GRACE - GRowing Advanced industrial Crops on marginal lands for bioRefineries

ADVANCEFUEL - SEEMLA WORKSHOP

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UNIVERSITY OF HOHENHEIM

About GRACE

BBI Demonstration project

Coordinated by: University of Hohenheim (340b)

Consortium: 22 partners from science, industry (incl. SME) and agricultural sector

Time: 2017 – 2022

Funding: BBI within EU H2020

Budget: 15 million €

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BIO-BASED INDUSTRIES Public-Private Partnership

Horizon 2020 European Union Funding for Research & Innovation

The GRACE project has received funding from the Bio-Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 745012.

GRACE - Partners

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Description:

- Crops: miscanthus and hemp
- Large scale demonstration of seed-based miscanthus hybrids
- Focus areas: marginal, contaminated and abandoned land
- Linking biomass production to industrial application
- Connecting all stakeholders along various value chains

  (from farmer to industry)
- Assessment of environmental, social and economic impacts

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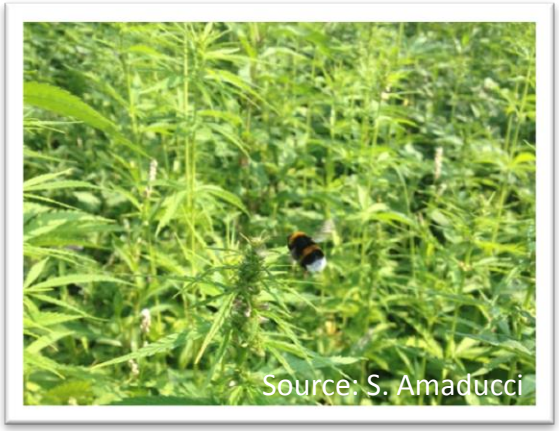
Propagation and crop production

Demonstration of crop production (>80 ha):

- Suitability of hemp and miscanthus for marginal, abandoned and contaminated land



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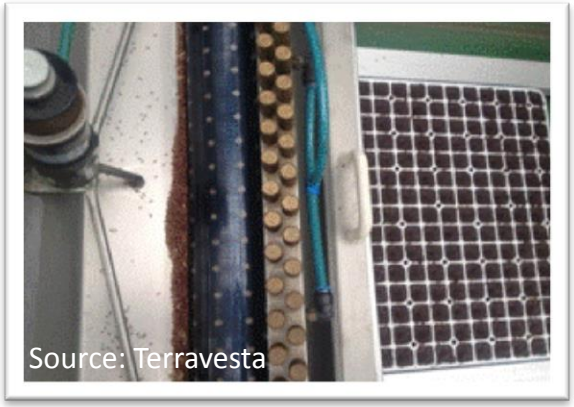
Propagation and crop production

Demonstration of crop production (>80 ha):

- Upscaling of miscanthus seed production, seed-based propagation and crop production (Logistics!)



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Value Chain Demonstration

Ten Demonstration Cases

- **Green Building**
- **Green Agriculture**
- **Green Medicine and Cosmetics**
- **Green Chemistry**
- **Green Composites**

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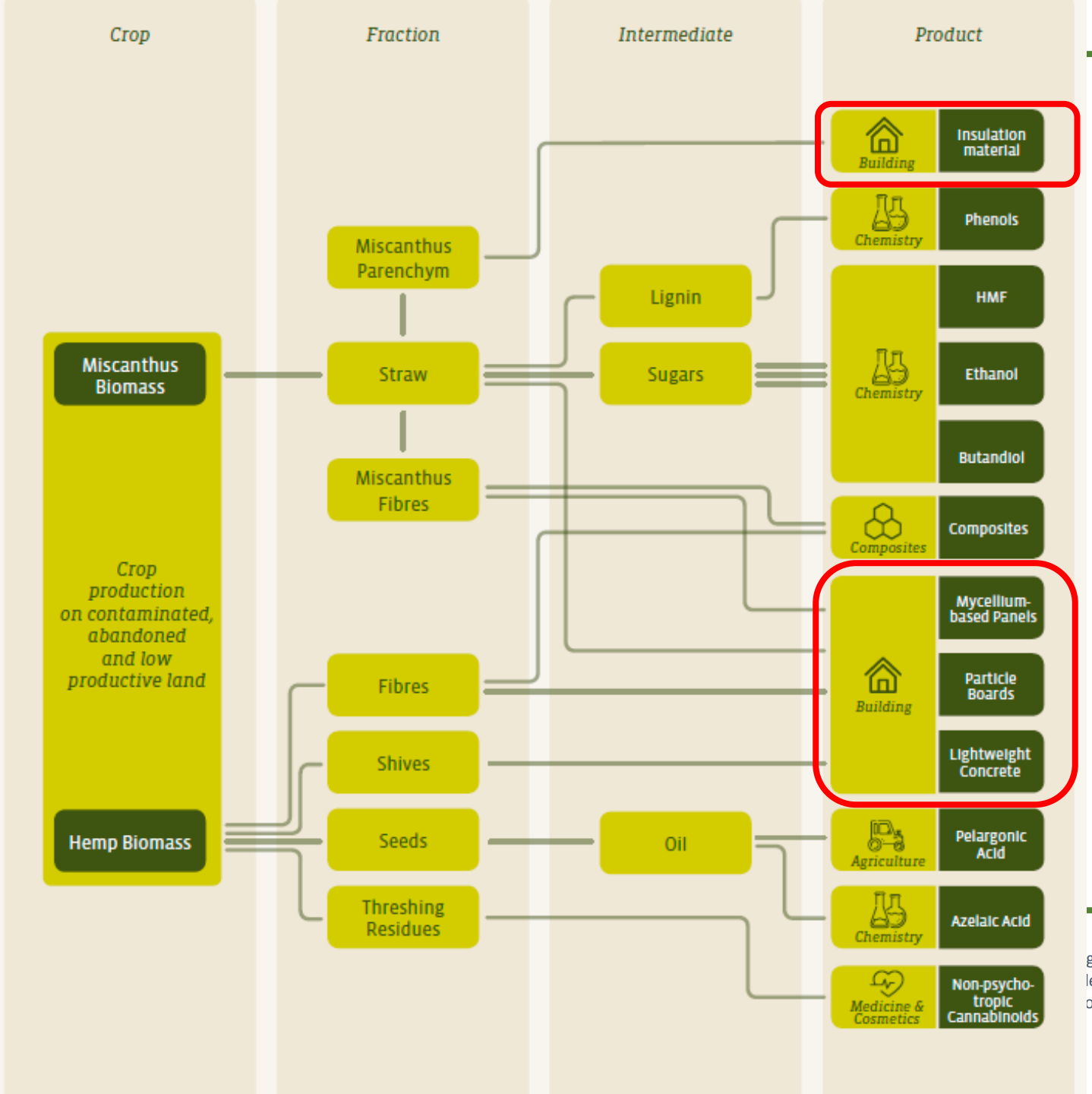

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Green Building: Utilizing miscanthus parenchym as insulation material

- Fractionate parenchym from stem fragments and utilize as insulation material in building bricks

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Green Building: Mycelium-based panels from hemp and miscanthus

- Fungal biomass as glue for lignocellulosic substrates

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Green Building: Formaldehyde-free bio-building material

Biomass

Preparation and mixing with biomass

Pressing

Formaldehyde-free biobuilding panel

- Hemp- and miscanthus-based building panels, patented technology by CMF Greentech

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Green Building: Lightweight Concrete

Source: Schiphol Trade Park

- Schiphol refinery
- Lightweight concretes, paper and paper-based products
- Based on miscanthus biomass

Source: http://acroniq.nl/

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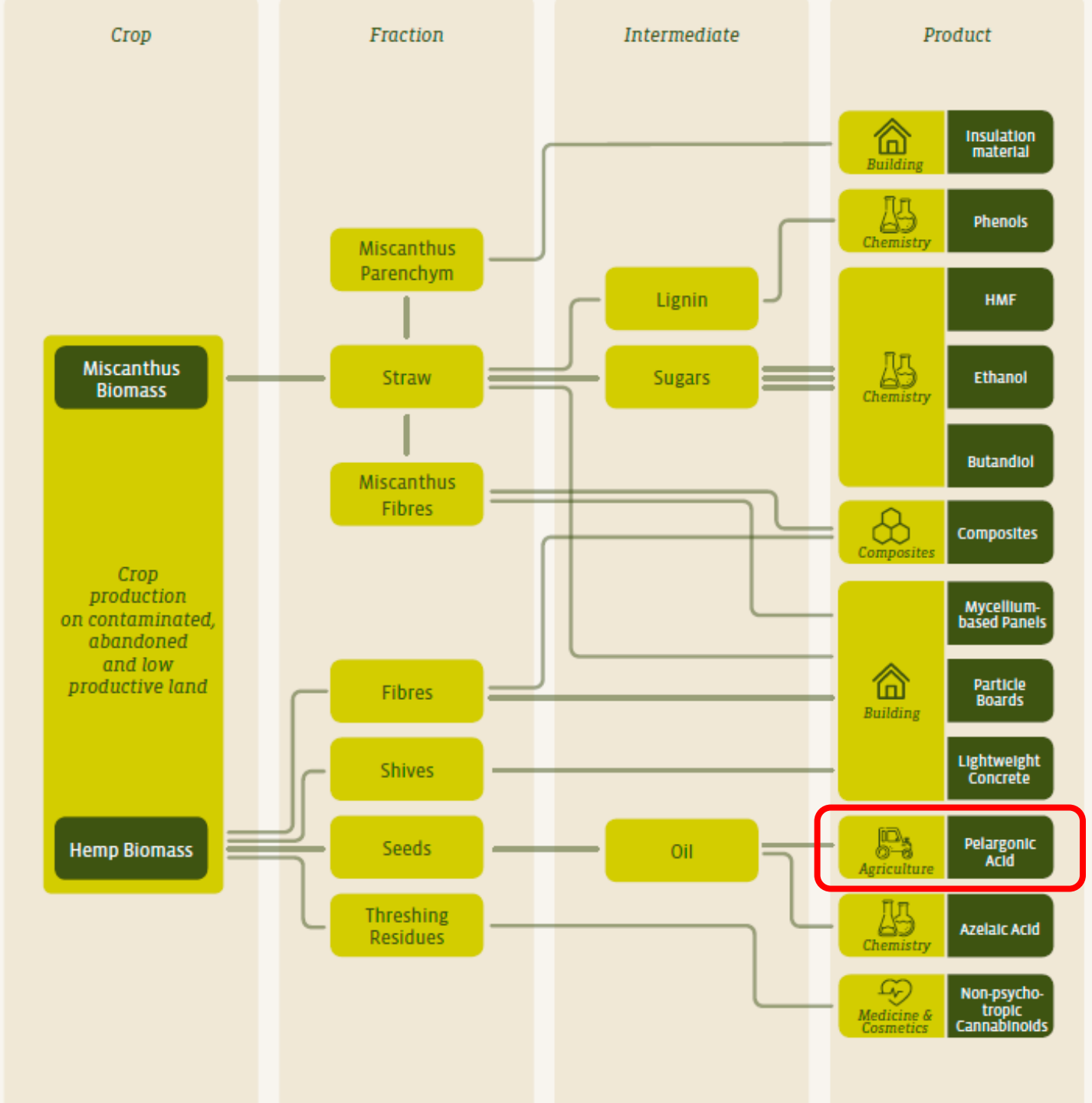
Crop
Fraction
Intermediate
Product
Miscanthus Biomass
Crop production on contaminated, abandoned and low productive land
Hemp Biomass
Miscanthus Parenchym
Straw
Miscanthus Fibres
Fibres
Shives
Seeds
Threshing Residues
Lignin
Sugars
Oil
Building
Insulation material
Chemistry
Phenols
HMF
Ethanol
Butandiol
Composites
Mycellium-based Panels
Particle Boards
Lightweight Concrete
Agriculture
Pelargonic Acid
Azelaic Acid
Medicine & Cosmetics
Non-psycho-tropic Cannabinoids

Green Agriculture: Bio-herbicide refinery

- Hemp oil-based pelargonic acid as herbicide
- Pelargonic acid causes rapid and non-selective burn-down of green tissues
- Possible substitute of glyphosate

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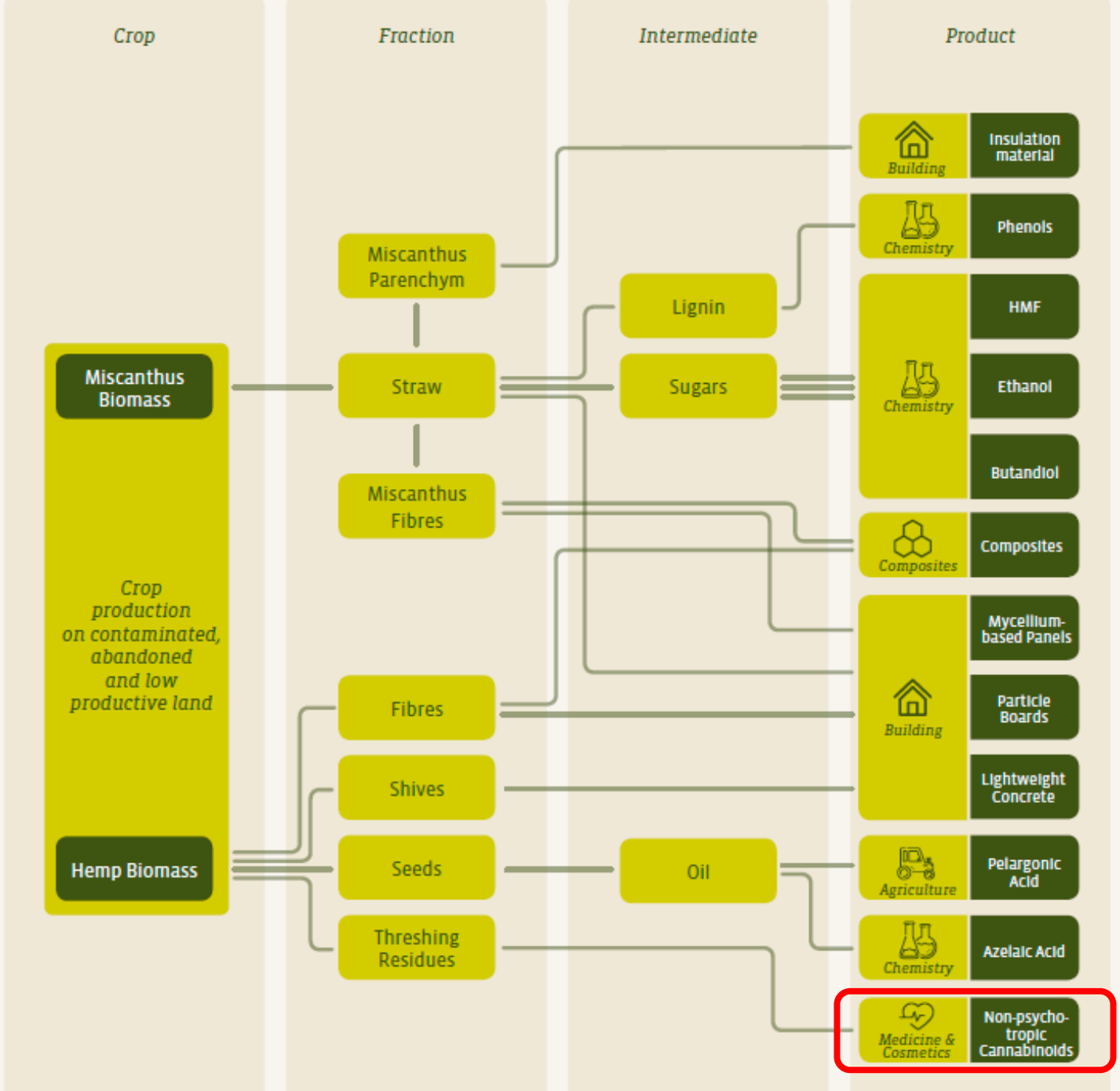

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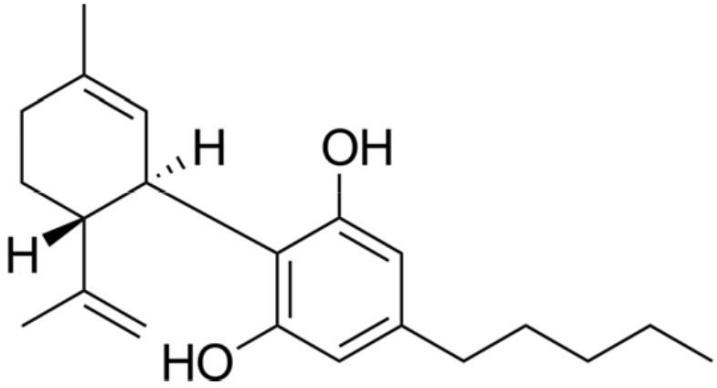
Green Medicines and Cosmetics:



- Extraction of non-psychotropic cannabinoids from hemp threshing residues for medicinal and cosmetic application

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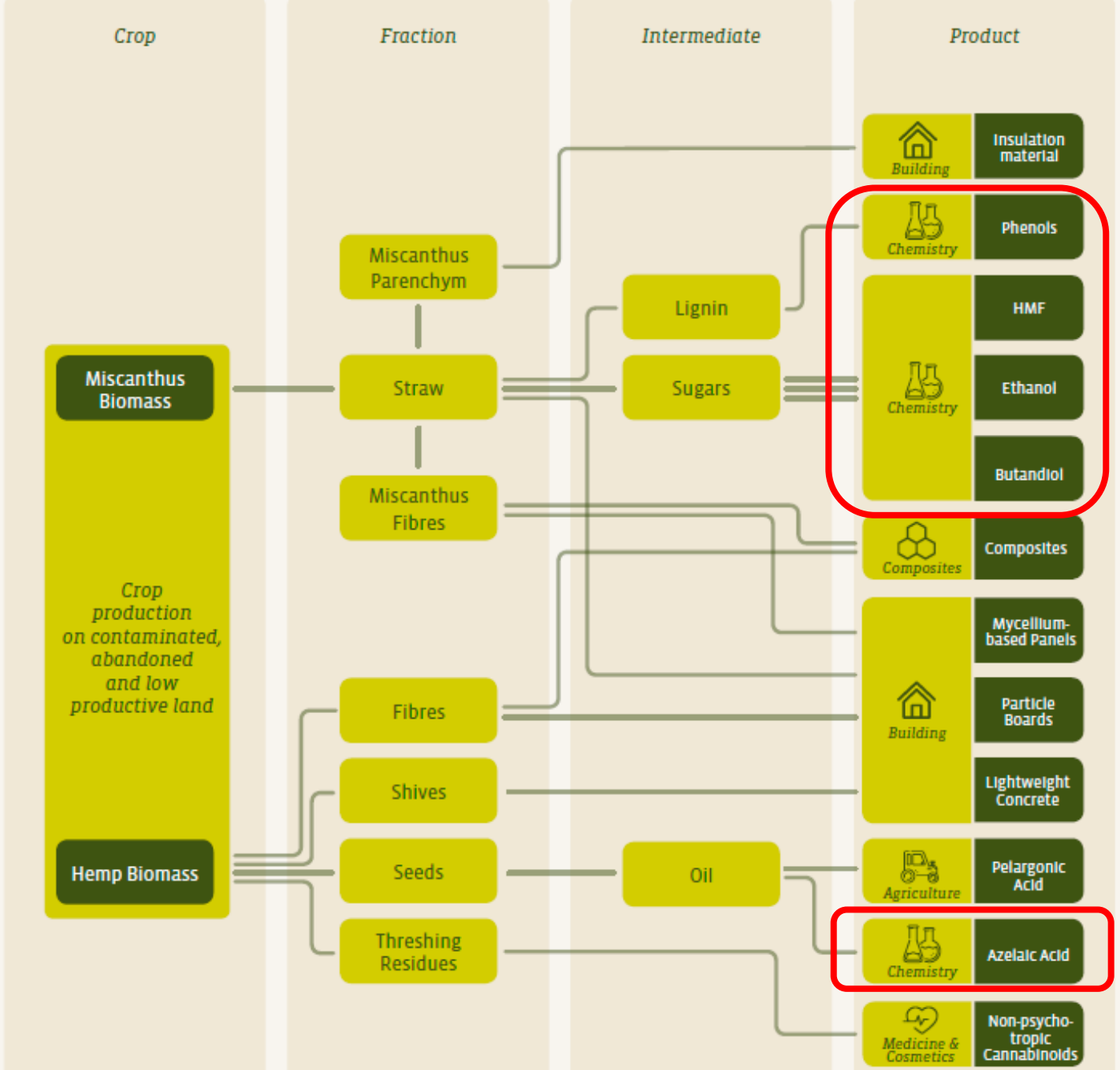

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Green Chemistry: Production of platform chemicals as building blocks for polymers

Lignin-rich fraction → Phenols

Cellulose and hemicellulose → Sugars → HMF

- HMF for example can be used to produce Polyethylenfuranoat (PEF) which can replace PET

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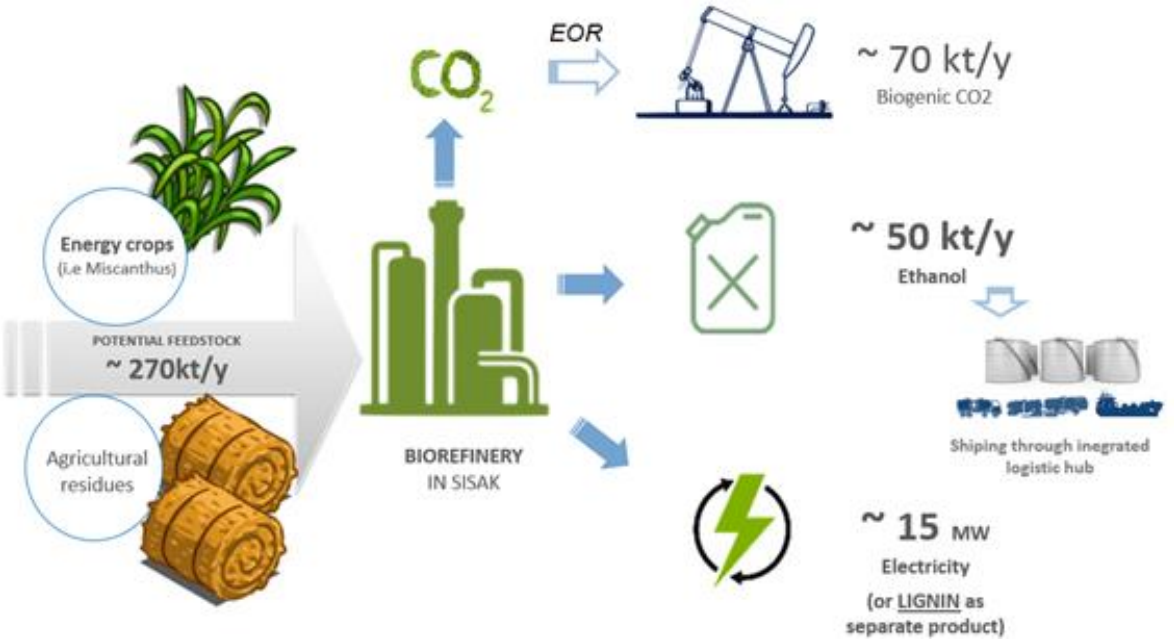
Green Chemistry: INA Ethanol refinery - Fuel/chemicals from abandoned land



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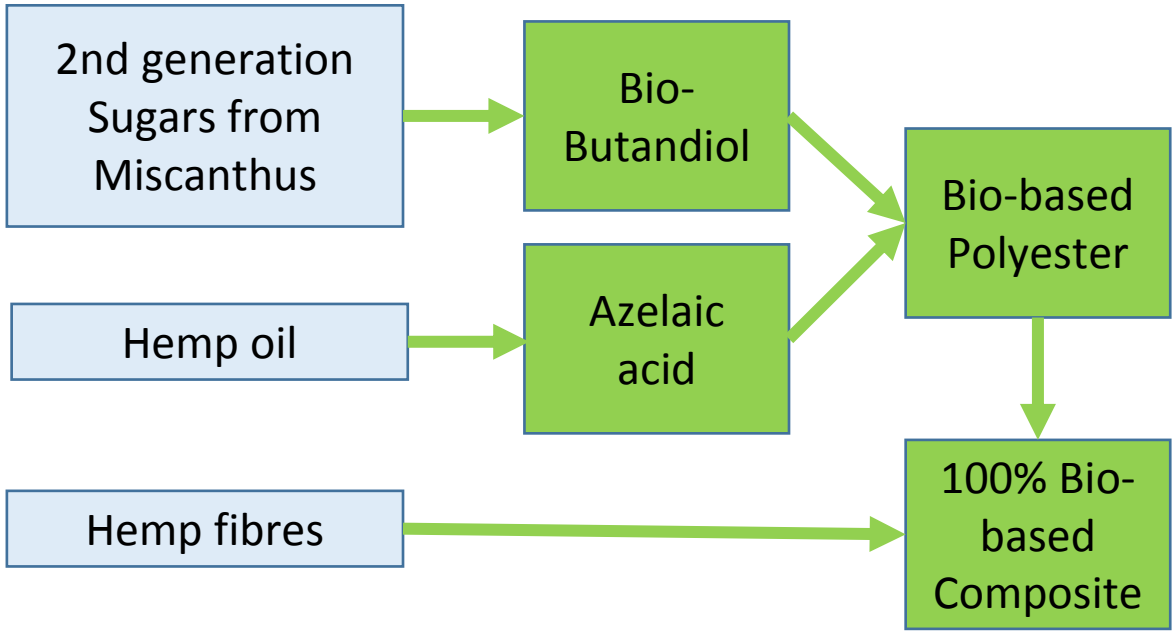
Green Chemistry: Platform chemicals for bioplastic and 100% biocompounds



- Bio-Butandiol (BDO) is an 1:1 replacement of fossil BDO
- Azelaic acid platform chemical for various chemical applications

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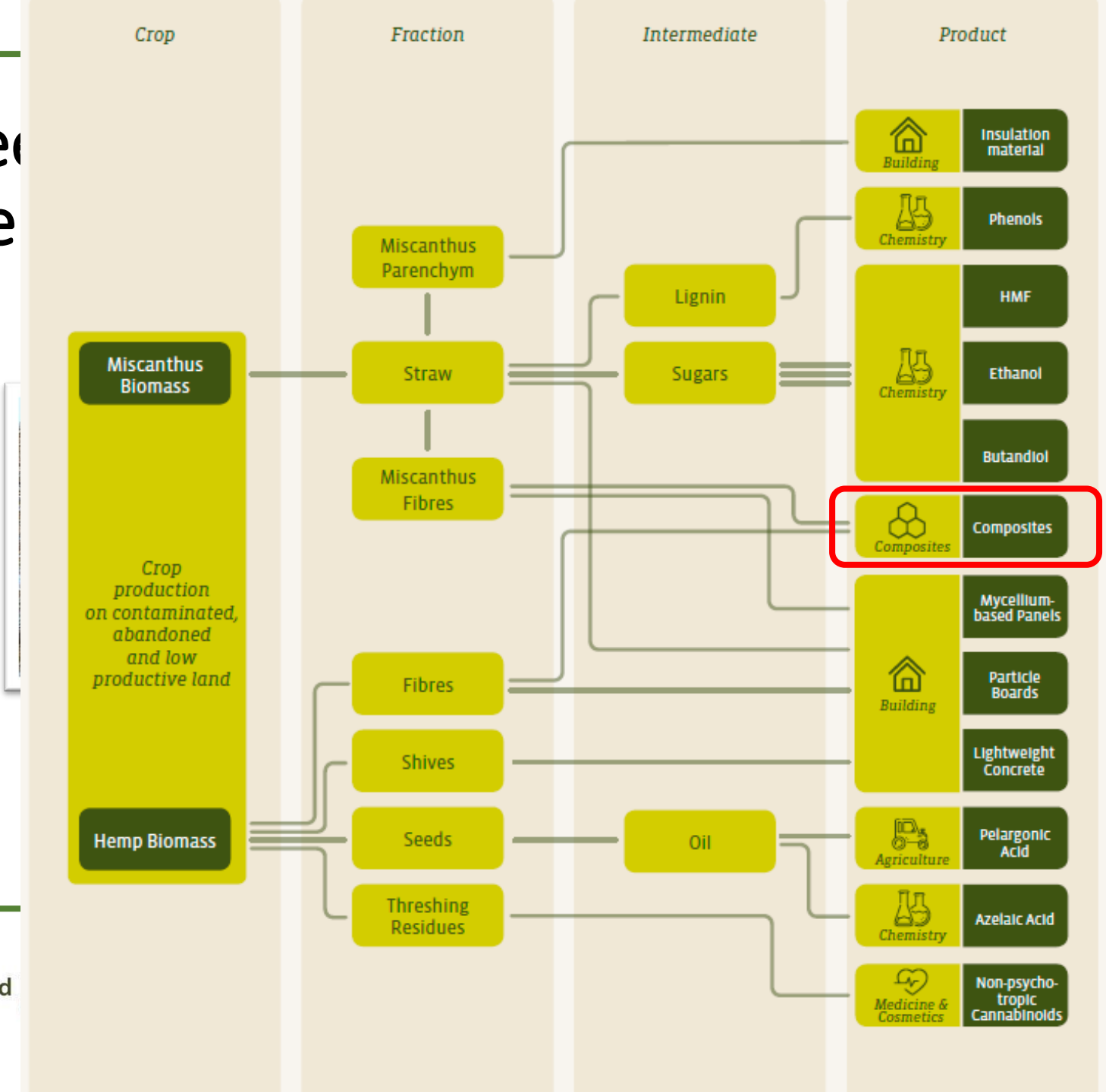

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Green Composites: Reinforced with natural fibers

- Polypropylene composites reinforced with miscanthus and hemp fibers

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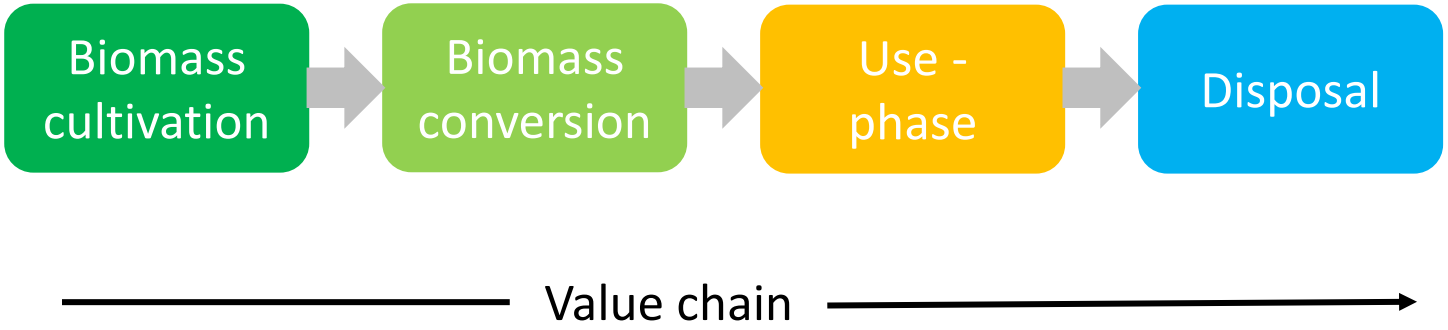
Value Chain Assessment and Organization

- Assessment of **environmental**, **social** and **economic** sustainability, identification of hot spots and potential for optimization



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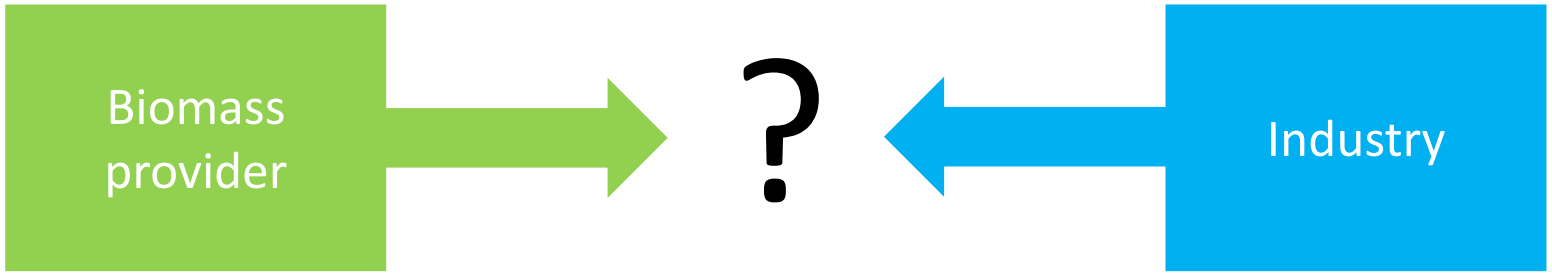
GRACE – Value Chain Organization



Why grow miscanthus when there is no demand?

Why develop miscanthus-based products/processes when there is no sufficient biomass supply?

Problem: Missing market for miscanthus!

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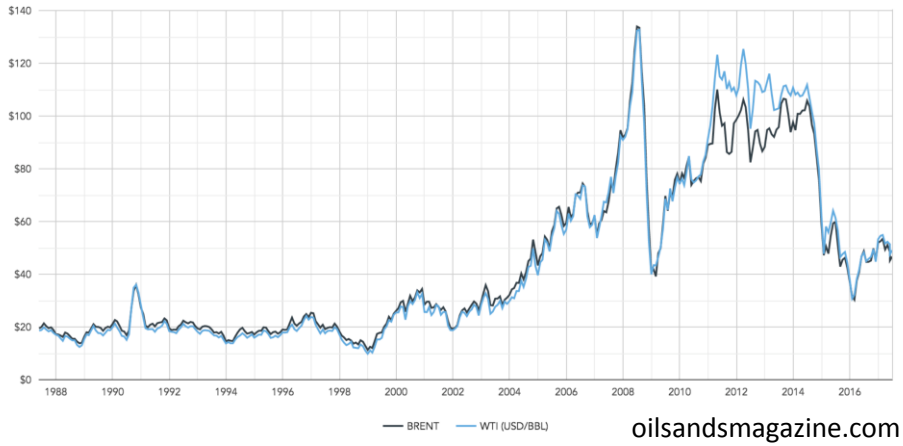
GRACE – Value Chain Organization

Barriers

- **Biomass costs**
- **Product price**
- **Price of competing products**

Success factors

- **Cost reduction**
- **Improved product characteristics**



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Info – The MISCOMAR Project International Scientific Conference

MULTIPLE BENEFITS OF BIOMASS CROPS ON MARGINAL LAND

20TH-21ST MARCH 2018, KATOWICE, POLAND

MORE INFORMATION UNDER
http://www.miscomar.eu/

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Thank you for your attention!

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