

# TEAM PROCESS

- Understanding the views of many different stakeholders
- Technical and economic preferences of processors, traders and feedstock producers
- Sustainability concerns of policy makers, NGO's and users
- Explored a wide range of ideas, targeted at
  - Technical solutions
  - Organisation of the supply chains and of the feedstock production
  - Monitoring, certifying and communicating the sustainability aspects

# THE TEAM EXPLORED TWO PATHWAYS TO MOBILISE BIOMASS

## Crops

Practically preferred but not politically accepted

- Best fit from technical point of view
- Nature provides very useful chemical structures
- High carbon yield per hectare
- Policy makers do not accept & support it
- Seen as competing with food
- Seen as causing ILUC

## Waste

Politically desired but practically challenging

- Resource is cheap
- Generally accepted because circularity appeals
- Many technologies exist and innovation ongoing
- Netherlands leading in waste collection, separation and treatment
- Big variety of sources – requires many approaches
- Potential is limited – may not be sufficient for some products
- Technology is (relatively) expensive
- Competition with less optimal incumbents

# CROPS

- Example: sugar beets
- Some directions for options
  - Identify unused land close to home (like land that cannot be used for food crops)
  - Replace sugar as a sweetener with low calorie alternative, the sugar can then be used for bio based goals
  - Create new land, offshore or in the Markerwaard
  - Develop land in the tropics connected to sustainable development goals
  - Concurrently improve the valorization of crop components, to decrease price of remaining biomass
- Challenge
  - Not accepted by NGOs and policy makers
  - Especially as it is seen as food crop and as causing ILUC
- Team found it extremely difficult to reconcile the concerns with the wishes
  - Understand that we cannot realistically ask to support this option
  - Team asks to keep the option in the discussion, so **to explore how food crops can be used in the biobased economy and how their production can be increased in sustainable ways**

# WASTE

- Many technical innovations
- Netherlands is leading
- Separate at household level
- Separate centrally (OMRIN)
- Advanced processing (SuikerUnie, AVB, Enerkem, Avantium, Empyro)

## Potential in Netherlands

- Increase number of options
- Increase deployment

## Potential abroad

- Export approaches and know-how to tap into potential elsewhere
- Like waste collection in urban areas in developing countries

### MSW – RDF

#### Municipal Solid Waste and Refuse Derived Fuel

- RDF and cellulosic fractions are already separated – infrastructure exists
- Direct streams to higher value use

### Waste Wood & forest residues

- End of life waste wood is already collected
- Collectors want new offtake markets
- Use of new technologies (pyrolysis, torrefaction)
- Harvest biomass from ditches, extract proteins
- Forest residues: unclear how much is already utilized in the Netherlands

### Sewage with kitchen waste (green waste)

- Innovative process to boost the methane production and collect nutrient (phosphate)
- Cooperate with water boards
- Connect to existing household collection
- Support of gas sector is existing

### Manure

- Processing at larger scale central hubs
- Between source and use
- Increases value of the separate fractions
- Recover nutrients
- Need stable regulation for manure treatment

# TEAM MEMBERS

- Carlo Hamelinck – Navigant (team leader)
- Erik Evers – DEKRA
- Aldert van der Kooij – Biobased Delta
- Gisle Johansen – Borregaard
- Anton Robek – BioRefinery Development BV
- Marieke van de Werf – Dr2 New Economy