

Session: Using biobased sources for new chemicals and materials
Presentation by: Ad de Laat, *Cosun Innovation*

Title: **Processing underutilised low value sugarbeet pulp into value added products**

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Curriculum:

Ad de Laat studied cell biology and got his PhD degree in plant physiology in 1982 both at the Agricultural University Wageningen. After 5 years in science in one of the Wageningen Institutes (ITAL) he took responsibility for the biotech activities in the breeding company VanderHave (part of Cosun).

After a short period as secretary of the executive Board of Cosun (1997-1999) he became director of the Cosun Food Technology Centre in Roosendaal. As from 2014 he is Innovation manager Agro and New Business, and responsible for scouting and early selection of new business opportunities for the Cosun companies.

Abstract:

Cosun is Coordinating a BBI project titled Pulp2Value. The objective is to develop an integrated processing concept for sugar beet pulp, delivering high value products for food and non-food markets for each of the major pulp constituents.

A powerful consortium of committed stakeholders succeeded in the successful development of desired products from the cellulosic (Betafib being a potent rheology modifier), the pectic (galacturonic acid and its derivatives as building block for e.g. surfactants and polymers) as well as the hemicellulosic fraction (Arabinose as a health promoting food ingredient or chemical intermediate).

The integrated process is designed for sustainability and economic performance, and has been scaled up to the demo level. Market pull will be the driving force for further upscaling to a full industrial scale.

<http://pulp2value.eu/>



www.pulp2value.eu

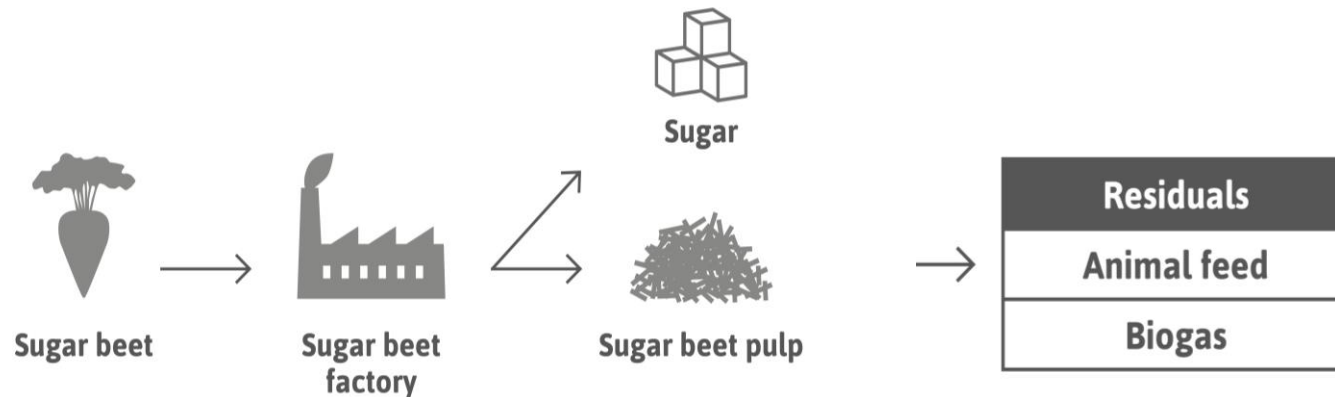
Processing Underutilised Low value sugarbeet Pulp into VALUE added products



The project has received funding from the Bio-Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 669105.

BACKGROUND

Sugarbeet pulp is a major residual stream from the sugar beet industry, which is currently valorised as low value feed and/or green gas. In Europe sugarbeet pulp accounts for a production volume of approx. 13 million tonnes per year.



Raw material

Beet pulp (dry)

- 25% Pectin
- 25% hemi cellulose
- 25% cellulose
- 15% other organic
- 10% ash

Primary Products

Special Sugars

- Arabinose
- Rhamnose
- Mannose
- Galactose
- other

Micro Fiber

Galacturonic acid

Oligo's

Derivatives

Plasticizers

Surfactants

Galactaric acid

“CBB”

Adipic acid

Furans

Gal X

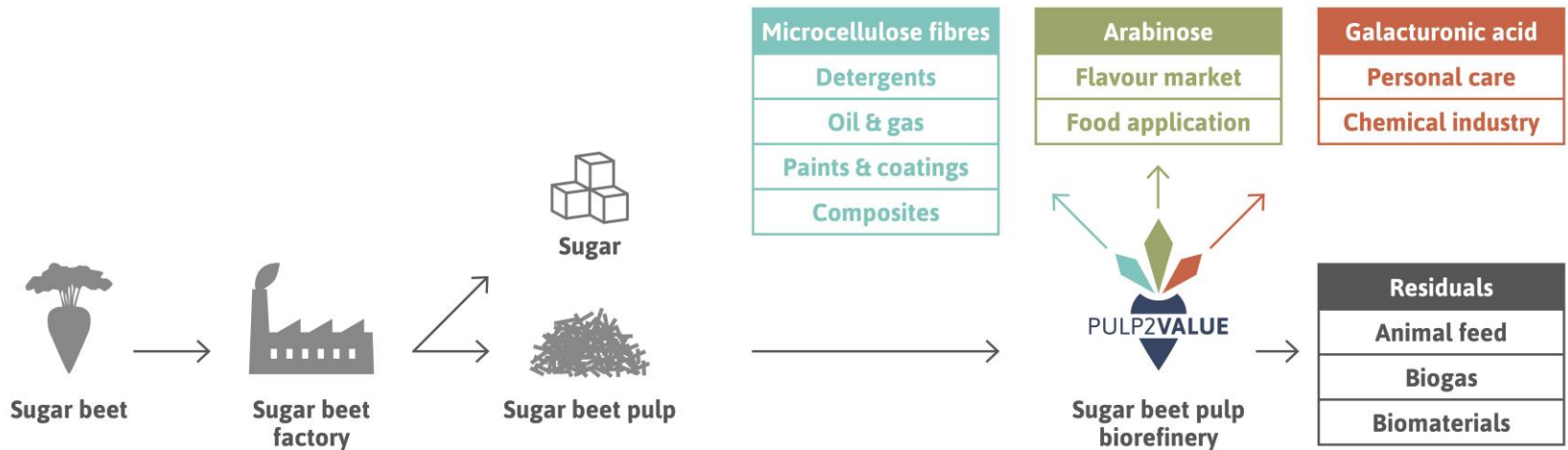
Markets

- feed
- biogas
- powder/tablets
- paper

- food
- pharma
- leather
- coatings
- composites
- flavors
- cosmetics
- detergents
- chemicals
- feed

- polymers
- chemicals
- leather
- cosmetics
- coatings
- plastics

SCOPE & OBJECTIVES



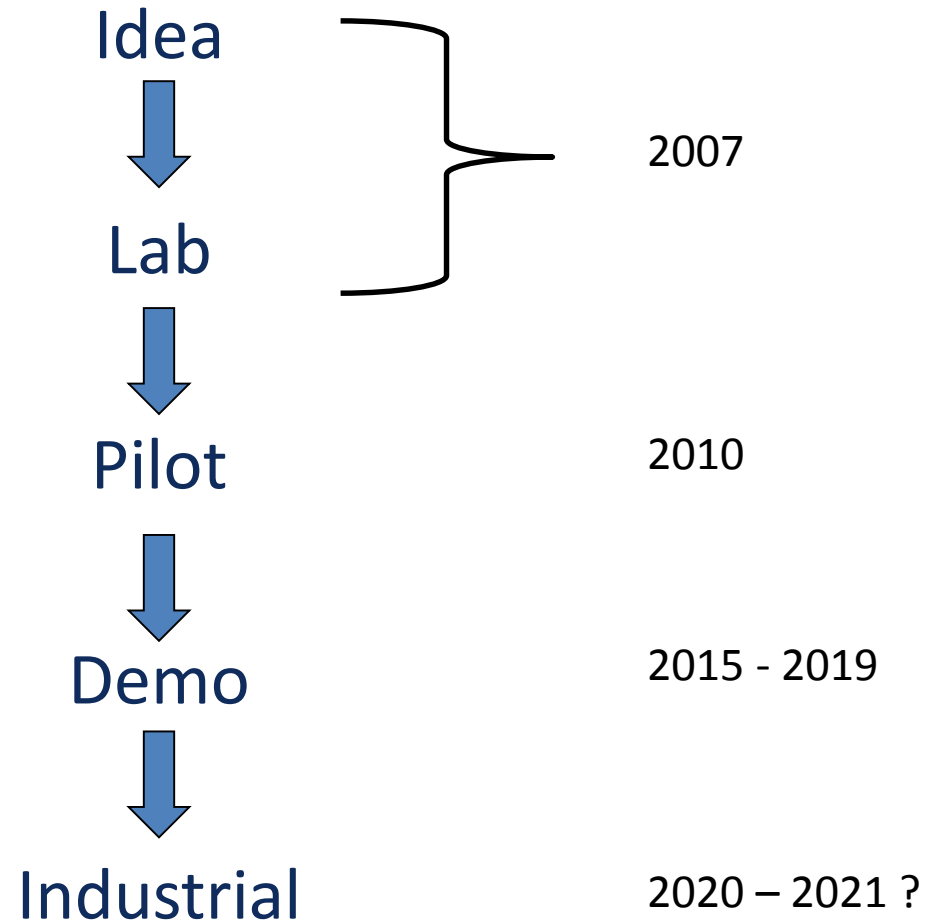
Main objectives:

- To optimize, scale up and integrate processes.
- To build long lasting value chains.
- The ultimate goal is to set up a **demonstration plant** which refines sugarbeet pulp in an **integrated and cost-effective cascading biorefinery**.

Innovation = Endurance !



**"Endurance is not just the ability to bear a hard thing, but to turn it into glory."
-William Barclay**



Lab: Grams - 20 kg



Pilot: 1 - 500 kg



Demo: 1 - 5 ton

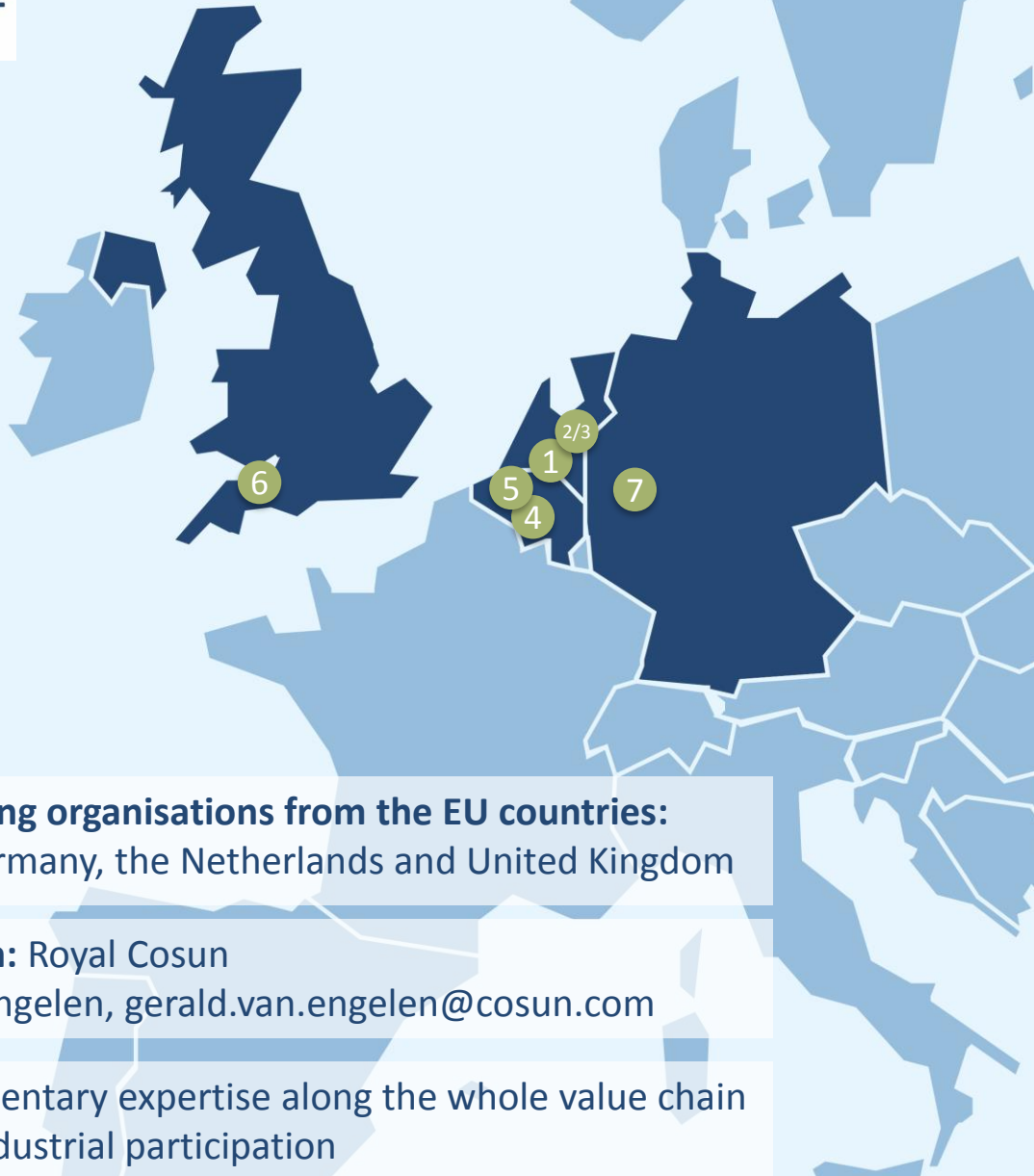


“Our dream”





The PULP2VALUE consortium



7 participating organisations from the EU countries:
Belgium, Germany, the Netherlands and United Kingdom

Coordination: Royal Cosun
Gerald van Engelen, gerald.van.engelen@cosun.com

- ▶ Complementary expertise along the whole value chain
- ▶ Strong industrial participation

- 1** Royal Cosun

- 2** Wageningen UR
Food and Biobased Research

- 3** Wageningen University
part of Wageningen UR
Division of Human Nutrition

- 4** Orineo bvba

- 5** Bio Base Europe Pilot Plant

- 6** Refresco Gerber UK Limited

- 7** nova-Institut für politische und ökologische Innovation GmbH


Project data

- ▶ PULP2VALUE receives funding from the **Bio-based Industries Joint Undertaking** under the European Union’s **Horizon 2020** research and innovation programme under grant agreement No 669105.



- ▶ PULP2VALUE is one of the two **demonstration** projects in the **Bio-based Industries Joint Undertaking (BBI JU) Call 2014**.
 - ▶ PULP2VALUE relates tot the BBI annual work plan topic BBI VC3.D4 2014: “Functional additives from residues from the agro-food industry”.
 - ▶ BBI JU Project Manager:
- ▶ **Budget:**
 - ▶ Total cost: 11.4 million Euro
 - ▶ Funding: 6.6 million Euro
- ▶ **Duration:** July 1, 2015 – June 30, 2019



PULP2VALUE Approach and main activities

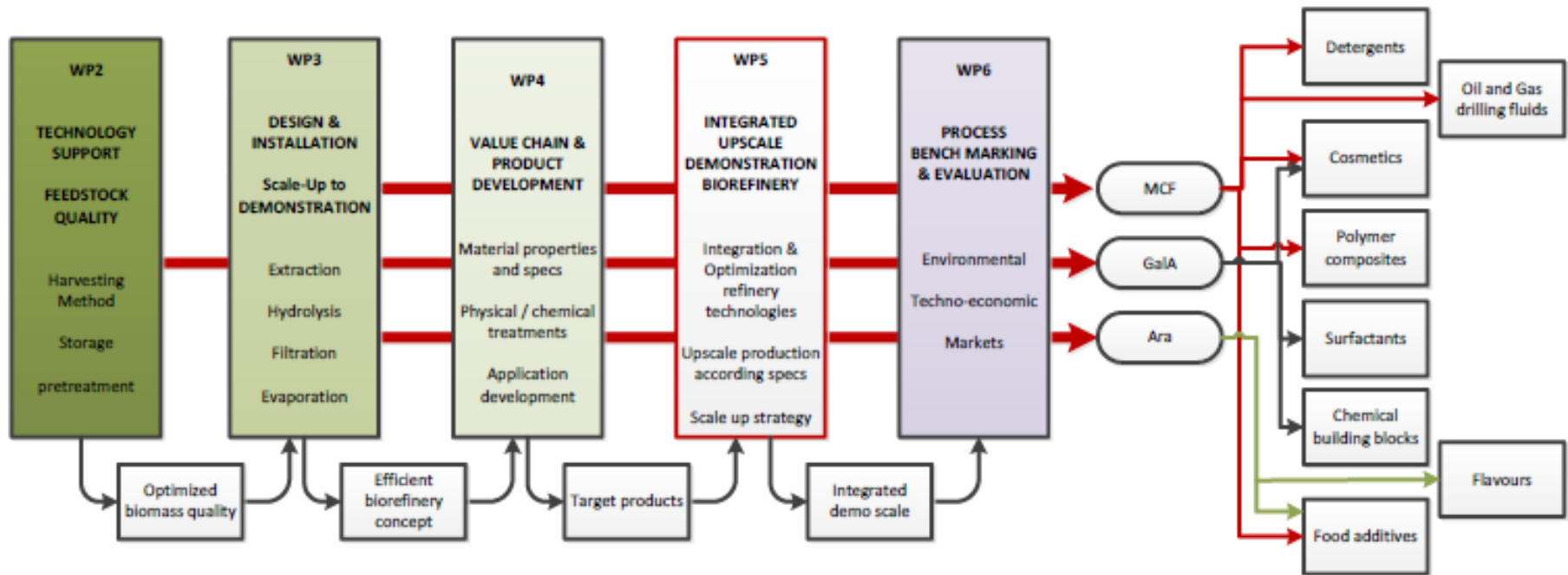


Figure 2: Value chain approach for optimal SBP valorisation in a range of new value chains

Evolution of sugarbeet biorefinery



Grow

Harvest

Logistics

Process

Logistics

Sugar



Biorefinery

Side streams

Fibers
Arabinose
Green chemicals
Other



Storage
Biomass

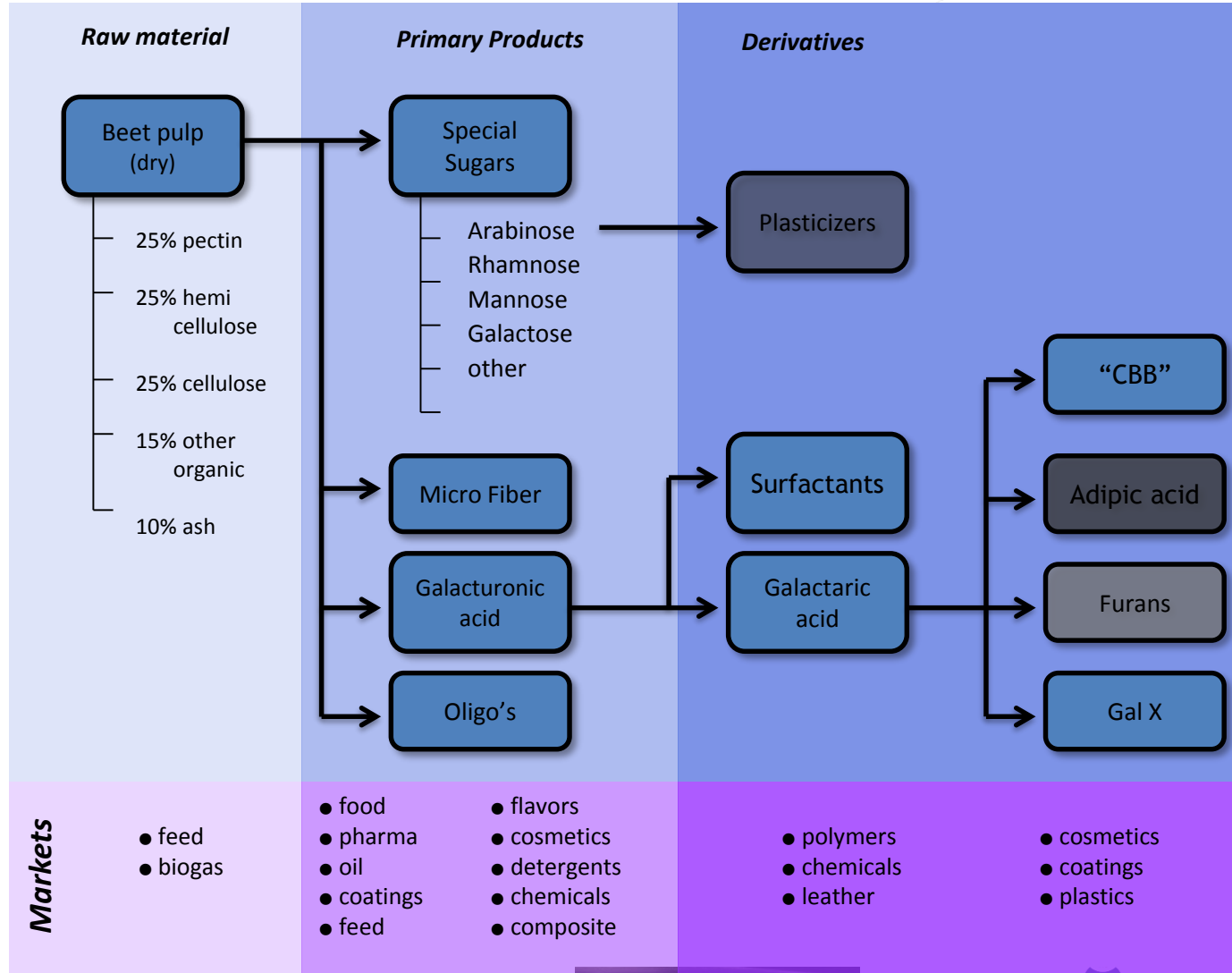
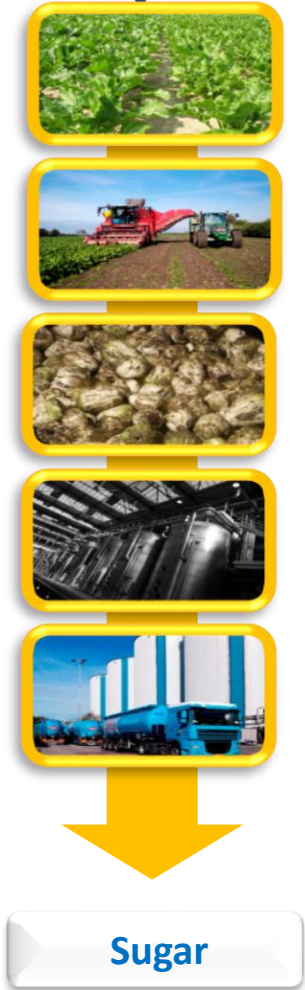


Digester

Green gas



Evolution of sugarbeet biorefinery



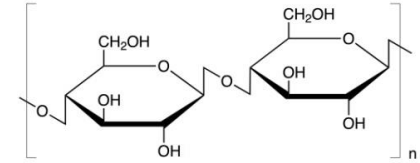
Value chain developments



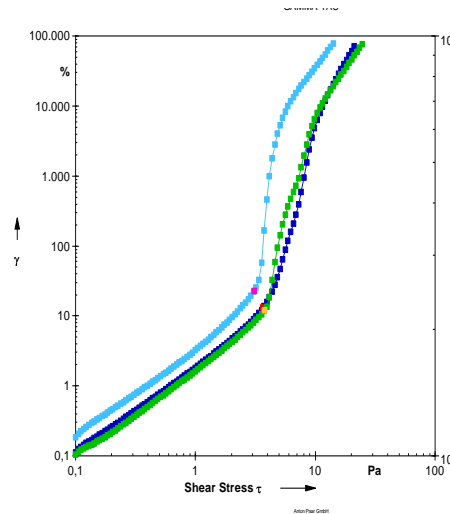
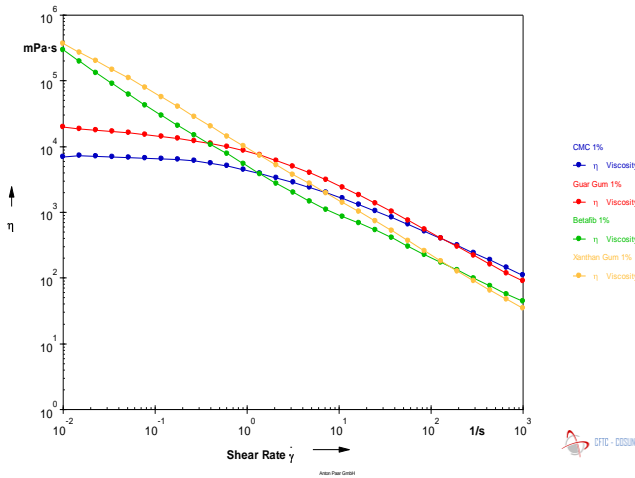
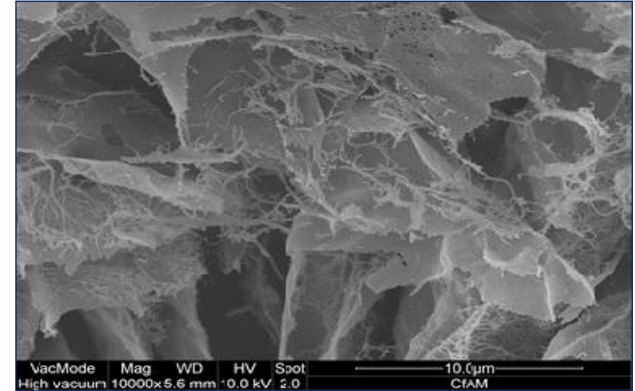
From biomass...

...to end-users

Betafib[®] MCF

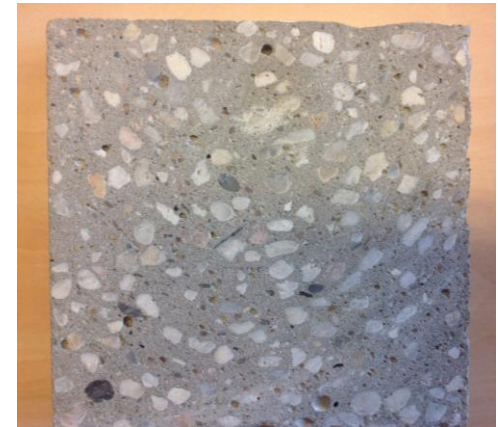
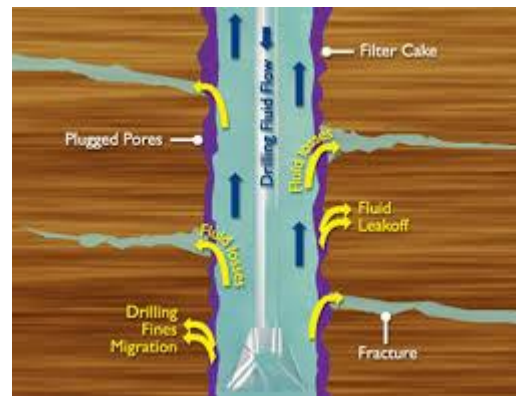


- ▶ Basic properties
 - ▶ Rheology profile
 - ▶ Shear thinning
 - ▶ High yield point
 - ▶ Structurant (particles).

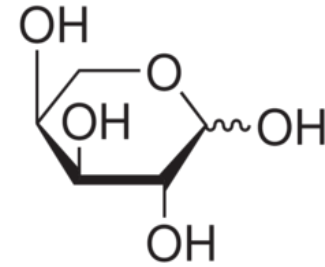


Betafib[®]: Applications

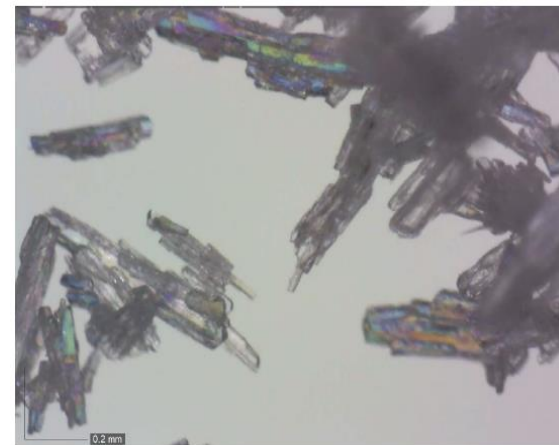
- ▶ Liquid detergents
- ▶ Paints & Coatings
- ▶ Drilling muds
- ▶ Cement / concrete
- ▶ Food



L-Arabinose

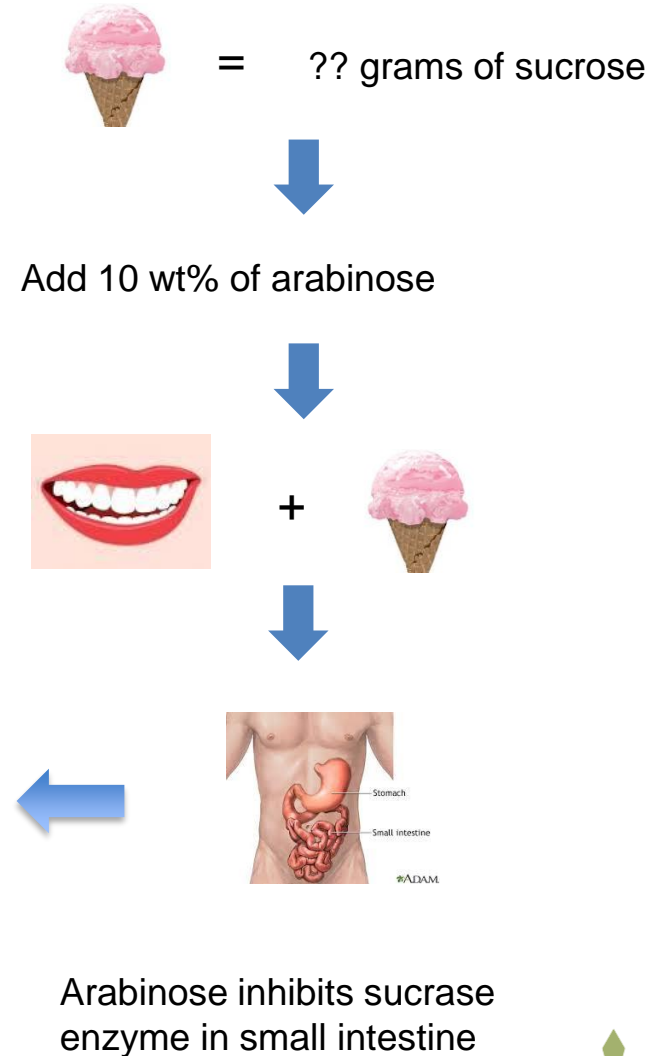
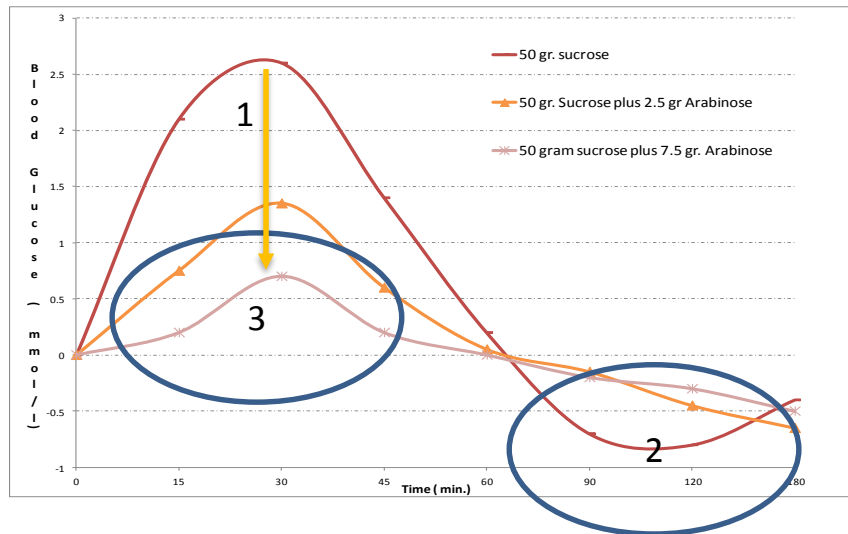


- ▶ Sweetness: 60% of sucrose.
- ▶ Available as syrup or high purity crystalline powder
- ▶ No adverse health effects in digestive system up to single dosages of 20 grams.



L-Arabinose

- ▶ Health benefits (WUR):
 - Lowering glycemic index
 - Reduction insulin response
 - Prolonged feeling of satiety



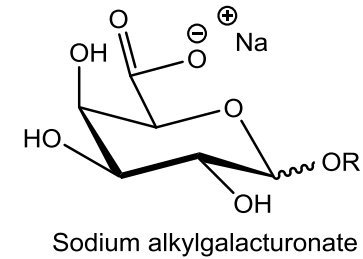
L-Arabinose: Applications

- ▶ Flavour
- ▶ Food products icw sucrose
 - ▶ Sports drinks, supplements, cereal bars, muffins



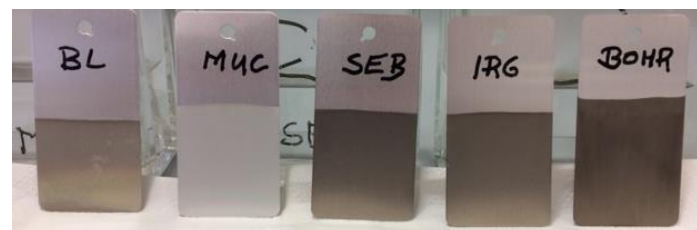
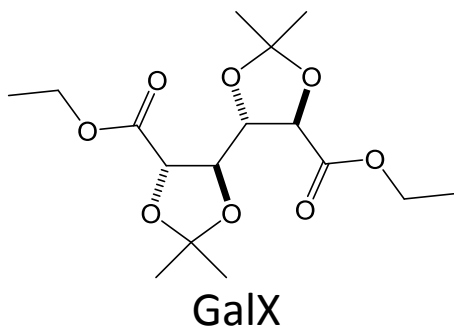
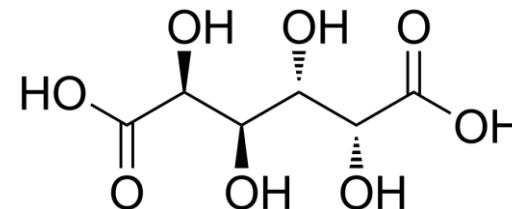
Galacturonic acid

- ▶ Anionic surfactants based on D-galacturonic acid
- ▶ Sulphate free
- ▶ Mild (non-irritant)
- ▶ Good foaming properties
- ▶ Personal care



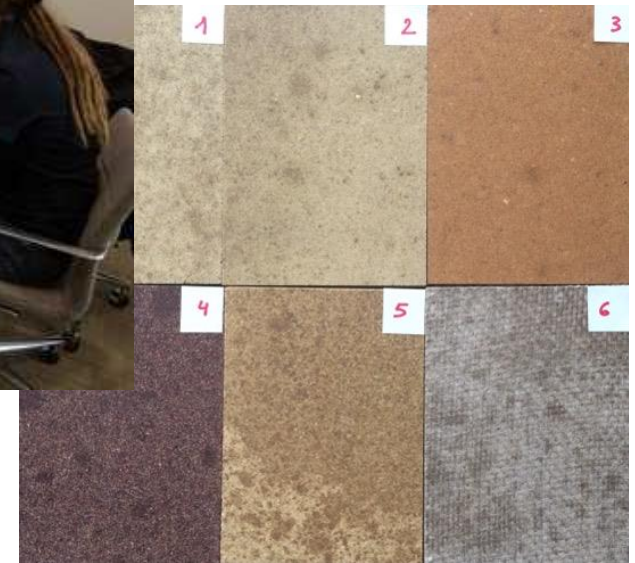
Galactaric acid

- ▶ Chelating agent (cosmetics)
- ▶ Corrosion inhibition
- ▶ Rigid building blocks for polymers (Gal X, cross-linker)



Orineo: Betabind[®] in composites

► Flooring panels and table tops

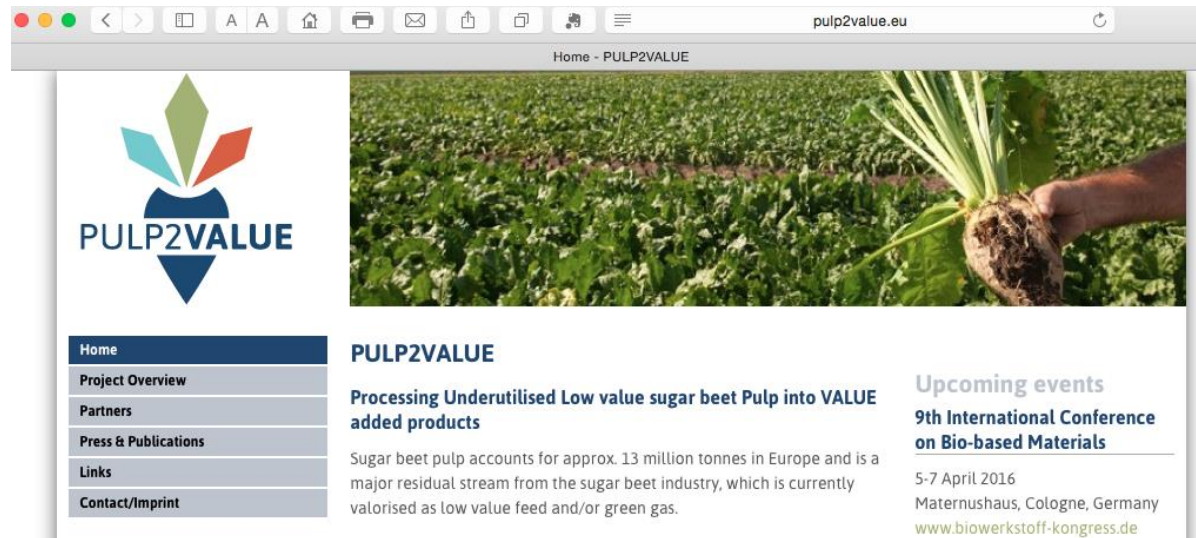




For more information, please visit our website:
www.pulp2value.eu



For questions, please contact the project coordinator:
Gerald van Engelen, gerald.van.engelen@cosun.com



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