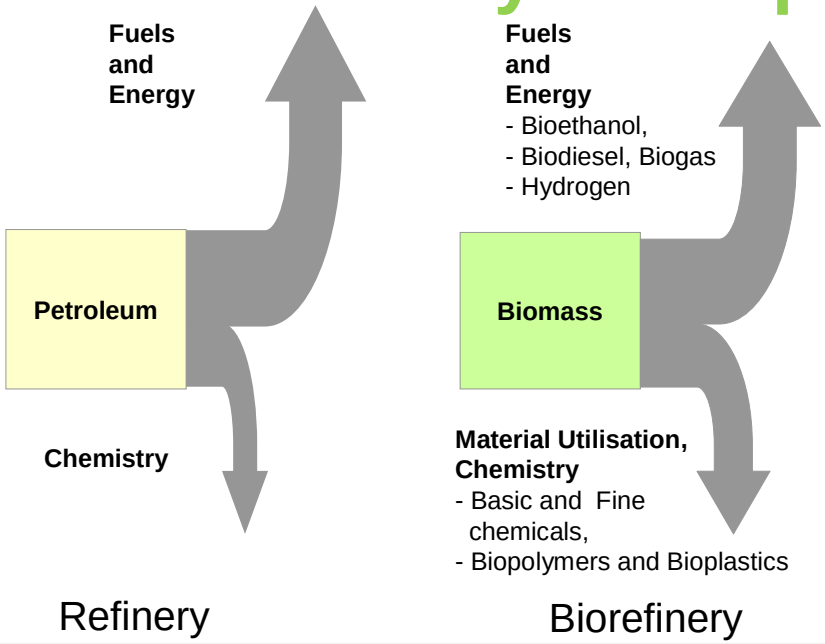
Ombelliscience PICARDIE vous aide à comprendre le monde

Prospective des bioraffineries du végétal en Europe

The Biorefinery concept



Biorefining is the transfer of logic and efficiency of the fossil based chemical, chemical processing and material converting industry as well as energy production onto the biomass industry.

📖 Kamm, B.; Gruber, P.R.; Kamm, M.; Biorefineries, Industrial Processes and Products, ULLMANN'S, Wiley-VCH, 2007

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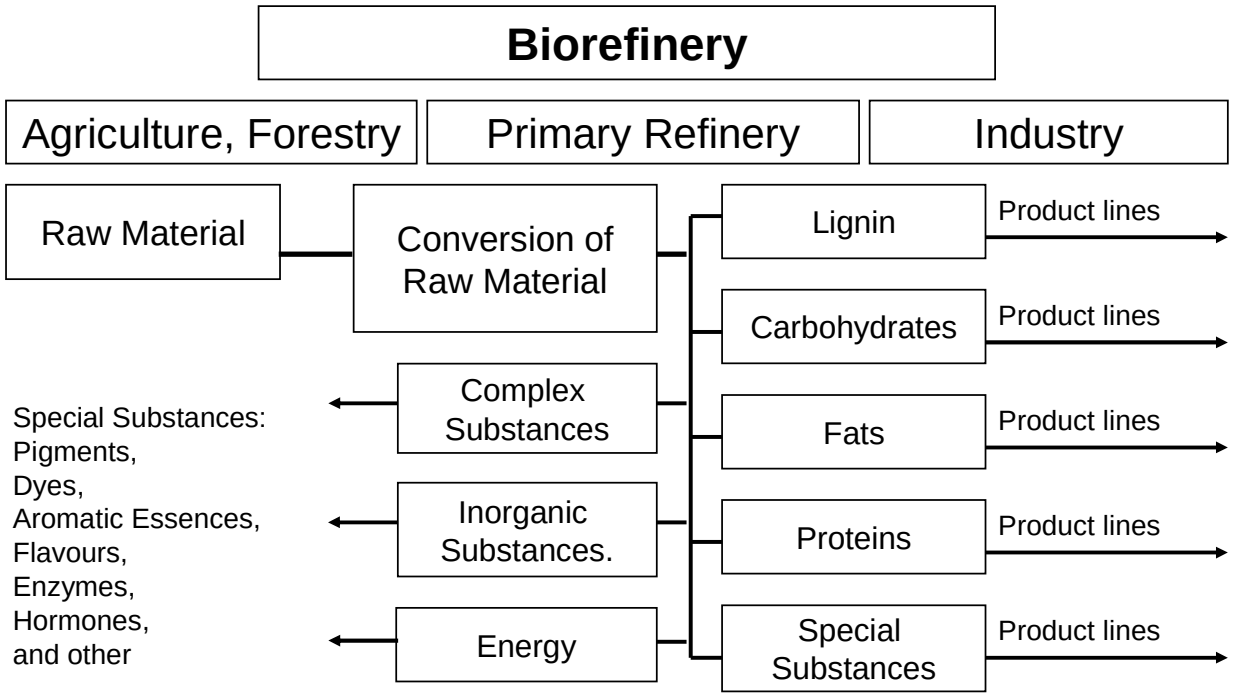
Biorefineries combine necessary technologies between biological raw materials and the industrial intermediates & final products

The Biorefinery concept



Kamm, B.; Kamm, M.; Principles of Biorefineries. *Appl. Microbiol, Biotechnol., (AMB)*, **64** (2004) 137-145

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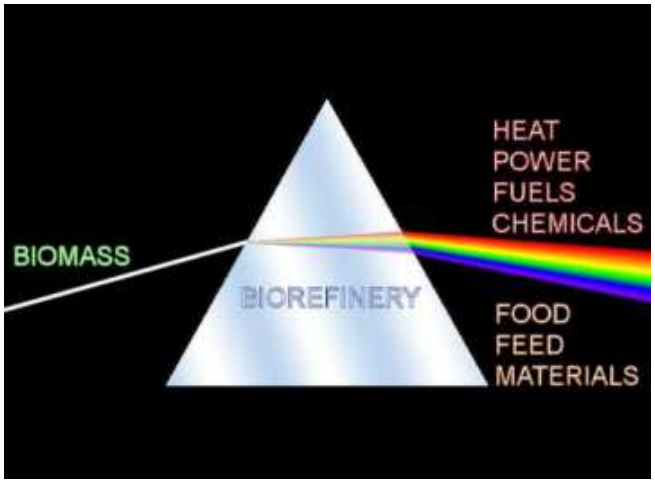
Definition of Biorefinery

IEA definition (Task 42)

Biorefinering is the sustainable processing of biomass into a spectrum of marketable products & energy.



This definition includes:

Biorefinery: concepts, facilities, processes, cluster of industries

Sustainable: maximizing economics, minimizing environmental aspects, fossil fuel replacement, socio-economic aspects taken into account

Processing: upstream processing, transformation, fractionation, thermo-chemical and/or biochemical conversion, extraction, separation, downstream processing

Biomass: crops, organic residues, agroresidues, forest residues, wood, aquatic biomass

Spectrum: more than one

Marketable: a market (acceptable volumes & prices) already exists or is expected to become available in the near future

Products: intermediates and final products, i.e. food, feed, fuels, chemicals and materials

Energy: power, heat, electricity

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Biorefinery classification

1. **Green Biorefinery**
   typically companies that run in campaigns, using wet (unstable) biomass, such as potatoes, tapioca and sugar beets


2. **Cereal Biorefinery**
   using stable dry cereals such as maize, wheat and rice to produce starch and derivatives

3. **Oilseed Biorefinery**
   using oil-containing seeds, such as rapeseed, sunflower, typically producing food and feed ingredients, biodiesel and oleochemicals

4. **Lignocellulosic Biorefinery**
   using forest based and lignocellulosic biomass to produce cellulose fibres, chemicals, lignin and energy.

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Biorefinery Euroview

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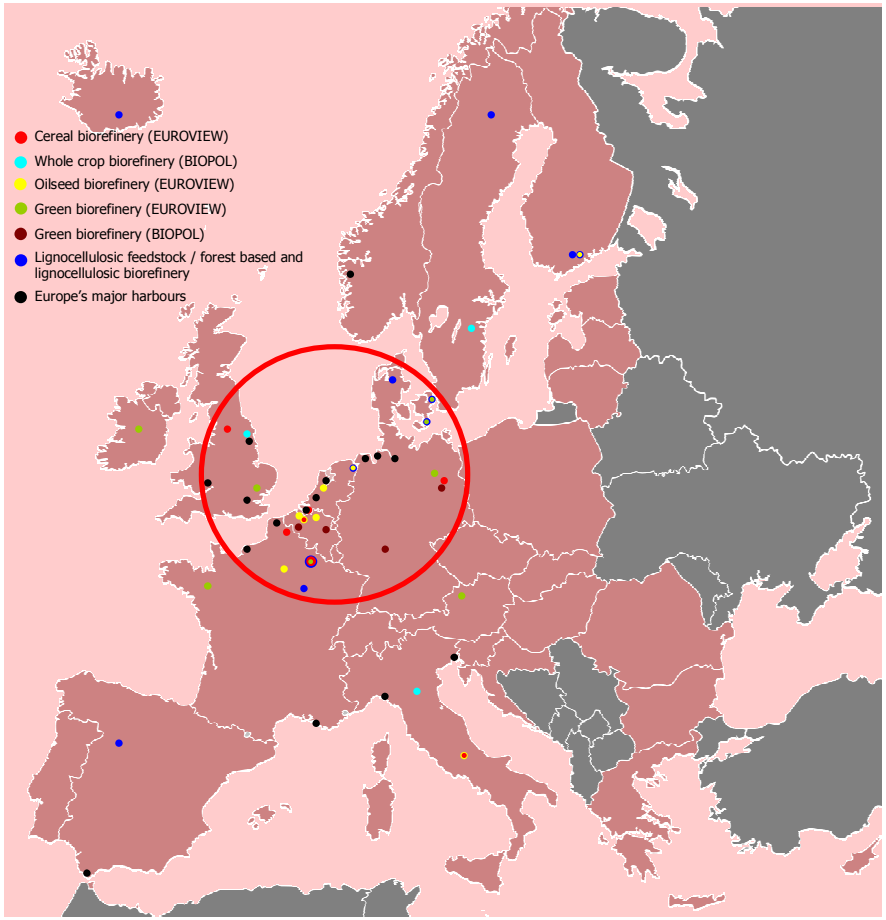
Mapping of biorefineries in Europe

Existing or planned biorefineries and major sea harbours in Europe



- ✓ 34 recognised biorefinery (pilot & industrial) sites
- ✓ 16 major European sea harbours
- ✓ 75% of the biorefinery sites and 70% of the largest sea harbours are located within a circle consisting of France, Germany, Denmark, Belgium, the Netherlands, and the UK.

BIOPOL Biorefinery Euroview

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Star COLIBRI: Strategic TARgets for 2020 COLlaboration Initiative in BioRefInery:

Biorefineries Joint call

CSA (Coordination & support action)

Enhancing exchange of information, synergies and cross-fertilisation between projects in the field of Biorefineries

➢Budget: 2 M€

➢2 years (2009-2011)

Star-COLIBRI

➢**5 European Technology Platforms**

Forest-Based Sector Technology Platform

Plants for the Future

SusChem European Technology Platform For SUSTAINABLE CHEMISTRY

Biofuels TECHNOLOGY PLATFORM

MANUFUTURE-EU

➢**5 workpackages. IAR is WP3 leader**

- ✓ R&D synergies, gaps and overlaps
- ✓ EU Biorefinery vision for 2030
- ✓ Strategic Research Roadmap for 2020

➢**5 Research & Innovation Partners**

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Green Chemistry Centre of Excellence

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Prospective des bioraffineries du végétal en Europe

Biomass in Europe in 2030

A broader context for biobased economy and biorefinery development

- ✓ The world in the coming decades will be simultaneously facing food security issues, climate change issues and energy security issues.
- ✓ These issues are unlikely to be solved before 2050
  - ➢ *2030 will correspond to a "peak demand" of biomass*

Biomass potentials in 2030

- ✓ The future production of biomass in Europe will be roughly based on the current land distribution with an increase in perennial system
- ✓ ***The key question for the future biomass production in Europe is the land availability***.

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Prospective des bioraffineries du végétal en Europe

Towards biorefineries in 2030

Characteristics of possible biorefinery development routes

- ✓ Integration with existing industrial value chains or development of new industrial value chains
- ✓ Up- and downstream integration
- ✓ Biomass supply: harbour (import of biomass or intermediates) or rural (locally produced biomass)
- ✓ Biorefinery scale

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Prospective des bioraffineries du végétal en Europe

Towards biorefineries in 2030

Integration with existing industrial value chains or development of new industrial value chains

- ✓ In 2030 many biorefineries will operate at a large-scale commercial level. Most of these biorefineries will be developed based on the integration with existing industrial value chains.
- ✓ ***Biorefinery development will be driven by the industrial leaders*** from the sectors involved in the biobased economy: agro-industry, forest based industry, energy sector, biofuels industry and chemical industry.
- ✓ New industrial value chains will also emerge (highly integrated, zero waste biorefineries)

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Prospective des bioraffineries du végétal en Europe

Towards biorefineries in 2030

Biomass supply: harbour (import of biomass or intermediates) or rural (locally produced biomass)

- ✓ The biorefineries based on wood are likely to be developed in Northern Europe.
- ✓ The biorefineries based on classical agricultural crops (cereal, sugar beets, oilseed crops) are likely to be developed in rural areas in “mid-Europe”.
- ✓ Biorefineries based on imported biomass will be established mainly in or very near to large harbours
- ✓ The development of biorefineries in Southern Europe is more difficult to predict. It could be either connected to industrial harbours or to (new) regional crops in rural areas.

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Biorefineries & biomass supply: harbour or rural ?

Biorefinery on harbour

Biorefinery

Rodenhuizedock

Port of Ghent

BioreFuture 2009
Biorefinery Euroview BIOPOL

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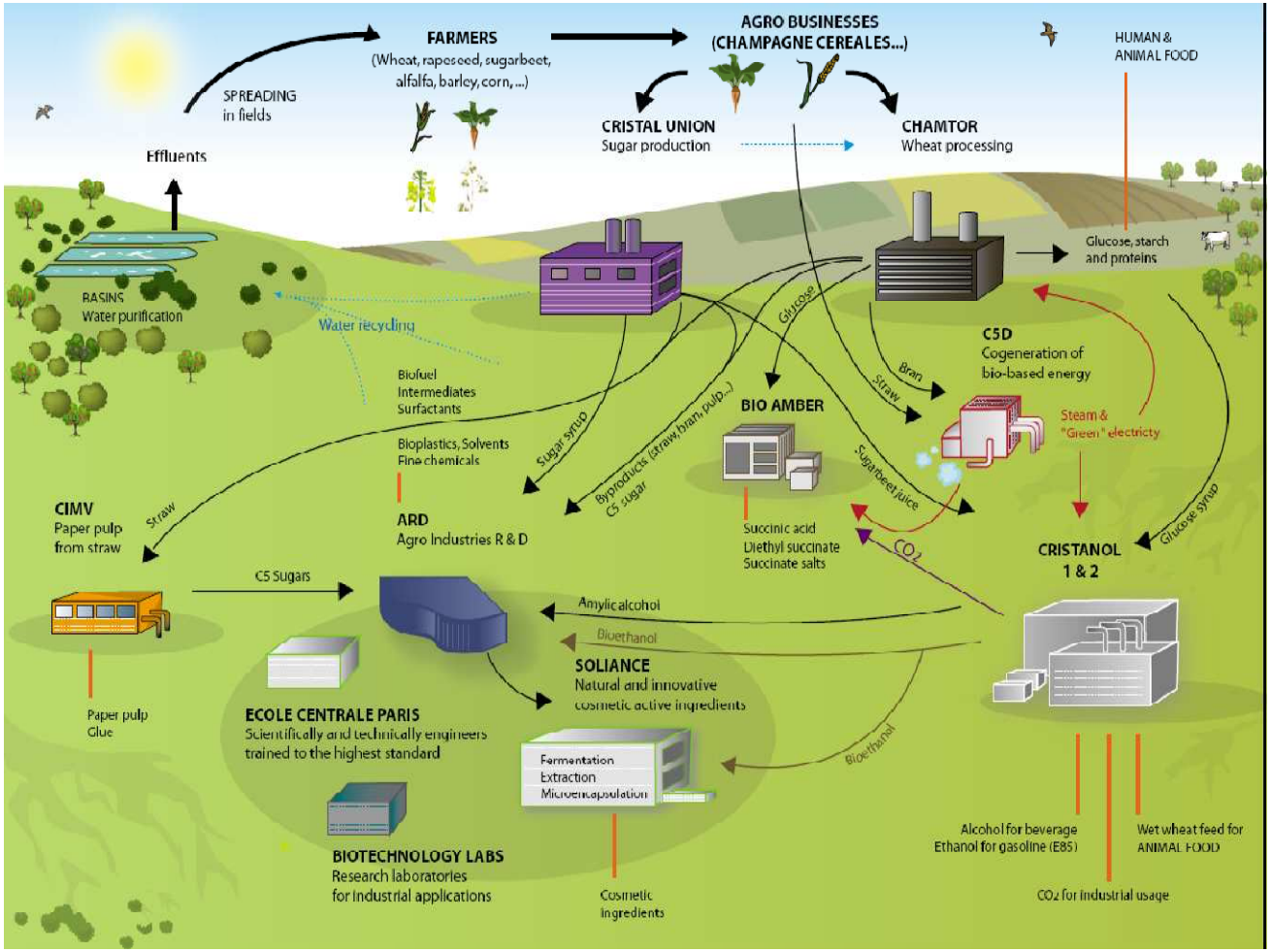
Biorefineries & biomass supply: harbour or rural ?



Biorefinery in the fields

Les Sohettes (F):

a good example

of an integrated rural

(sugar/starch) biorefinery

NO WASTE ....
THE BYPRODUCTS OF ONE COMPANY IS THE RAW MATERIAL FOR AN OTHER

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Prospective des bioraffineries du végétal en Europe

Towards biorefineries in 2030

Biorefinery scale

The choice of the optimal biorefinery scale has to fit size to purposes based on constrains such as logistics, production costs and required size of the processes.

- ✓ Large scale integrated biorefineries, mainly based on thermochemical process, are likely to emerge in Northern Europe and/or in large industrial harbours.
- ✓ Small/medium scale integrated biorefineries, mainly based on biotech processes, are likely to emerge in rural areas in “mid” Europe (western, central and eastern Europe).
- ✓ Decentralised biorefineries will also emerge in both regions, based on the development of a network of pre-treatment units.

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Prospective des bioraffineries du végétal en Europe

Biorefinery concepts in 2030

Starch and sugar biorefineries

diversification of products output (advanced biofuels and specialty chemicals) and of feedstock (lignocellulosic crops)

Oilseed biorefineries

development of a new oleochemistry / relative decrease of 1G biodiesel

Existing industrial value chains

Forest based (pulp & paper) biorefineries

Valorisation of side streams (advanced biofuels and chemicals)

Other lignocellulosic biorefineries

On dedicated lignocellulosic crops & fractionation approach

Green biorefineries

In 2030 many small scale Green Biorefineries will be established in regions that traditionally produce high quantities of wet biomass

New biorefinery types (aquatic, Molecular Farming,...)

new industrial value chains

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Prospective des bioraffineries du végétal en Europe

Biorefinery Vision in 2030

Europe in 2030 is a world leading and competitive Biobased Economy

- *Efficient and flexible utilisation of biomass.*
- *Strong focus on market opportunities for higher-added value products.*

- ✓ 30% of Europe's heat and power production is based on biomass
- ✓ 25% of Europe's transport energy needs are covered by biofuels (increasing share of advanced biofuels and especially biobased jet fuels).
- ✓ 30% of the chemicals market is biobased (50% for high added value chemicals and polymers but 10% for commodities).
- ✓ New generation of biobased materials and composites

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Prospective des bioraffineries du végétal en Europe

Biorefinery Vision in 2030

- ✓ A wide spectrum of competitive biobased products comes from biorefineries' production capacity
- ✓ Versatile biomass supply chains for biorefinery
- ✓ A renewed, competitive and knowledge intensive rural economy based on biorefinery
- ✓ A growing integration of biobased industrial sectors
- ✓ Focus on sustainable products from biorefinery processes gives Europe a competitive edge *("green" products)*
- ✓ Versatile biorefinery development routes *(flexibility)*

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Prospective des bioraffineries du végétal en Europe

Star COLIBRI: Strategic TARgets for 2020

COLlaboration Initiative in BioRefInery:

Day 1, Tuesday 12 April – Future biorefineries

Industry sectors joining forces: www.star-colibri.eu/events

A Joint European Biorefinery Vision for 2030

Forest-Based Sector Technology Platform

European Technology Platform Plants for the Future

SEVENTH FRAMEWORK PROGRAMME

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IAR Industries & Agro-Ressources

SusChem European Technology Platform For SUSTAINABLE CHEMISTRY

MANUFUTURE-EU

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Merci de votre attention.

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