

# CINBIOS-VISIONS-ARBOR: Developing 2<sup>nd</sup> generation technologies for the valorisation of biomass sidestreams

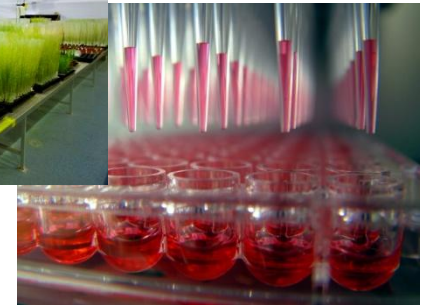
Flanders' Food Sustainability Platform, 19 June  
2014



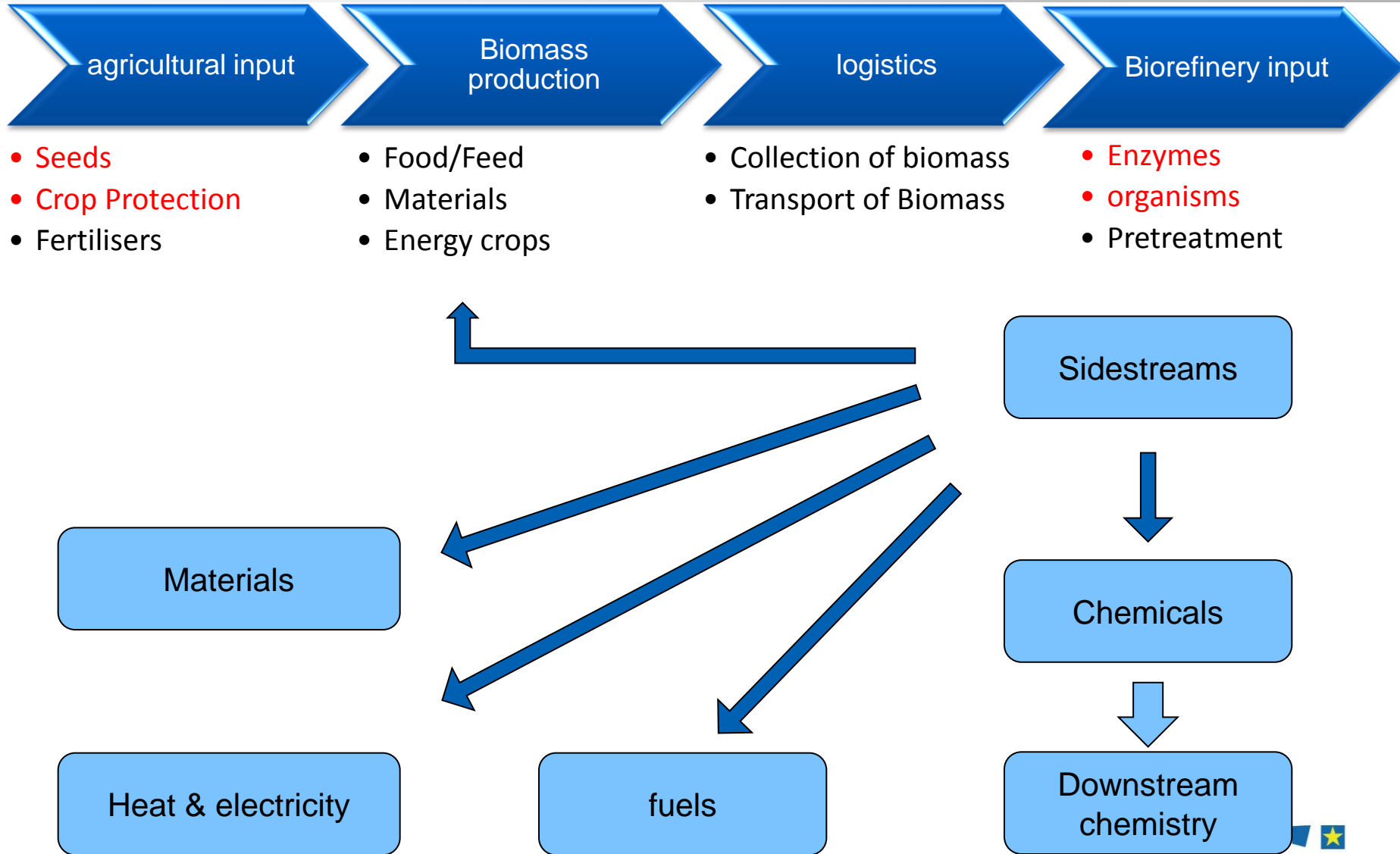
# FlandersBio, the Life Sciences cluster

## Driving the triple helix

- Founded in 2004
- Member organisation – more than 270 members
- Private not-for-profit
- Board of Directors (#17)
- Team of 7
  
- Means:
  - Strategic partners and Membership
  - Sponsoring
  - Project subsidies:
    - IWT, EU, FIT, ...



# Value Chain in the biobased economy



# CINBIOS – industrial biotech cluster

A common initiative of van:



CINBIOS: an essential link between companies from diverse industrial sectors, and between these companies and the knowledge centers

# VISIONS

IWT funded collective research project

Collaborating within the region on second generation technology

# VISIONS project: Valorisation of Organic Sidestreams

- **Project duration: 4 years**
- **Start date: 1 september 2011**
- **Budget: 2.5 million Euro, IWT Funded (80%) cofunded by industry (35 companies)!**
  - Development of a **database of organic sidestreams** in Flanders
  - Development of **2<sup>nd</sup> generation technologies** for lignocellulosic sidestreams and waste oils.
  - Dissemination and **implementation** in Flanders



**Activities have reached over 150 companies today**

# Organic waste in Flanders – e.g. Agriculture

Primaire stroom	Jaar	Primaire productie (ton)	Type nevenstroom	Areaal (ha)	Volume (NS) (ton/ha)
<b>Granen</b>					
Korrelmaïs	2012	772794	Blad- en stengelmasa	66051	25
Wintertarwe	2012	661169	Stro	75133	4
Wintergerst	2012	105379	Stro	12253	4
Triticale	2012	24956	Stro	3565	4,5
Zomergerst	2012	4231	Stro	651	3
Zomertarwe	2012	3924	Stro	604	3,5
<b>Zetmeelrijke gewassen</b>					
Aardappelen	2012	1631087	Blad- en stengelmasa	37932	-
<b>Nijverheidsgewassen</b>					
Suikerbieten	2012	1577850	Bladmasa + koppen suikerbieten	21038	40
Winterkoolzaad	2012	2366	Stro	640	2à4
<b>Peulvruchten</b>					
Bonen (industrie)	2011	89100	Blad- en stengelmasa	8100	10
Erwten (industrie)	2011	64400	Blad- en stengelmasa	9200	10
<b>Vollegroendsgroenten</b>					
Wortelen	2011	317400	Bladmasa	5100	-
Prei vers	2011	132000	Bladmasa (groen deel)	4000	10 (vers), 20-30 (industrie)

# 2nd generation technology development: lignocellulose

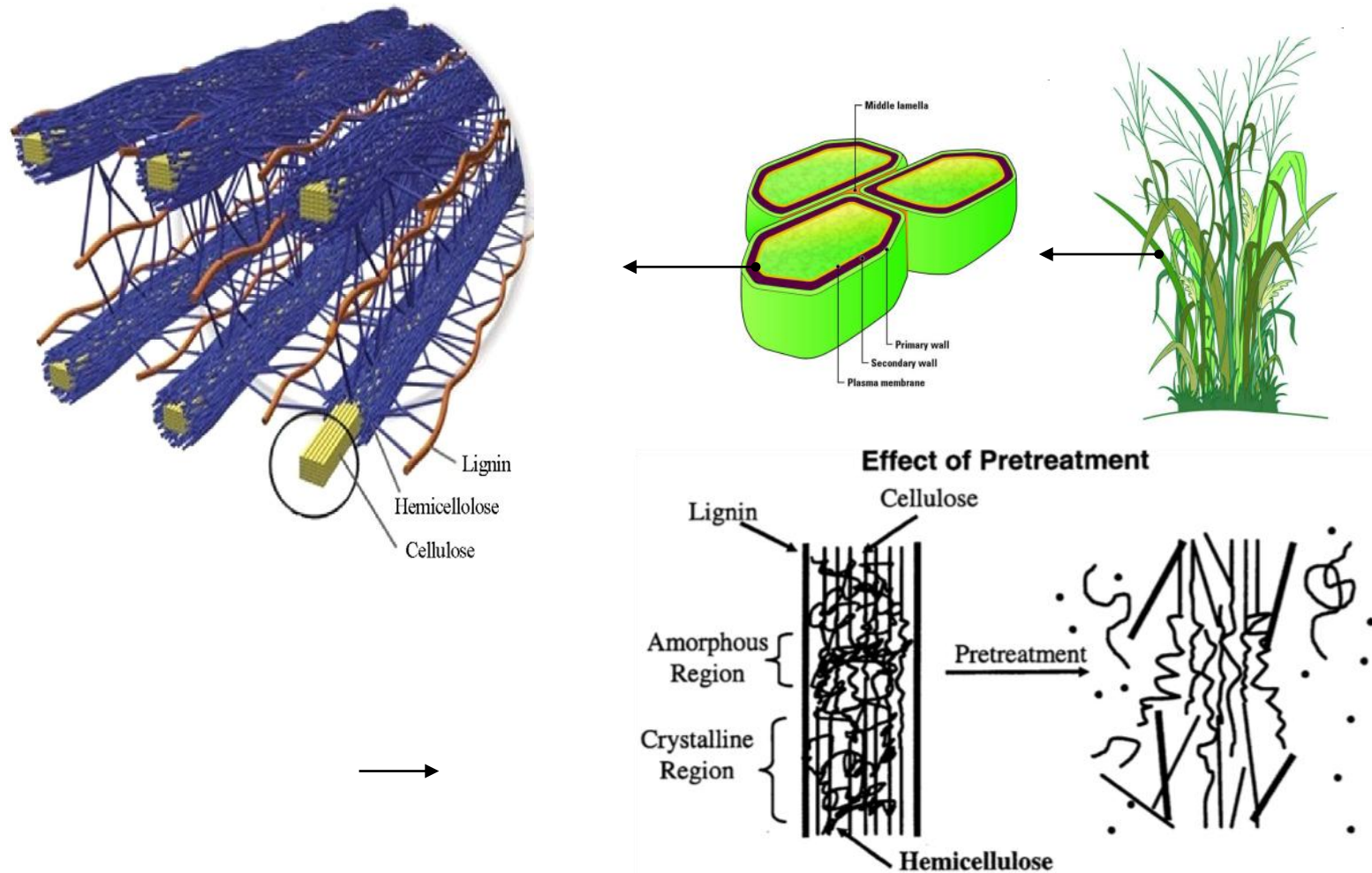
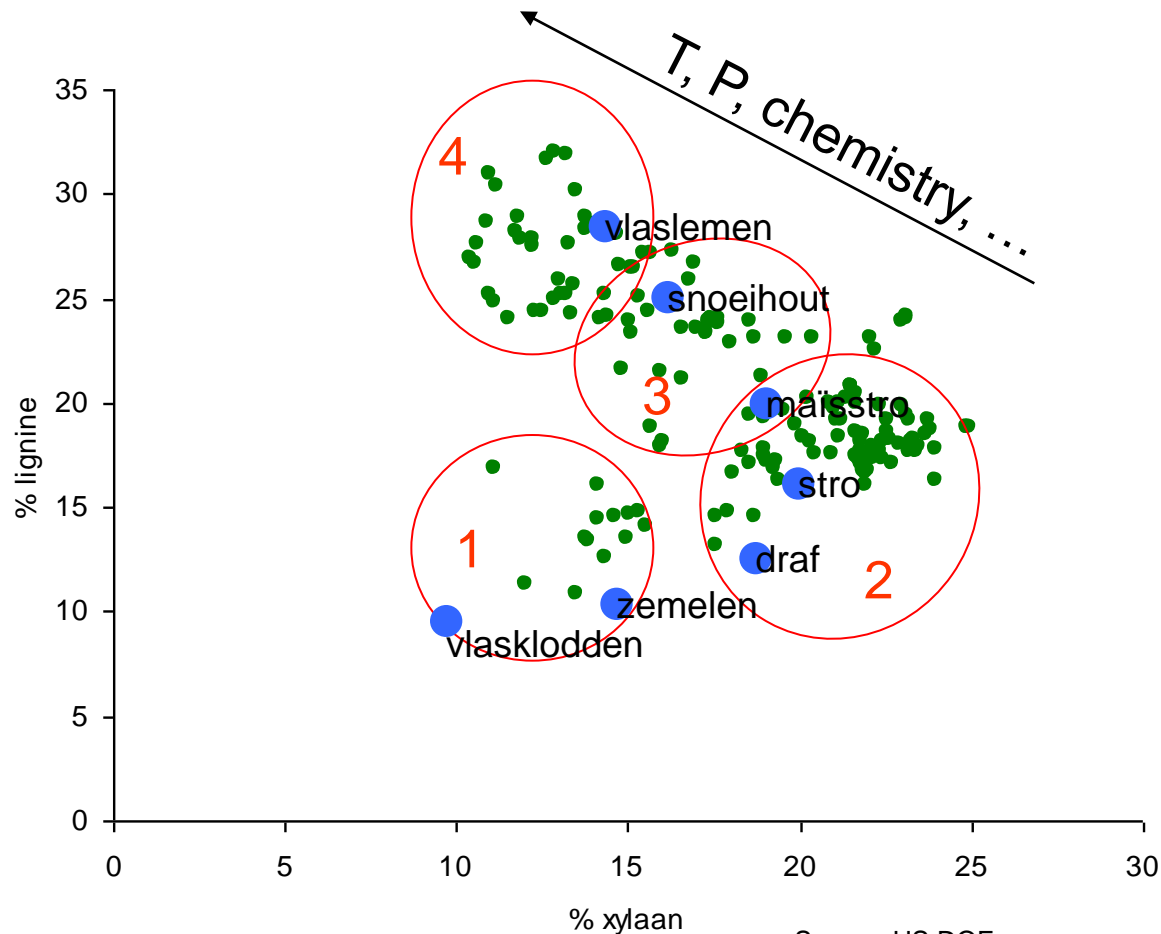


Fig. 1. Schematic of goals of pretreatment on lignocellulosic material (adapted from Hsu et al., 1980).



# 2nd generation technology development: lignocellulose

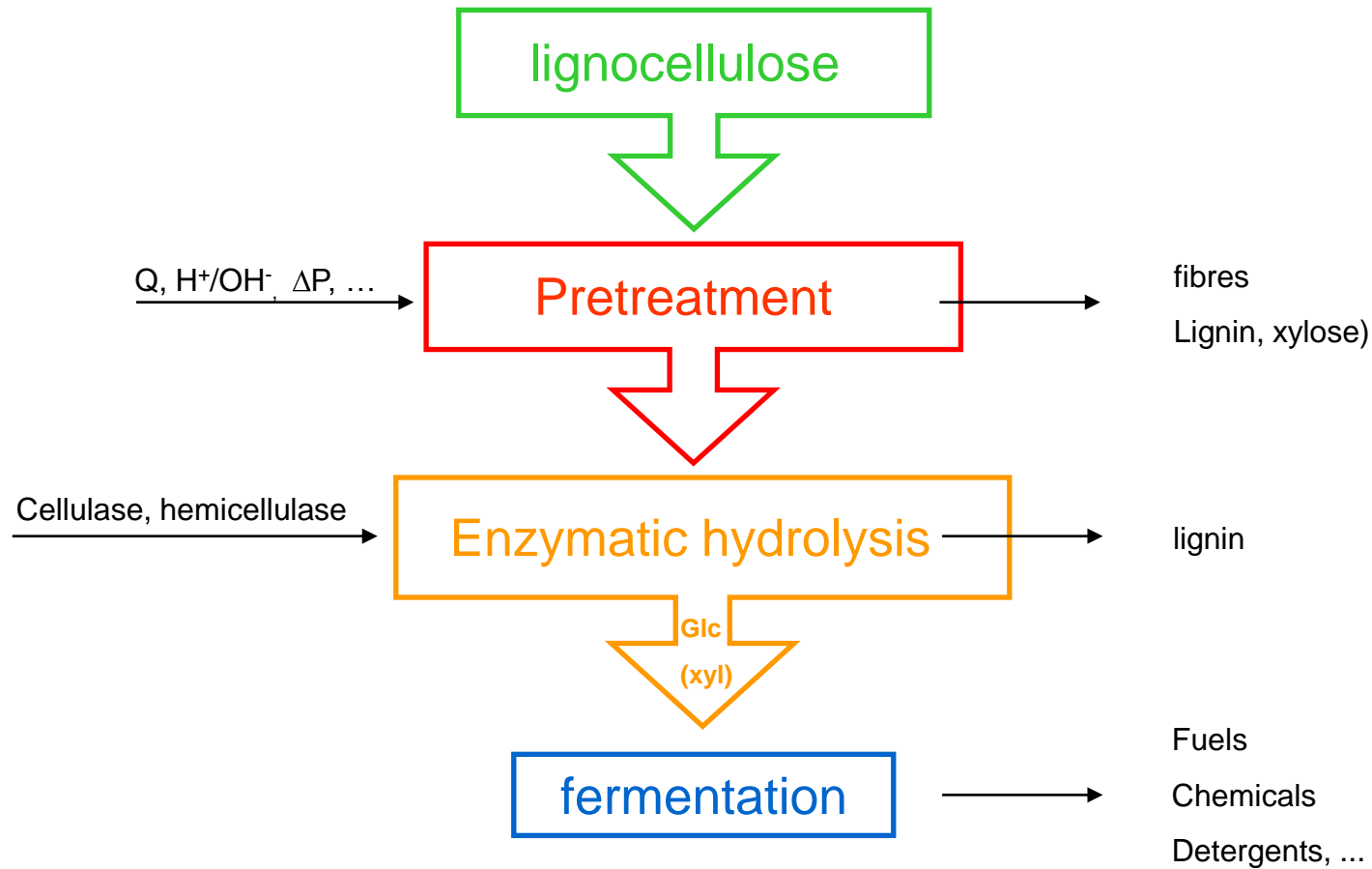
## Theoretical decision matrix



Source: US DOE

<http://www.afdc.energy.gov/biomass/progs/search4.cgi>

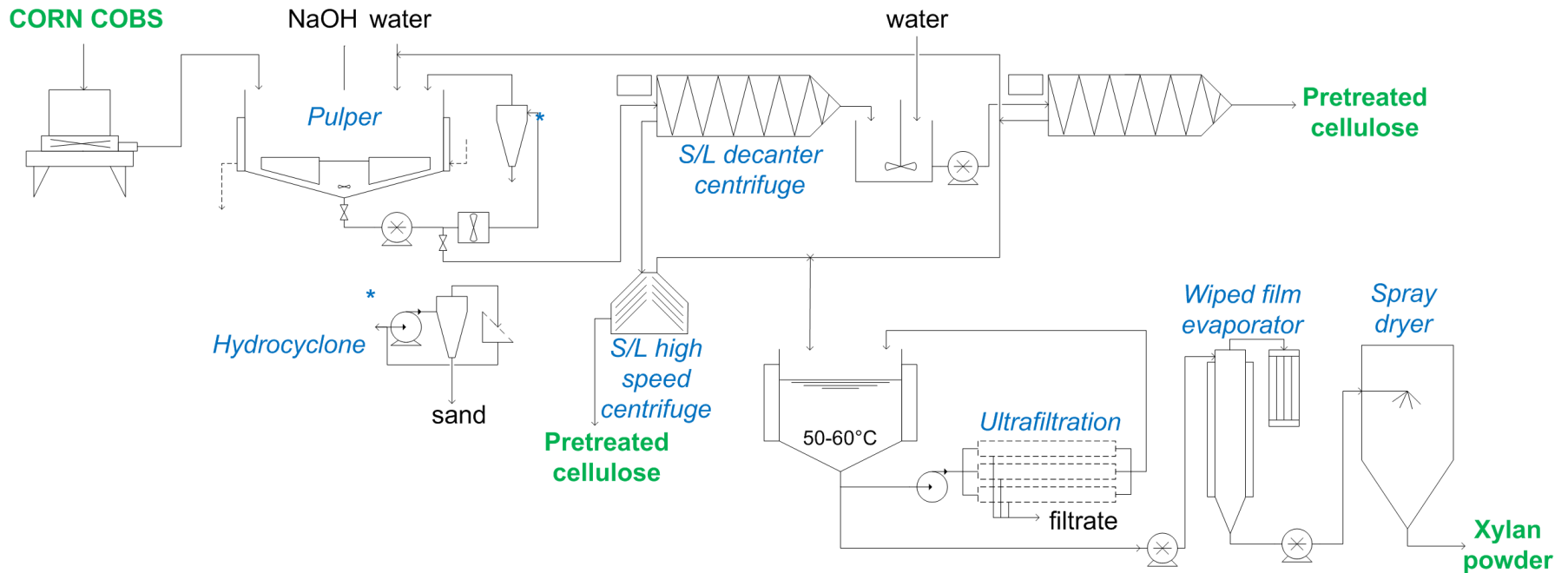
# 2nd generation technology development: lignocellulose





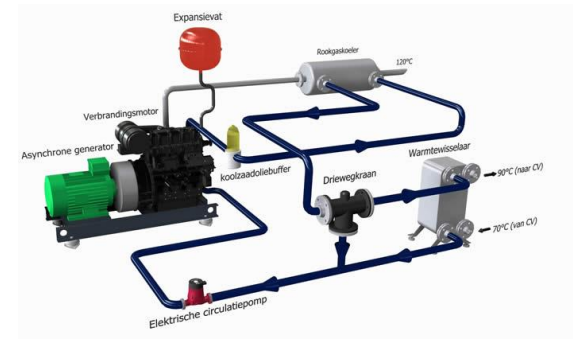
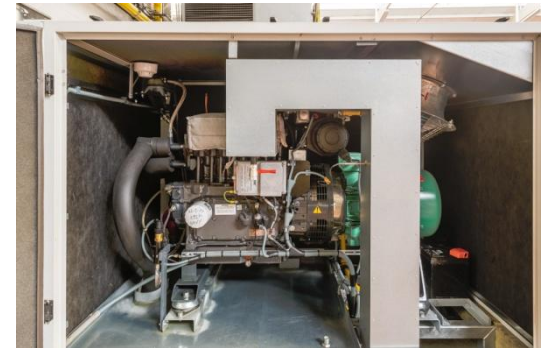
# Corn cobs fractionation

## Pilot process xylane powder:



# 2nd generation technology for Waste oils & Fats

- Transformation of Cat 1 fats to 2nd generation biofuels for decentralised heat & electricity generation, .....
- Development of chemical intermediates



# ARBOR

Interreg IV B NWE project

Collaborating between regions  
in establishing the biobased economy



INTERREG IVB



# ARBOR, Interreg IVB NWE project

- Interreg IVB NWE project
- Approved as Strategic initiatief, March 2011
  - 13 partners from 6 North West European regions
  - Staffordshire UK, Flanders Belgium, the Netherlands, Luxemburg, Saarland, Dublin Ireland,
  - Observers from France and Switzerland
- Total budget: 7.289.415 euro



## WP1

- Stimulating sustainable production, collection and preparation of biomass

## WP2

- Conversion and utilisation of biomass to energy

## WP3

- Sustainability assessment and strategy development



# WP 1 Production, Collection and Preparation of biomass

## ■ Development of **agro-side streams** for bio-energy

- Pilot 1: Valorisation of straw of maize
  - Up to 7 – 8 tons DM/hectare?
  - Important source of organic matter for the soil
- Pilot 2: Valorisation of stems of Brussels sprouts
  - 2 to 3 tons DM/hectare?
  - Left on the field, source of undesired high amounts of nitrogen in winter

Pilot 3: ...

- Development of **Synergy** parks: biomass from industry for bio-energy



# WP 1 Production, Collection and Preparation of biomass

## ■ Development of low-impact (non-Food) energy crops

### ■ Pilot 1: Multifunctional **Short Rotation Coppice**

- SRC & biodiversity/nature conservation
- SRC & agroforestry
- SRC & buffering on industrial sites



### ■ Pilot 3: Harvesting biomass from marginal land or non-used land

- Biomass from treatment wetlands: reed
- **Biomass from contaminated land**: phytoremediation  
more specific in 'Vlaamse & Nederlandse Kempen' 700 km<sup>2</sup> is  
contaminated with heavy metals

## WP1

- Stimulating sustainable production, collection and preparation of biomass

## WP2

- Conversion and utilisation of biomass to energy

## WP3

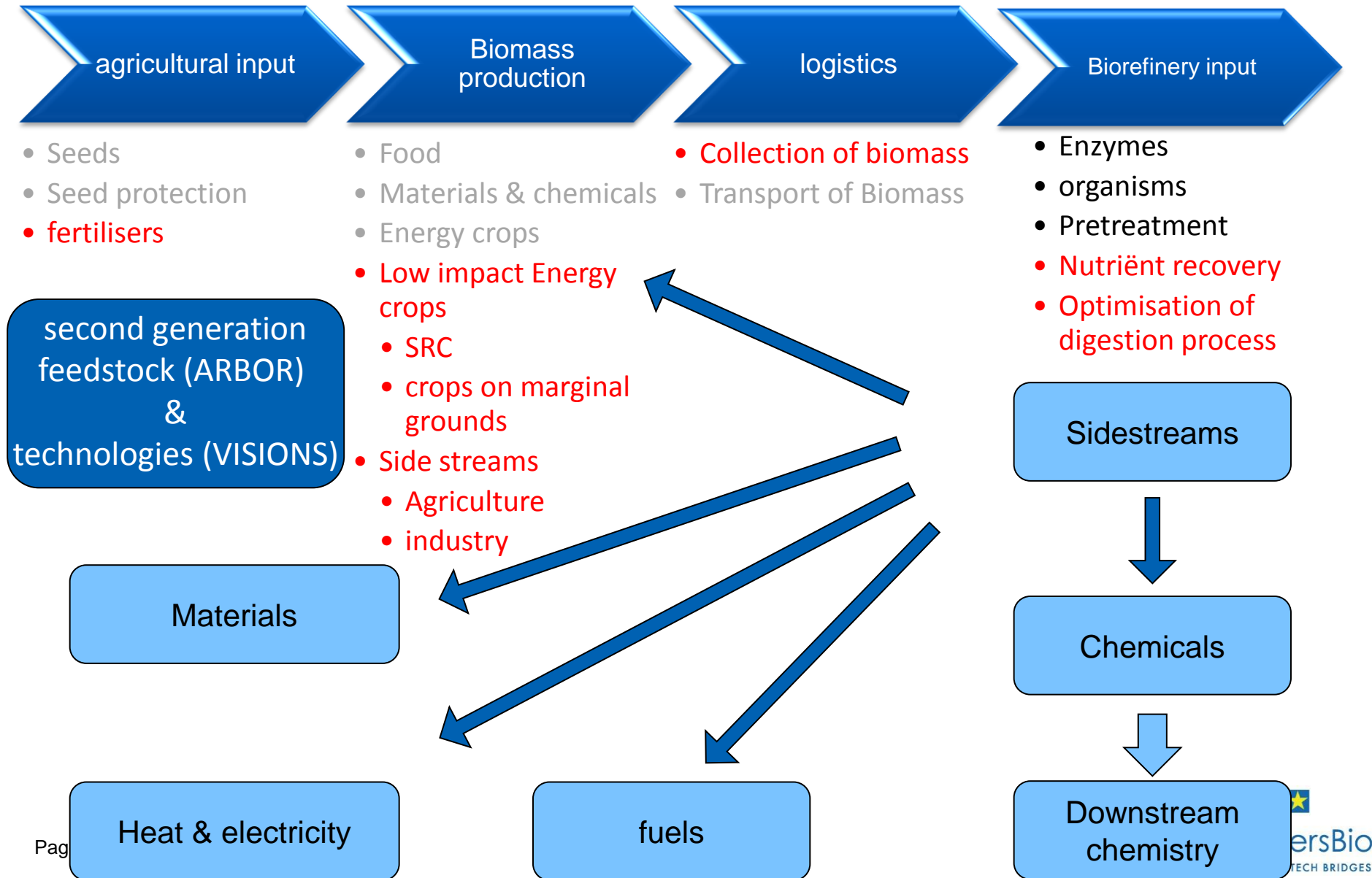
- Sustainability assessment and strategy development

## WP 2 Conversion and utilisation of biomass to energy

- Action 7: Inventory of existing conversion processes
- Action 8: Characteristics of biomass samples
- Action 9: **Inventory and evaluation of nutrients from digestates and valorisation potential of the resulting end-products**
- Action 10: Innovation and technology watch
- Investment 3: Biogas hub
- Investment 4: Centre of Excellence for Biomass
- Added value and outputs

Interest from the  
chemical industry

# Value chain in the biobased economy



# Flanders' assets in developing the biobased economy; roadmap KET-Ind Biotech

- **Strong agro-base:**
  - knowledge intensive agriculture
  - Strong agro-Food industry
  - Established biogas sector
- **Strong chemical base (Antwerp= top 3 chemical cluster in the world)**
- **Strong logistics (harbour based biorefinery concepts)**
- **Strong in basic and applied research (universities, VIB, VITO, ILVO, ....)**
- **Positive government attitude**
- **Financing instruments available (to a certain extent)**

# Flanders needs in developing the biobased economy

- Collaboration
- Demonstration
- Public awareness creation,
- .....

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