The need for biocommodities to link the available biomass potential to the European feedstock and fuel needs in the coming decades

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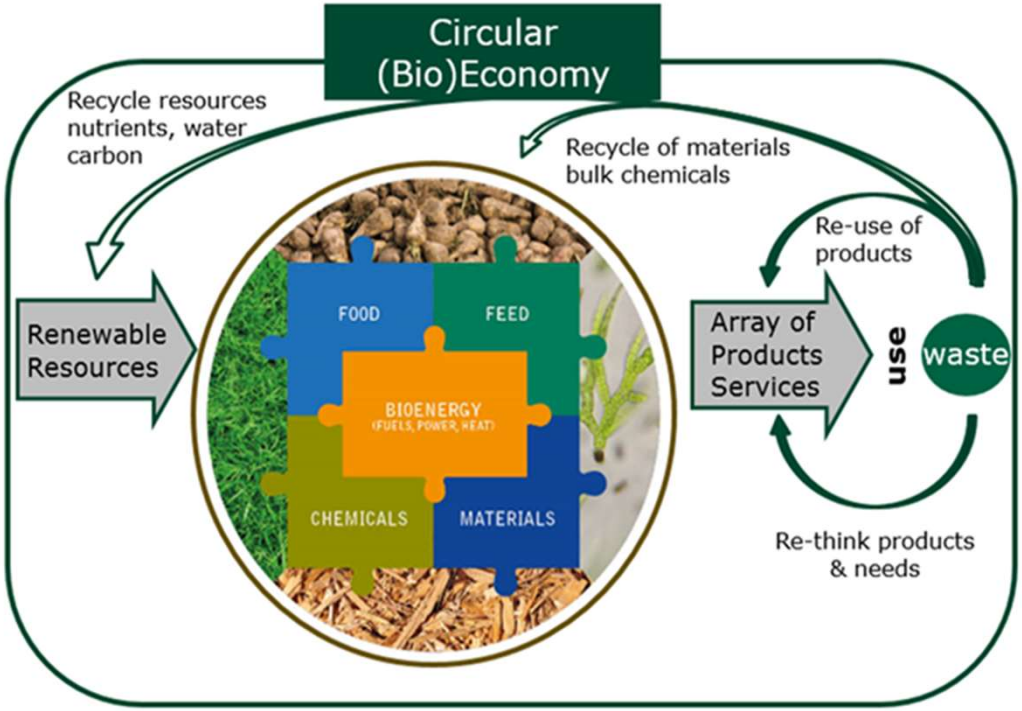
sooyears

Biomass vision

Currently biomass mainly for Food and Feed applications; Non-food/feed use is mainly pulp/paper and fuels/energy

Lignocellulosic biomass for Non-Food applications is expected to grow significantly in the coming decades both for the production of biobased products, biofuels and bioenergy



Biorefining key enabling strategies for sustainable biomass use in a Circular (Bio)Economy [IEA Bioenergy T42]

Biomass vision - where should a lignocellulose Biorefinery be located?

Location: / Factor	Near the biomass	At a logistical hub (harbour)
Cost of biomass	+	-
Biomass security of supply	-	+
Availability of Infrastructure	-	+
Maximum scale	-	+
Availability of personnel / expertise	-	+
Value or residues	-	+
Sum	1+	5+

Biomass vision

We need to mobilize all available Non-food Lignocellulisic biomass resources, i.e.:

- lignocellulosic crops (cultivated and marginal lands)
- agroresidues
- process residues
- post-consumer residues

to meet this future market demand

We need biomass resources of the right quantity **AND quality** for an acceptable price @ the right time @ the right place for being refined into a portfolio of biobased products and secondary energy carriers

We need BIOCOMMODITIES and a related international trade market

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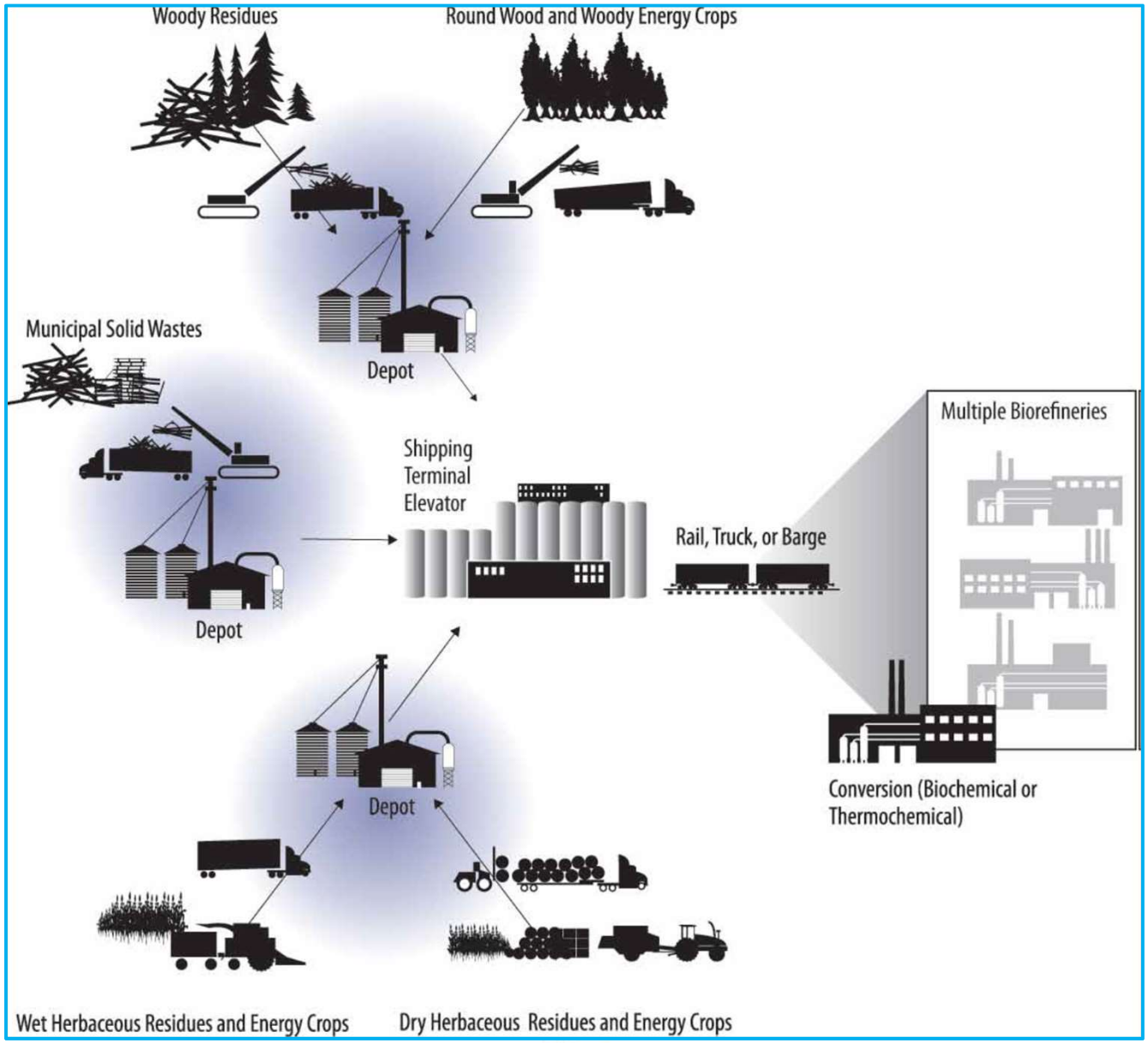
To be or not to be a Biobased Commodity

Real commodity	Not a commodity
Easy to store and transport → high energy density, dry, low volume, low ash, nutrient depleted	**Not easy to transport**
Fungible → "exchangeable" = standard quality	**Not fungible**
Standardised transport, contracting, standard insurance, etc.	**No broad standards**
Standard conversion systems	**No functioning markets or trade**
Functioning markets:	**Trust needed between producer and buyer**
Trade systems, Financial instruments (futures, etc.)	**One on one relations between producer and buyer**
High tradability	**Vertical integration**
Sustainability	**Less security of supply lager**
Standard certification systems	**High transaction costs**
	Inefficient



Just a few commodities that cover all the biomass types and all applications:

What will it be?

- Wood pellet?
- Herbaceous pellet?
- Pyrolysis oil?

(www.inl.gov)

Pellets as Biocommodity?

- Traditionally produced
- Min 25.000 ton per year
- Easy transport
- Easy storage
- Pellet production should costs € 35 to €55,-/ton

- No standards for non-wood?
- No transparent market, cost of transport
- Reliability of transport, contractibility

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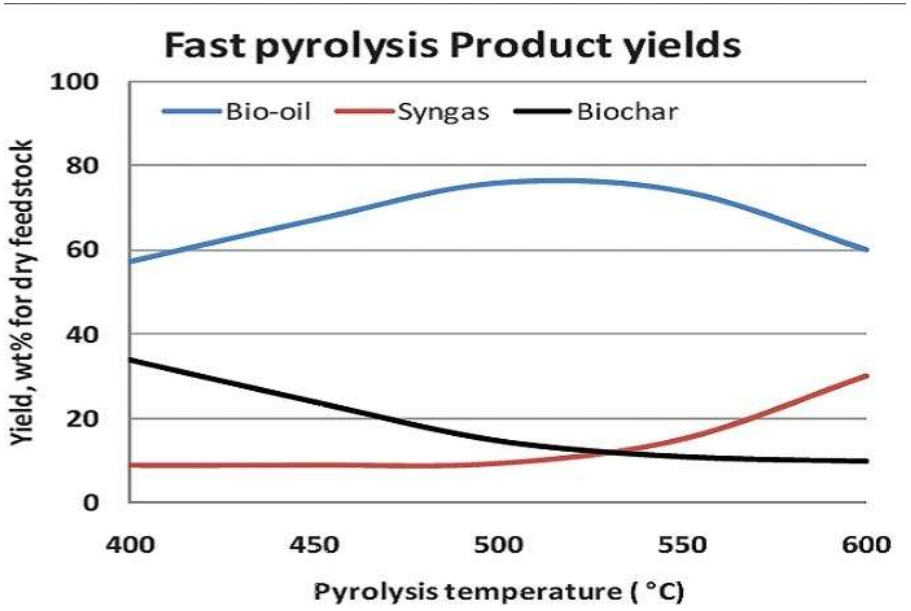
Pyrolysis oil as Biocommodity?

- Lignocellulose to pyrolysis oil:
  - Input is (dry) lignocellulose:
  - Low oxygen + 500 °C
  - Also small scale: 20.000 tons per year
  - Pyrolysis oil (70%) + char (20%?)
  - Pyrolysis oil can be used for heat, electricity, refinery of transport fuel (diesel)
  - Char may improve soils?? Or be used for heat production



Bio-oil (~22 GJ m^{-3})

Bio-char (~21 MJ kg^{-1})

Syngas (~6 MJ kg^{-1})

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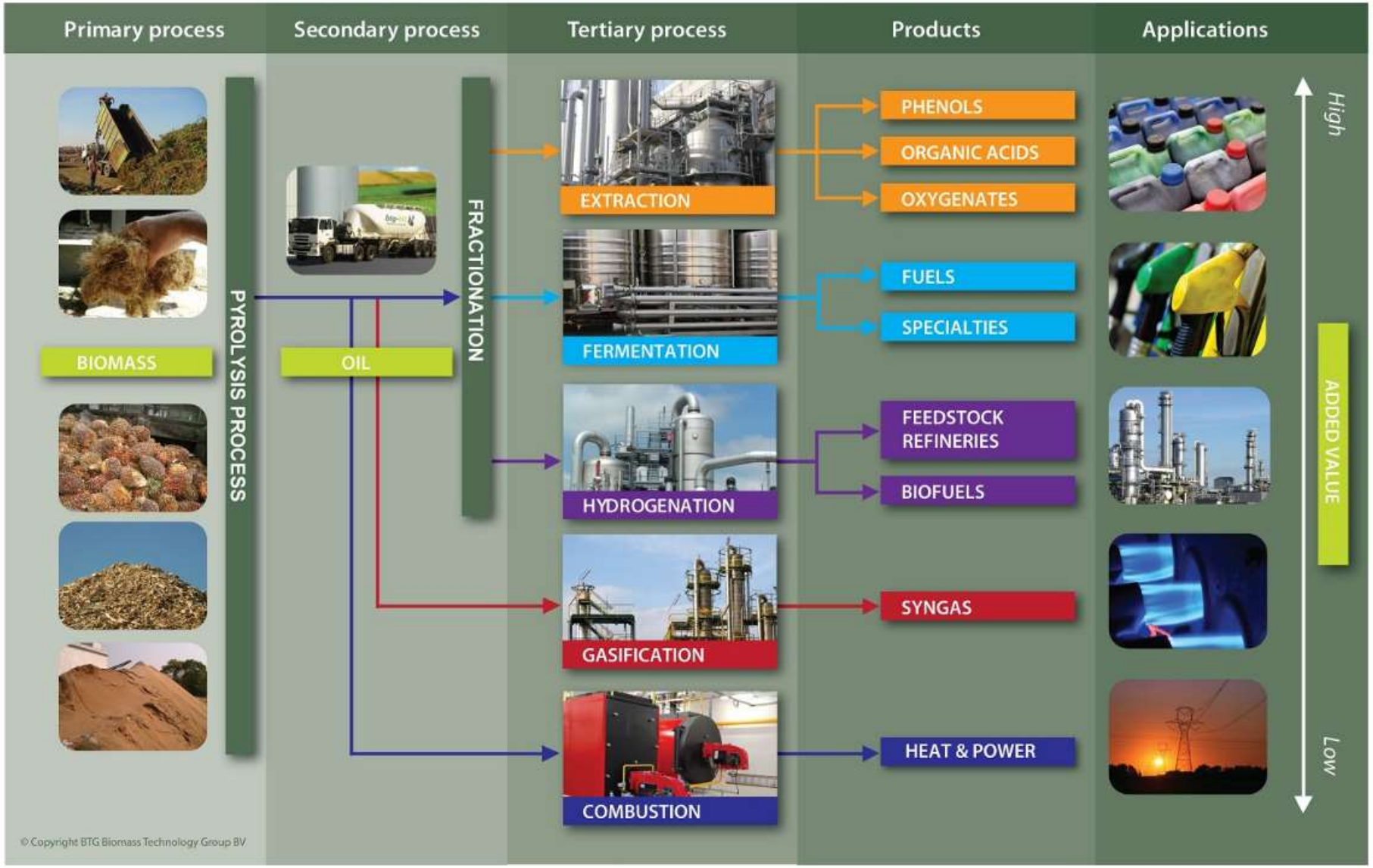
100years

bioliquids refinery



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https://www.btg-btl.com/en/applications

Not only focus on wood!

Herbaceous biomass is underutilized – Often causing pollution problems

How much can be used for biobased applications?

Top 10 crops in the world		Total field	Total mill
	Million hectares	Million ton DM crop residue per year	
Maize	185	1,038	
Rice, paddy	163	816	
Wheat	220	729	
Sugar cane	27	264	264
Oil Palm	19	192	52
Barley	49	173	
Sorghum	45	103	
Sunflower seed	25	66	8
Millet	31	43	
Seed cotton	35	35	
Sum:	**800**	**3,459**	**316**
All crops worldwide:	1,414		

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Herbaceous biomass

Characteristics:

- Often wet biomass
- Perishable
- Dispersed
- Various qualities
- Etc.

What part can we mobilize @ what quality?
Can we recycle the nutrients?
What part is needed for the soil?

Local pre-treatment necessary to recover and recycle nutrients, remove contaminants and energetic densification to produce Biocommodities for international trading

Wash/pelletising and wash/pyrolysis combinations? Will the necessary additional investment meet the biocommodity trade market requiements?

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Example: counter current extraction

2 to 3 liter of water to extract 1 kg of biomass

To lower K or Cl by 95% we need more water or more stages

Extraction factor (E)	20	4	2.3	1.8	1.5	1.35	1.30	1.23	1.18	1.10
Nr. of stages or columns needed	1	2	3	4	5	6	7	8	9	10

First estimate of cost for 40.000 ton (DM) per year of biomass will cost 6.5 €/ton, which equals 8 US$/ton

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Proposed way forward

- Develop local biorefinery systems with small economy of scale (30.000 ton per year) to remove nutrients, protein and water and produce **lignocellulosic biocommodities** for the internatiuonal trade market
- Define only a few biocommodities that cover both
  - All lignocellulosic biomass types (wood, EFB, trunks, grass, straw, bagasse, etc.) and
  - All biobased market applications (energy, fuels, materials, chemicals, etc.)
- Set wide standards and avoid frivolous demands
- Involve all players in the production chain (biomass producers, machine builders, regulators, insurers, bankers, transport, end users)
- Involve both EU and other countries!

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Take home messages

- To meet the future demand for Non-food applications we need to make available all potential biomass resources in a sustainable way
- Besides woody biomass, also herbaceous biomass resources potentially can provide a significant biobased resource potential
- The development of technologies for the production of a few robust and widely applicable **Biocommodities** will be a critical success factor for the large scale deployment of an international (Circular) Biobased Economy
- Linking decentral closed-loop biorefineries producing locally usable biobased products (minerals, proteins, water,, etc.) together with Biocommodities for the (inter)national trade market seems to be great strategy futher develop the global (Cicrular) Biobased Economy

Focus should NOT be on development of single technologies but on development of full biomass-to-products value chains tackling both technical and non-technical bottle-necks and involving full chain stakeholders

Development of Biocommodities production technologies should be an integral part of EU FP9 because they should be the foundation of all biobased value chains building the Biobased Economy !!!

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