Cosun Beet COMPANY

Sugar Beet : Sustainable Source for Bio-based Chemicals and Materials

CBPM Symposium 2022

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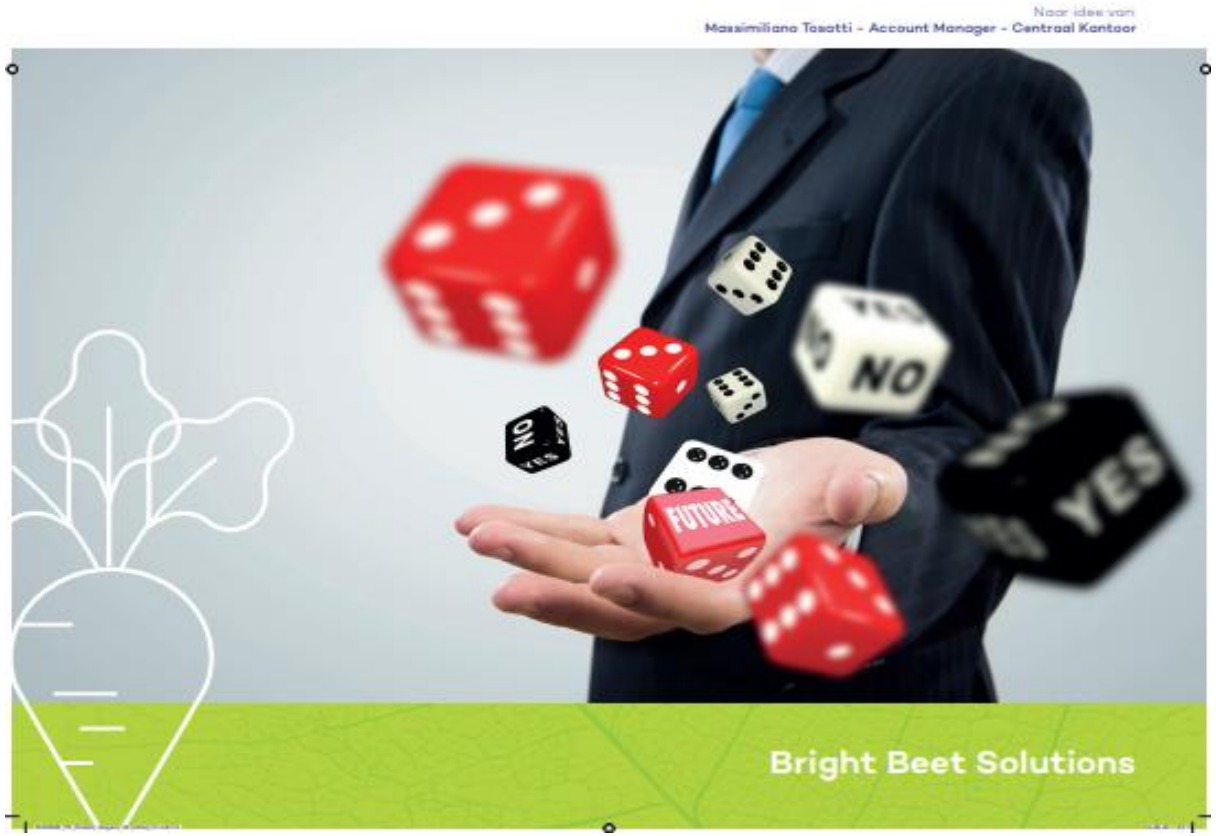
Bright Beet Solutions

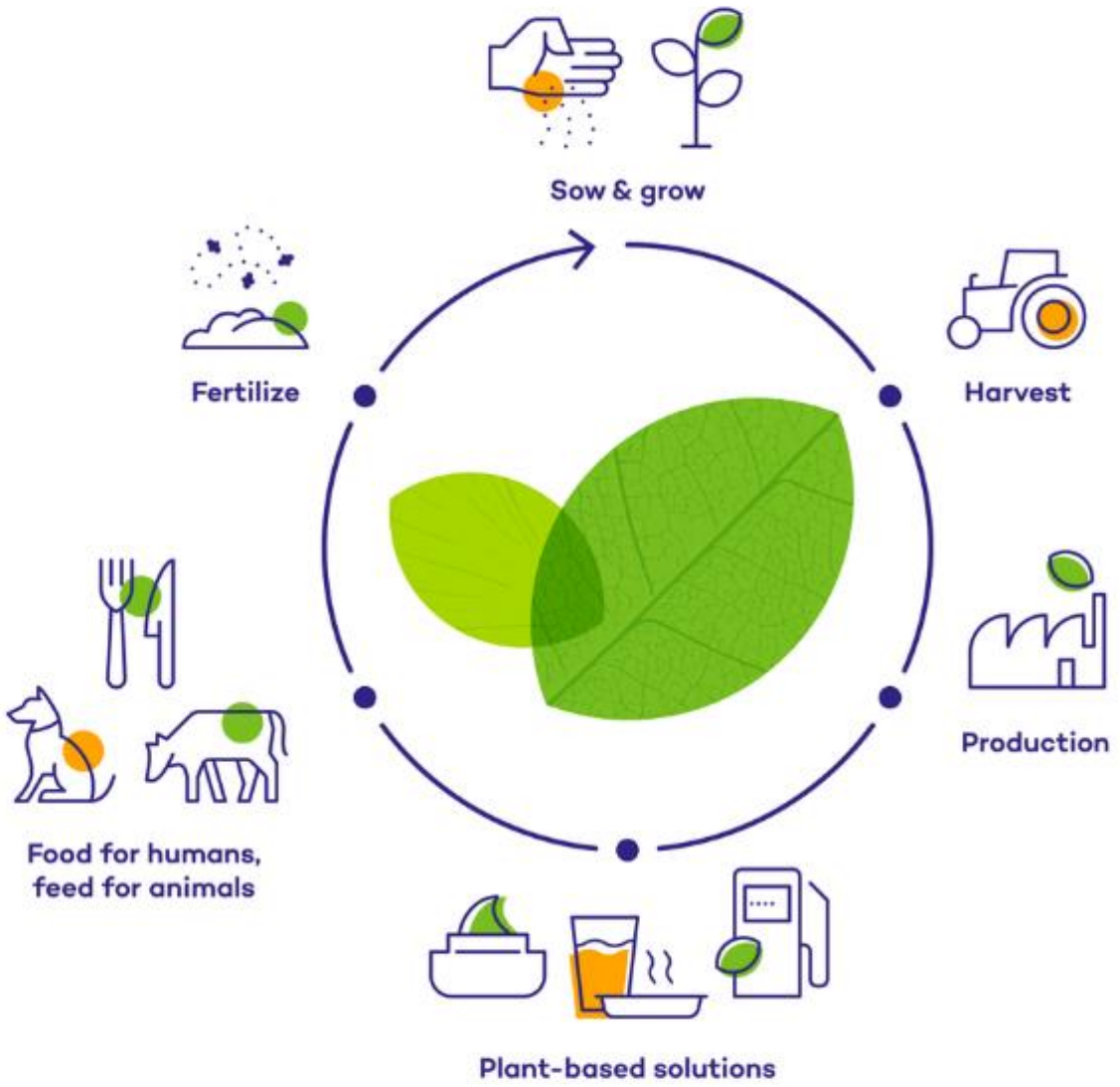
BET on the FUTURE!



Agenda

- About Cosun
- Need for renewable carbon
- Why Sugar Beet
- Biorefinery Concept
- Examples
- Conclusion

Cosun



Royal Cosun

- Royal Cosun is an agro-industrial group processing arable crops and other vegetable raw materials
- Cooperative of approx. 9,000 sugar beet growers
- Processing up to 10 million tons of plant-based materials
- Head office located in Breda, The Netherlands

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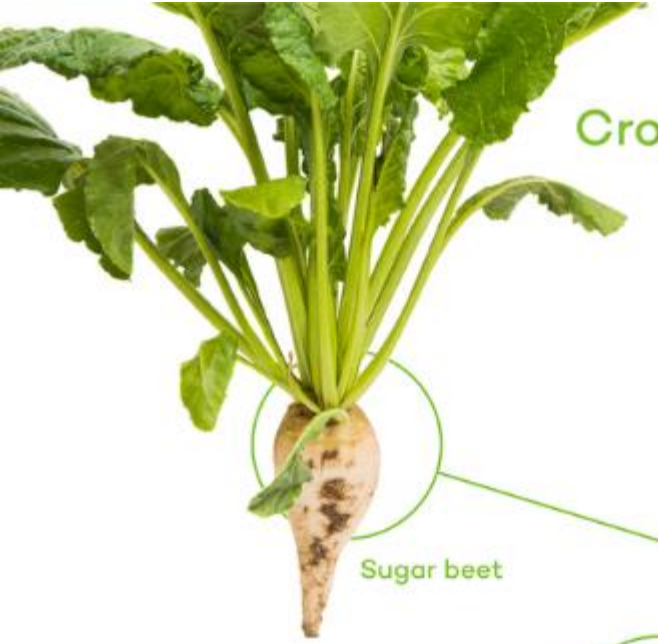
Crops → Processing and innovation → Solutions



Sugar beet

Potato

Cichory

Vegetables & Fruit

Cosun

Aviko
Cosun Beet Company
Duynie Group
Sensus
SVZ

Food

Food ingredients

Feed

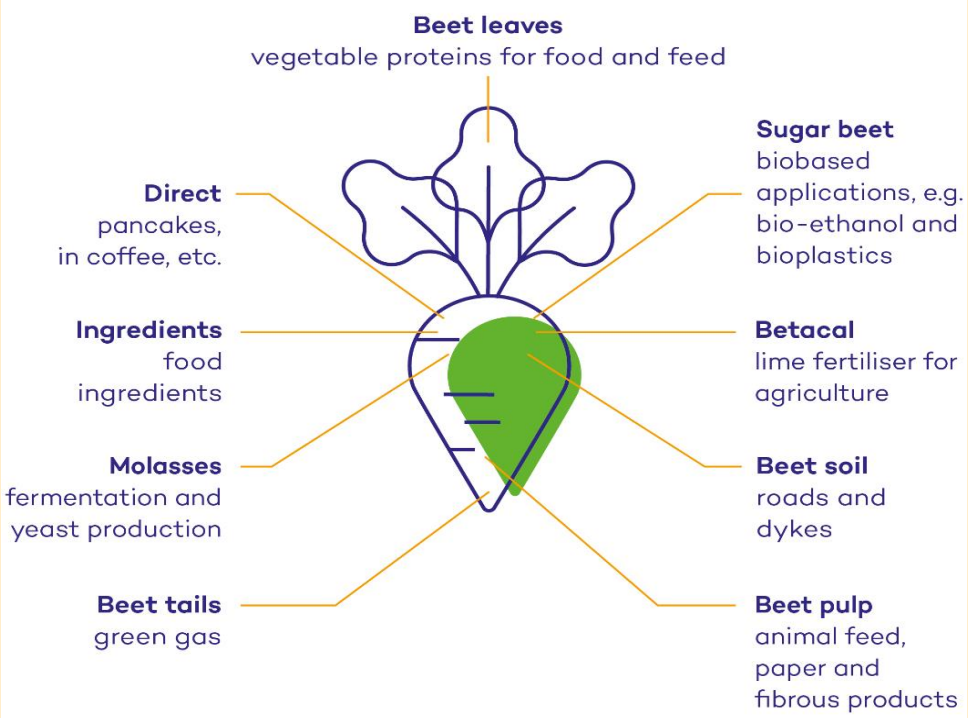
Pet food

Biobased solutions

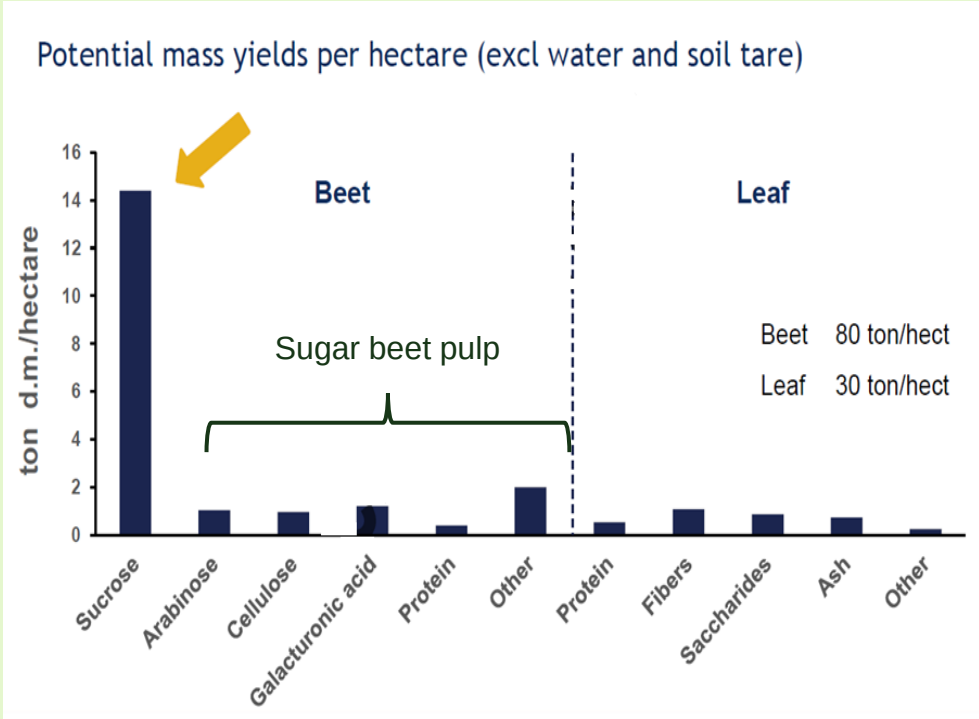
Green energy

We make a plant-based contribution to the circular solutions needed for the current social challenges we all face

Bright Beet Solutions



Sugar Beet is more than sucrose



Reference: Van der Poel et al., Sugar Technology.

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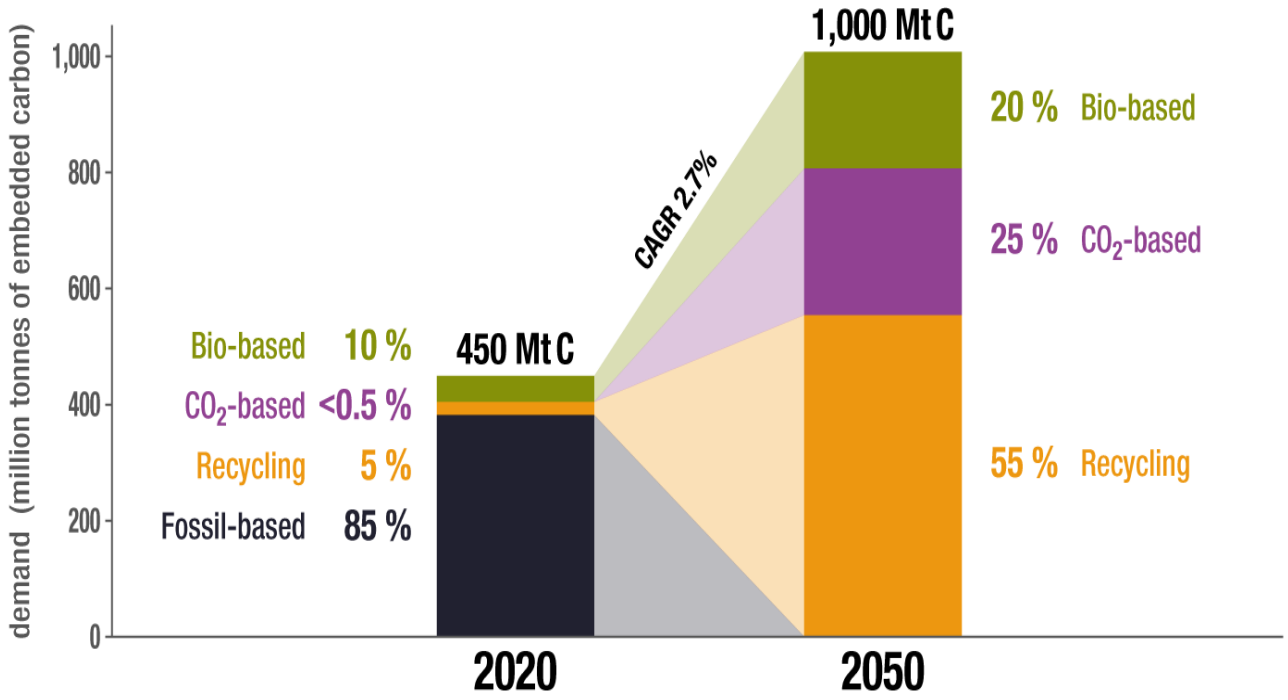
Need for Renewable Carbon

- 85% of global carbon required for organic chemicals and derived materials is fossil based
- Chemical and plastic industries need alternative carbon sources
- Use of Biomass to shift towards a more sustainable and climate-friendly production and consumption
- Sugar Beets are sustainable and ready to use source of Renewable Carbon



Global Carbon Demand for Chemicals and Derived Materials

Source- Nova Institute_Renewable Carbon Initiative

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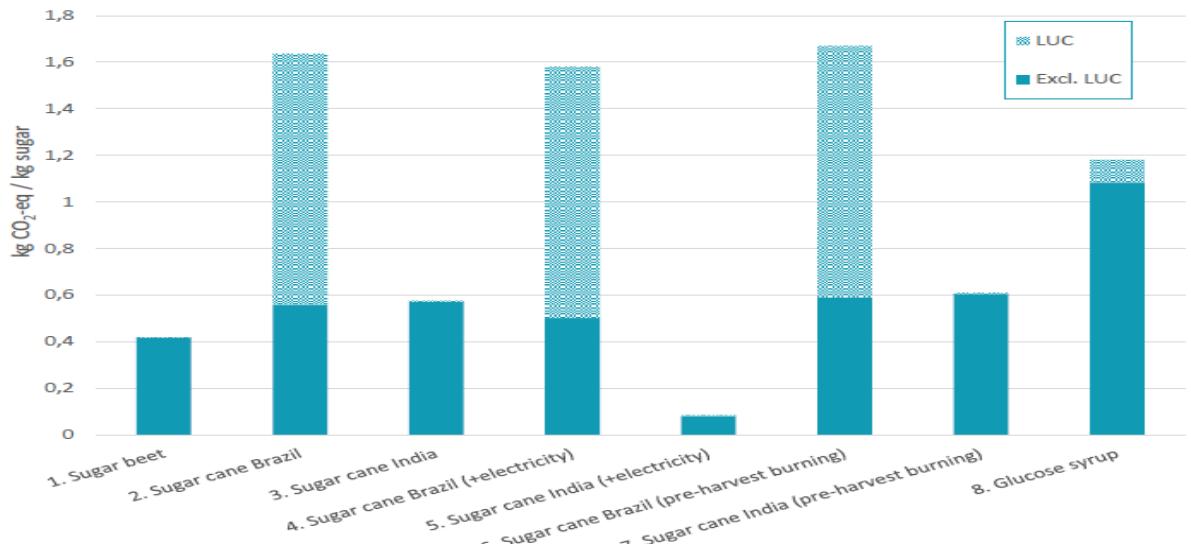
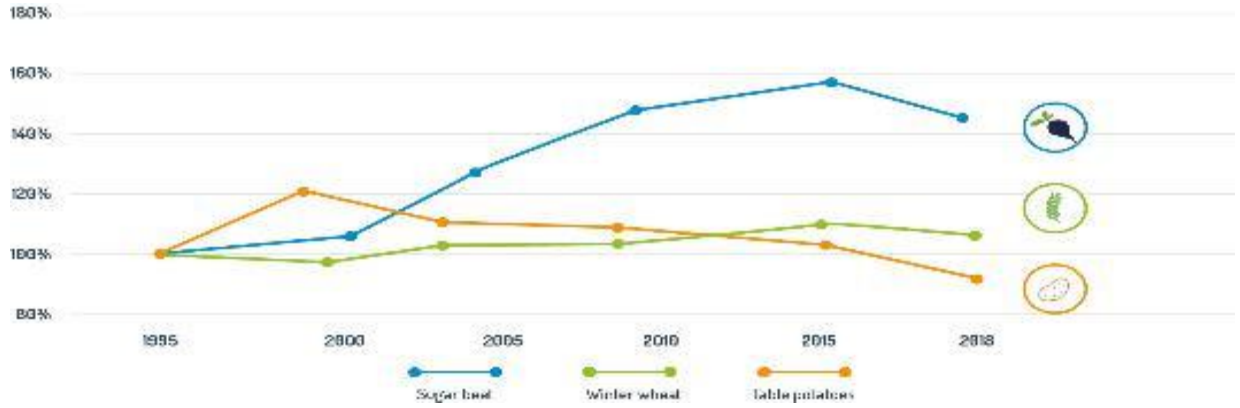
The unbeatable beet

LIFE CYCLE IMPACT ASSESSMENT



YIELD DEVELOPMENT SINCE 1995



Sugar beet is sustainable feedstock for bio-based products

- Direct access to sugars
- Well established supply chain
- Higher yields
- Low carbon footprint
- Locally grown

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Sugar

Molasses

Sugar beet pulp

Technology Platform

Green Chemistry

Enzymatic Conversion

Biorefinery

Bio-based Chemicals & Materials

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Sugar Beet based Glycols

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Cosun Beet Company + Avantium:
complementary capabilities to deliver plant-based glycols

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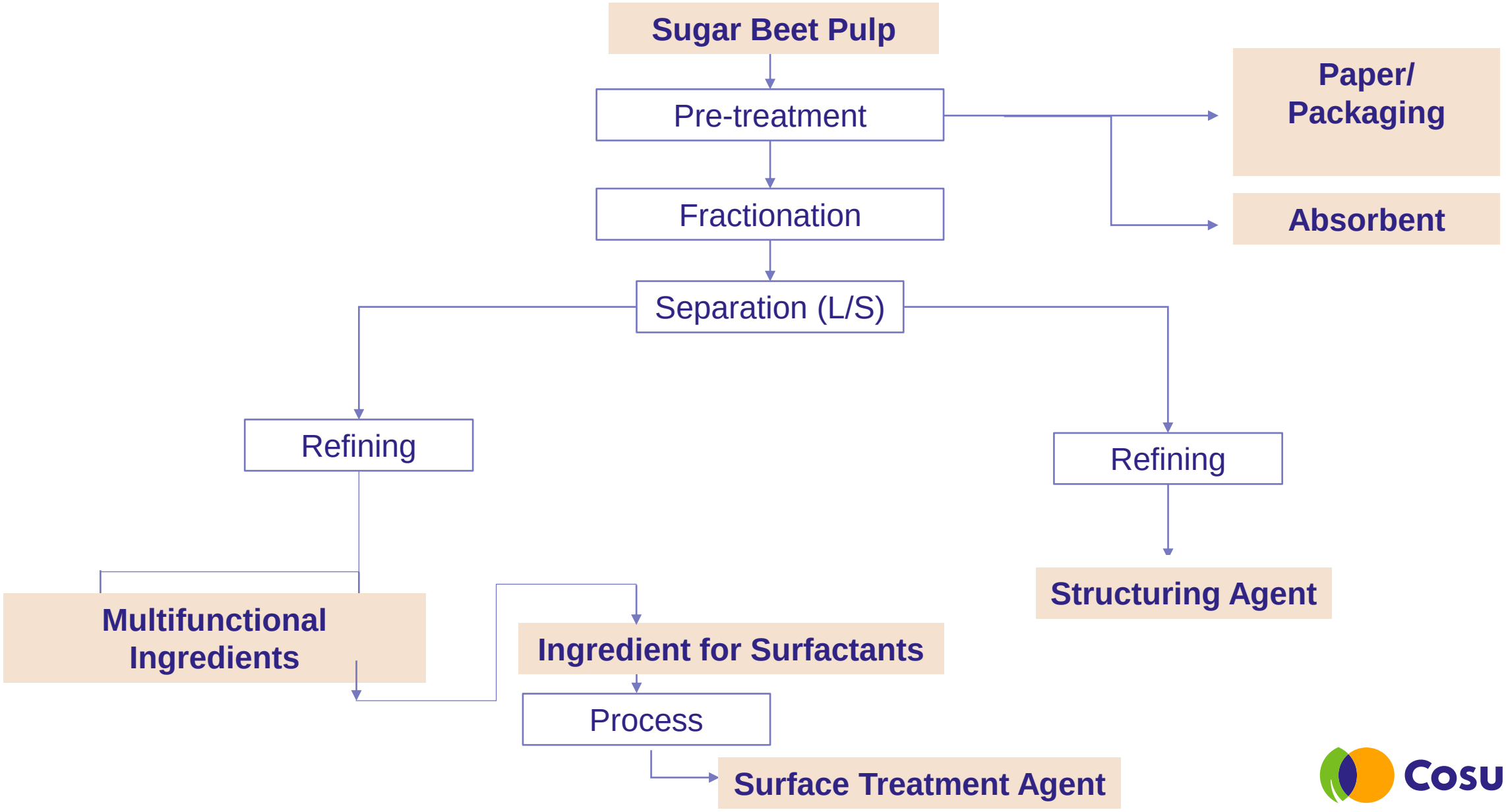
General Biorefinery Concept



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Making Packaging more Circular & Sustainable

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Sugar Beet Paper

Sugar beet pulp up to 80% more sustainable than cellulose

WHEN REPLACING 20% OF WOOD FIBER FOR SUGAR BEET PULP

THE ENVIRONMENTAL FOOTPRINT IS REDUCED BY 16%

6%
CO2 EMISSION REDUCTION

17%
PARTICULATE MATTER FORMATION REDUCTION

5%
LESS TERRESTRIAL ACIDIFICATION

18%
LESS AGRICULTURAL LAND USAGE

10%
LESS WATER

Innovation through collaboration

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Sugar Packaging with Beet Paper

- Leading by example
- Van Gilse sugar from April '21 in Crown Native beet paper
- Successful with industrial 25 kg packs
- Sugar beet pulp in packaging : developments under progress

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Making Home & Personal care products more Sustainable

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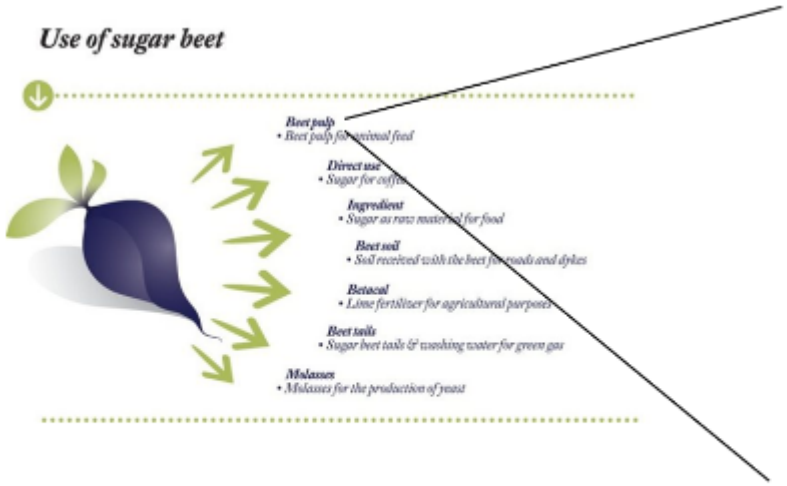
Beta*fib*®



Component	Amount (% w/w)
Water	4-8
Cellulose	22-26
Hemi-cellulose (arabanes)	22-26
Pectin	21-25
(Raw) proteins	6-10
Residuals	7-13
Soluble sugars	1-3
Lignin	0-3
Other	6-12

Remove everything else

- **Upcycling from side stream sugar production process**
  - ✓ Preservation through ensilaging or drying

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Betafib®

- 100% natural biopolymer
- **Purified, parenchymal (plant derived) cellulose**
- **Stabilization and structuring of formulations**

- **Rheology modification**
  - ✓ Broad operational window
  - ✓ Very robust system
  - ✓ High yield point

- COSMOS and ECOCERT certified

- Ingredient for home care and personal care formulations, such as body washes, shampoos, creams, scouring agents, and detergents

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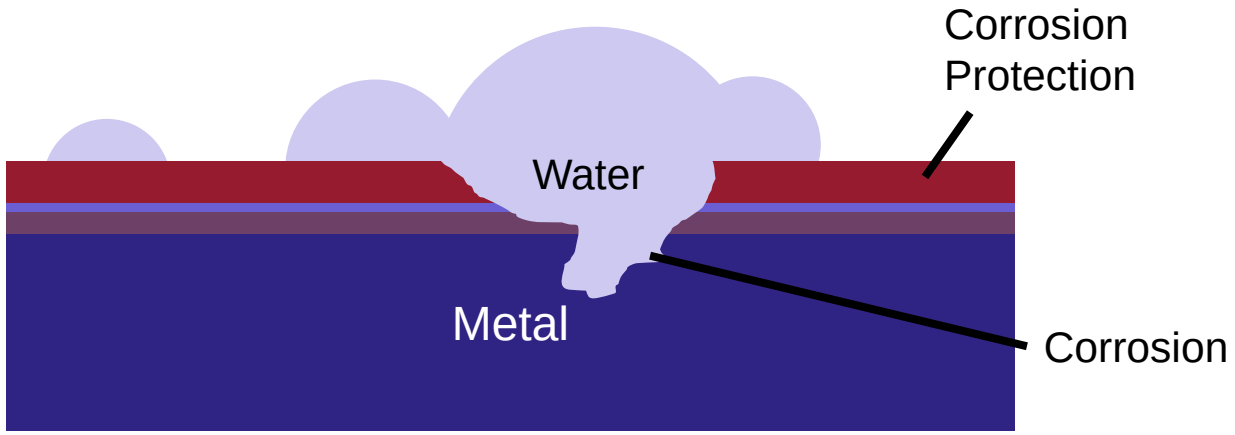
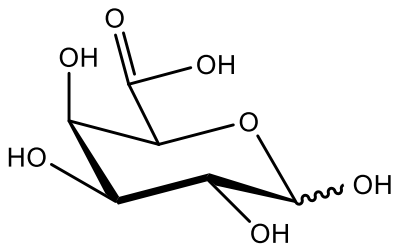
Innovation for Corrosion's Tough Problems

Number of industries are affected by corrosion and have significant consequences both monetary and safety risks



Cr^{6+} and Zn regulations (environmental and health concerns) and finding alternatives matching performance and costs is a challenge

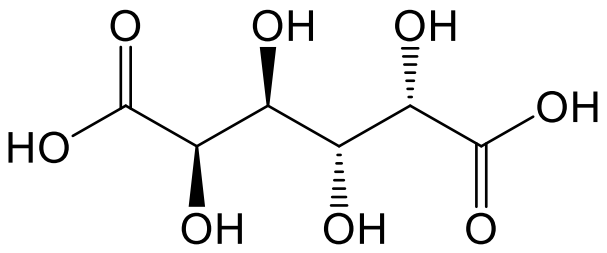
Galactaric Acid



Galacturonic acid

D-galacturonic acid

Cosun IP



Galactaric acid

- Galactaric acid shows a unique combination of corrosion mechanisms:
  - Film former
  - Complexing agent
  - Passivator
- The biobased inhibitor performs equal to fossil commercial benchmarks and passed international standardized tests
- The biobased inhibitor shows distinguishing results to aluminium and acts as a natural conversion coating: on the way towards commercialization
- Cosun is open for co-operation within value chain

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Conclusion

- **Sugar beet is efficient and locally available sustainable source of renewable carbon**
  - High land efficiency
  - Better Life cycle impact
  - Valuable components available in Sugar Beet
- **Sugar Beet fuels the European bio economy (food, feed, biofuels, biogas, bio products)**
- **Valuable components available in Sugar Beet**
- **Cosun Beet Company is on the path to be the greenest, most innovative and most successful sugar beet processor in the world**
- **Cosun Beet Company is open for co-operation within value chain**

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Questions?

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