



Thursday 4th July 2019 | ACRRES | Edelhertweg 1 | 8219 PH | Lelystad

### Sugar from Sugar Beets as building blocks for the Chemical Industry





### Agro meets Chemistry and Markets

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Biethanol Seminar ACCRES -Lelystad 4 Juli, 2019

## Foundation Biobased Delta: a Public Private Partnership





### **Biobased Delta: Ecosystem for the Circular Bioeconomy.**





**Mission:** Greening of the Delta while making money !! To increase the economic value and reduce CO2 in the Biobased Delta via Agro meets Chemistry and Markets

Biobased Delta is connecting and promoting:

- SME's from start-ups, scale-ups to mid size companies
- Large international companies with sustainability agenda
- Education Institutes
- Knowledge Institutes
- Port Authorities

With regional and local governments in facilitating mode





bio based delta

### **Role Biobased Delta**

Networking

- Initiation
- Support
- Supra regional
- International
- > Lobby

### What are the best crops to focus on ?





#### Take aways:

Sugarbeet and sugarcane have by far highest fermentable sugar content

Cereal crops are much lower, but have valuable proteins as co-stream (feed)

Wood (forest timber) and SRC are advantaged when grown on non-arable Land. Low productivity and challenged wrt high quality fermentable sugars

Fermentable sugar as a raw material for the chemical industry: first generation as sustainable as the second – significant reduction in greenhouse gases for both Nova Institute January 2019

Source: Biomaterial Innovation Dupont: Christian Lenges, International Conference on Biomaterials, Cologne, May 15-16, 2018.

## Sugar beet biorefinery (Suiker Unie)





### Key products

Sucrose: Glucose – Fructose

Thick Juice

Melasse

Beet pulp

Biogas

Water

## Importance of glucose/sucrose for chemicals





## Importance of C5 sugars for Chemicals



### Key value chains:

Ethanol

Xylose- Xylitol

Furfural

Furfuryl alcohol – Furan resins

bio based

delta

Glycols

# EUROPE PETROCHEMICALS, CRUDE OIL & SUGAR PRICES 2014-2019





### **Bio-MEG supply lacking but pilot projects continue**

- India Glycols the sole producer
- Avantium's Mekong project; Braskem's Mosaik project
- Fortress Global focuses on xylitol
- Biokim focuses on polypropiolactone
- UPM glycols project postponed?



Source: Tecnon OrbiChem, \*Petrochemwire

### Global production capacities of bioplastics 2018 (by material type)



### Bio-based/non-biodegradable 56.8%

**Example:** Renuva from Dow Furan resins (Transfuran)



\*Bio-based PP and PEF are currently in development and predicted to be available at commercial scale in 2023

Source: European Bioplastics, nova-Institute (2018) More information: www.european-bioplastics.org/market and www.bio-based.eu/markets

## Status Bioplastics capacities

Global production capacities of bioplastics 2018 (by market segment)



Rigid and flexible packaging are No 1And No 2 market in volume.Textiles are the third largest marketFor bioplastics, dominated by PTT

### **Top Five:**

- 1. Bio-PET
- 2. TPS/Starch blends
- 3. Nylons
- 4. PLA
- 5. Bio-PE

https://www.european-bioplastics.org/about-us/ members-membership/members-list/

Source: European Bioplastics, nova-Institute (2018). More information: www.european-bioplastics.org/market and www.bio-based.eu/markets

# Expert study JRC EU

https://ec.europa.eu/jrc/en/science-update/future-bio-based-chemicals-eu-bioeconomy

## Table 1: Estimates of total EU production, the bio-based share of production and the consumption of bio-based products for each category

Product category	EU bio- based production (kt/a)	Total EU production (kt/a)	EU bio-based production share (%)	EU bio-based consumption (kt/a)	
Platform chemicals	181	60,791	0.3	197	]
Solvents	75	5,000	1.5	107	]
Polymers for plastics	268	60,000	0.4	247	]
Paints, coatings, inks and dyes ( <sup>a</sup> )	1,002	10,340	12.5	1,293	]
Surfactants	1,500	3,000	50.0	1,800	
Cosmetics and personal care products ( <sup>a</sup> )	558	1,263	44.0	558	
Adhesives ( <sup>a</sup> )	237	2,680	9.0	320	
Lubricants ( <sup>a</sup> )	237	6,764	3.5	220	]
Plasticisers ( <sup>a</sup> )	67	1,300	9.0	117	]
Man-made fibres	600	4,500	13.0	630	
Total	4,725	155,639	3.0	5,489	

(<sup>a</sup>) No total EU production data were found; it has been assumed that total EU production (fossil- and biobased) equals the total EU market (fossil- and bio-based consumption).

## (M)Ethanol as sustainable building block





## How does the chemical industry work ?





Narrow Specification

**Operational excellence** 

**Excellent Quality** 

### **Summary**



- > Beet sugar has excellent quality for virtually all fermentations & green chemistries
- Beet sugar has high potential for high purity fructose (furan value chain)
- Glucose from starches has lower cost than beet sugar (in all three geographies)
- Sugars from 1st gen crops are as sustainable as Cellulosic sugars (Nova study)
- Sugars from 1st gen crops have higher quality than 2nd gen sugars: F(pretreatment)
- > Crucial will be the quality required for chemicals beyond bioethanol (as biofuel)
- > Beta process reduces cost, provided there is year around production, fit > ethanol ?
- Sustainable Ethanol qualifies as new building block for the chemical industry in the new economy