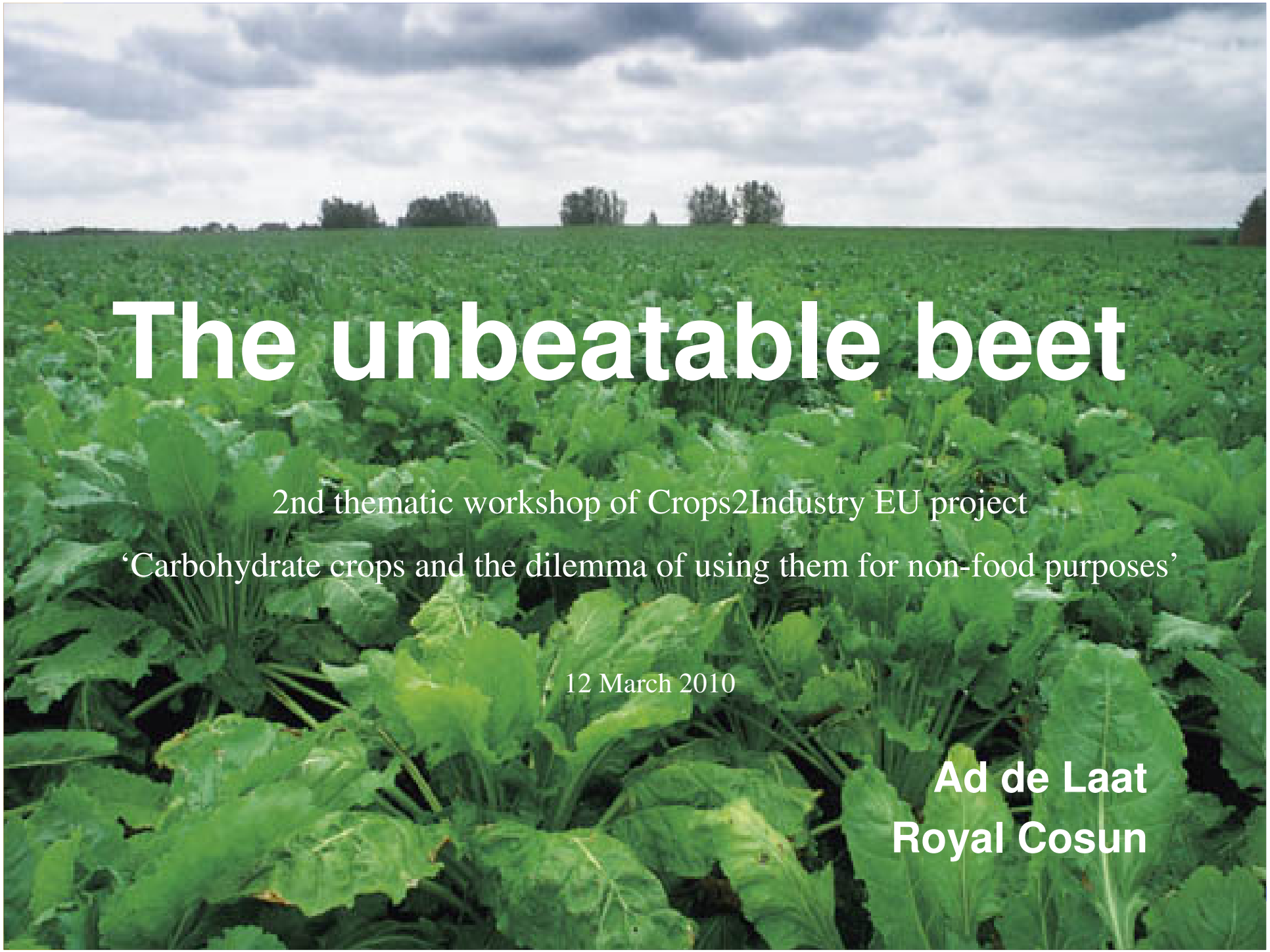
Royal Cosun

- **Cooperative of Dutch sugar beet growers**
- **± 11.000 members / sugar beet growers**
- **± 4.300 FTE**
- **Turnover: € 1.7 billion (2008)**
- **> 100 year active in bio-refinery**



The unbeatable beet

2nd thematic workshop of Crops2Industry EU project

'Carbohydrate crops and the dilemma of using them for non-food purposes'

12 March 2010

Ad de Laat
Royal Cosun

1. The overall picture
2. The sugar beet case

Global social trends

- **Demographic development**
  - **6.5 bln $\xrightarrow{50y}$ 9 bln**
- **Growing energy/materials demand**
- **Exhaustion gas/oil reserves / price increases**
- **Global warming (a.o. CO_2) due to massive use fossil materials**

Options for achieving better sustainability

- Prohibitory rules (demographics, energy use etc.)
- Incentives to industry and civilians to reduce usage, waste and pollution
- Shift to alternative, sustainable resources:
  - solar cells
  - geothermic
  - hydrogen
  - gravitation
  - wind / water
  - biobased

Biobased economy

- Biomass as feedstock for energy / materials / food / feed
- Using solar energy of today rather than of the past
- Capturing 0.3% of solar energy sufficient

Consequences of biobased economy

- Competition for land (food, feed, fuels, materials) and water
- Interrelation crop value / oil price
- Increasing and more volatile food prices
- Need for policies to secure food supply?

Key challenge for Agro-industrial complex

- **Efficiency of land use**
  - **Environmental**
    - **Low input / high output → net CO_2 capturing closed cycles**
  - **Economical**
    - **Low input / high output → capturing values by cascade processing (bio-refinery): value stacking**

Toward efficient land use

- Questionable
  - Feed crops
  - Organic
  - Bio-diesel crops
- What direction ?
  - What ‘crops’
  - Dedicated ⟷ multi purpose
  - Food crops preferred

Crops for fossil replacement

	Input agriculture practices	Output (DM yield)	Composition: ease of saccharification/ valorisation
Woody plants (willow, poplar)	++ ?	+ (+)	--
Perrennial grasses (miscanthus, switchgrass)	+ ?	+ (+)	--

Wheat/corn -seeds -straw	+/-	- (-) - (-)	++ -
Energy maize	+ / -	+ (+)	+ / -
Beet	+ / -	+ (++)	++
Potato	-	-	++

Biobased Economy

Beets as feedstock ? !

Biobased Economy

Beets today

- Yield: 25 t DM (average NL 2009)
- Food crop
  - 14 t sugar (food)
  - 6 t pulp (feed)
  - 3 t molasse (fermentation)
  - recycling P (+N) to land
- Energy crop (emerging)
  - 7 t ethanol (fuel)
  - 6 t pulp feed

Biobased Economy

Beets tomorrow (….on top of …)

- → water
- Sugar + 30% →
- Protein (≈ 2 tDM/ha) → food / feed
- Molasses → fertilizer
- Pulp → food fibres
  - → non food fibres
  - → C5/C6 sugars → chemistry / alcohol
  - → energy (biogas)
- Leaves → food proteins
  - → as pulp (all)
- Betacal → fertilizer (high end)
- Debris → energy (biogas)

Biobased Economy

Beets LT future:

in planta production of chemicals by metabolic engineering

- tools available
- proof of concept (cane, potato)
- large vacuoles (40-50 m3/ha)

Dual purpose beets: chemicals + energy

Biobased Economy

Beets

- Most productive crop in NW Europe + upward potential
- Existing agricultural practise + biorefinery infrastructure
- Versatile use (food + molasses + non food)


The unbeatable beet
Royal Cosun, Ad de Laat, March 2010