

Task 42

Biorefineries in a future BioEconomy

Activities and current results



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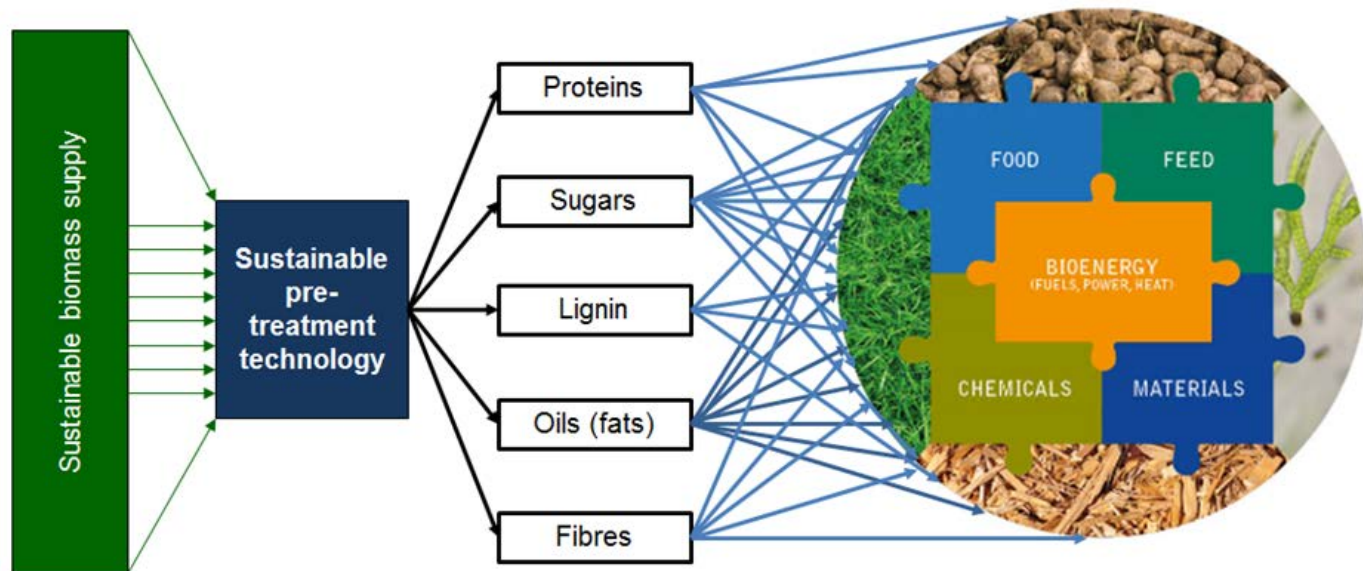
Wageningen Food and Biobased Research

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Biorefining

Definition IEA Bioenergy Task42

Sustainable processing of biomass into a portfolio of marketable biobased products (food and feed ingredients, chemicals, materials, fuels, energy, minerals, CO₂) and bioenergy (fuels, power, heat)



Task 42




Vision Biorefining is the optimal strategy for large-scale sustainable use of biomass in the BioEconomy resulting in cost-competitive co-production of food/feed ingredients, biobased products and bioenergy with optimal socio-economic and environmental impacts, viz.

- > efficient use of resources
- > reduced GHG emissions

Mission To facilitate the commercialisation and market deployment of environmentally sound, socially acceptable, and cost-competitive biorefinery systems and technologies, and to advise policy and industrial decision makers.

Motivation



Why do we need to think about, develop and implement biorefineries?

- Because the products and services we are using are based mainly on non-renewable resources
- Because the biomass resources are not inexhaustible, so they have to be used efficient and sustainable

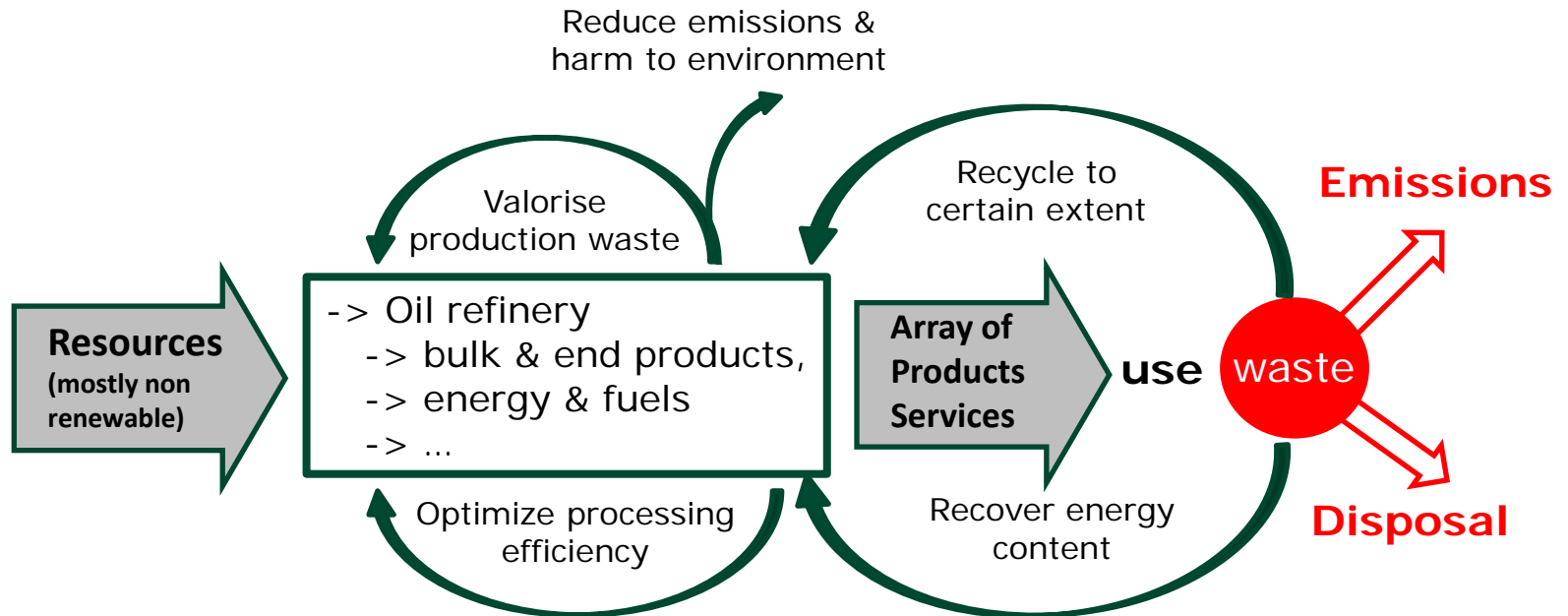
Non-renewable and current biomass processes are inefficient and not sustainable, consequently business as usual will not work out any more in the future!

Concept of current Economy

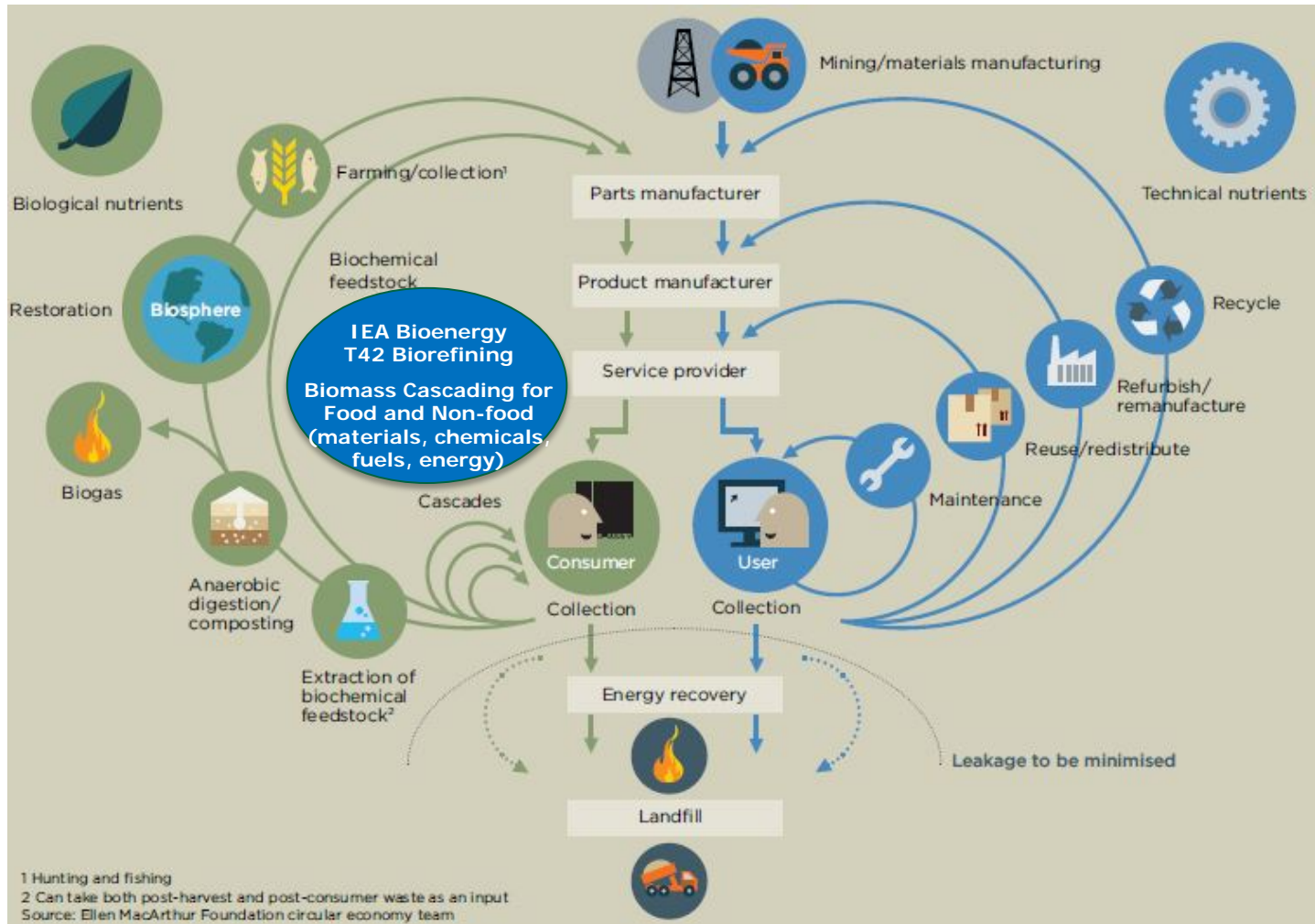
Resources
depletion !

Production system is not sustainable

Global
Warming !

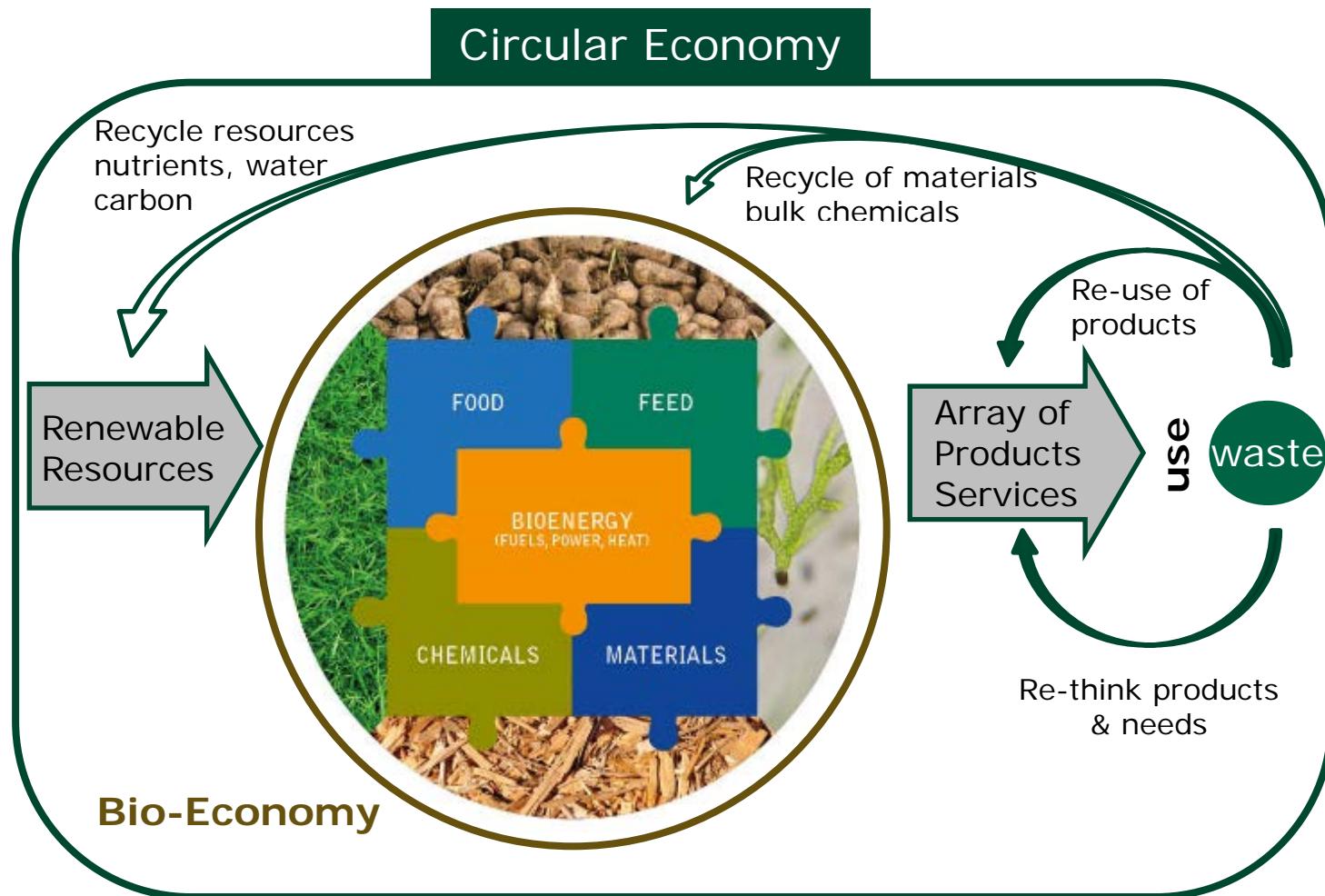


Re-think Economy



Reference: Ellen MacArthur Foundation (2012)

Concept of future Economy



Definition Circular Economy

A Circular Economy is an industrial system that is restorative or regenerative by design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models.

Reference: Ellen MacArthur Foundation (2012)

EU Priority Areas for Circular Economy

Sectors in which a biorefinery approach is very suitable and biorefining can make an impact !

1. Food Waste
2. Biomass and bio-based products
3. Plastics
4. Critical raw materials
5. Construction and demolition waste

Reference: EC (2015)

Task 42 Activities 2016 – 2018

Countries involved: AT, AUS, CAN, DEN, GER, IRE, IT, NL, US

Scope involve 4 different Activity Areas (AAs)

- **AA1 - Biorefinery Systems**
Analysis and assessment of biorefining in the whole value chain
- **AA2 - Product Quality**
Reporting on related biobased products/ bioenergy standardisation, certification and policy activities
- **AA3- Evolving BioEconomy**
Analysing and advising on perspectives biorefining in a Circular BioEconomy
- **AA4 - Communication, dissemination & training**
Knowledge exchange, stakeholder involvement, reports & lecturing

Planned results of Task42 Activities 2016 – 2018

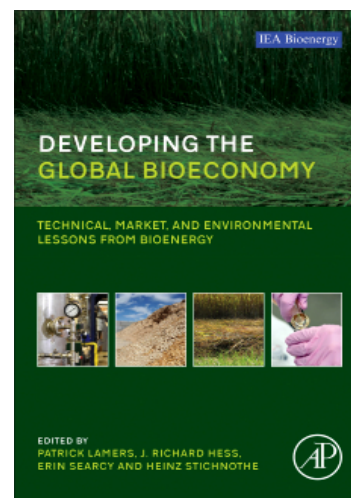
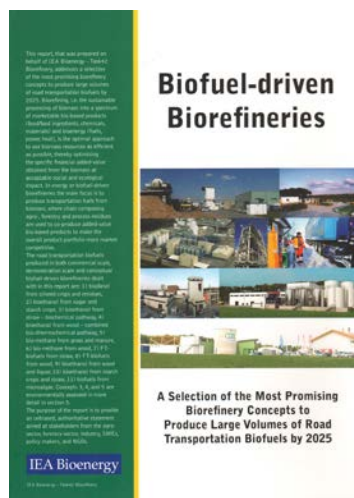
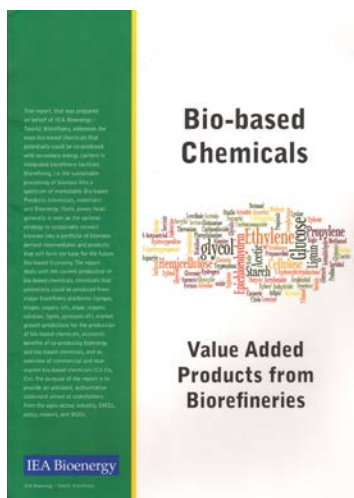
Deliverables

- Biorefinery Database System
- Biorefinery Factsheets – significant increase no.
- Joint Tasks Projects
- Strategic Reports on Chemicals, Materials and Proteins
- Updates of national Country Reports
- Thematic Stakeholder Workshops together with IEA IETS, FAO and OECD, JRC, other Tasks
- Conference & training contributions, ...

Task42 Results so far

Biorefinery definition, classification system and factsheet methodology

Thematic Reports



Recently published



Country Reports

AT, AUS, CAN, DEN, FRA, GER, IRE, IT, JAP, NL, NZ, TUR, UK, US

Task42 Results so far

Stakeholder Meetings, Excursions & Workshops

Between 30-40 over last 9 years



Knowledge & experience transfer

Lectures at international conferences

Publications in journals

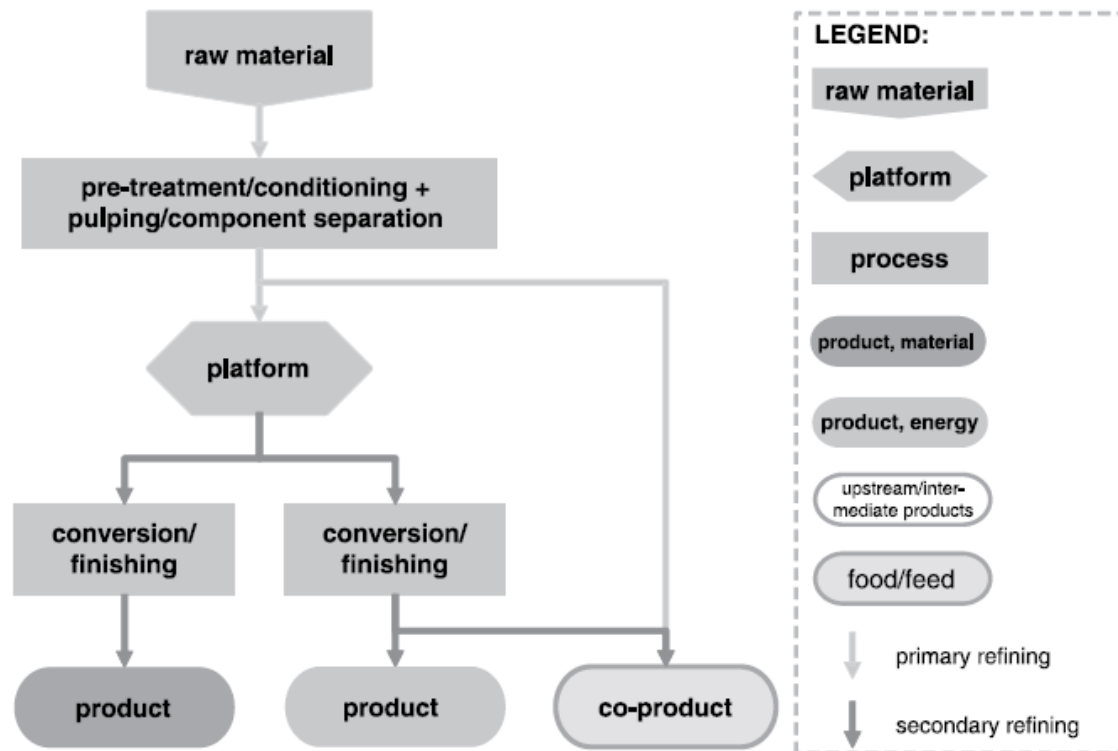
Specific thematic workshops

Specific biorefinery education
and training courses



Task42 - Results so far ...

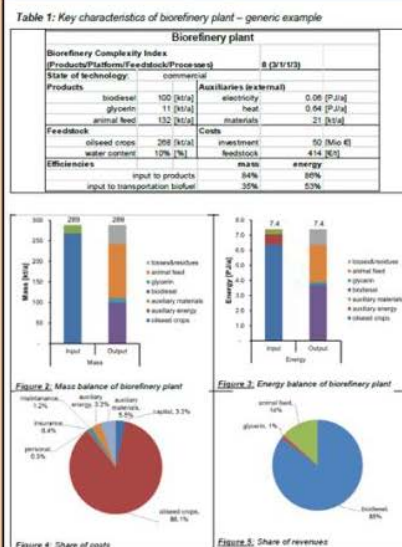
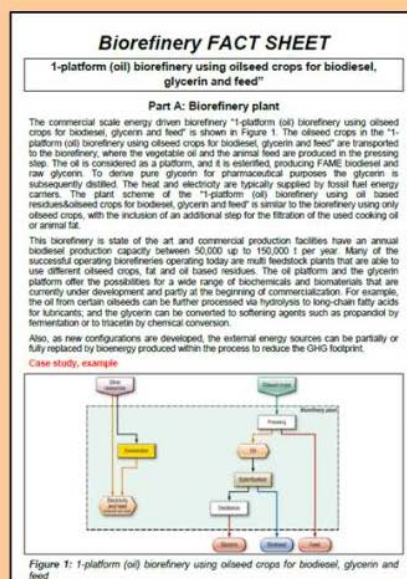
Definition – Classification System



Reference: VDI Richtlinie 6310, part 1 (2016)

Biorefinery fact sheet

Part A: Biorefinery Plant



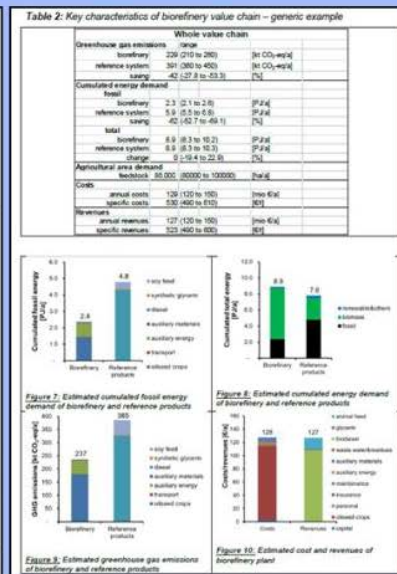
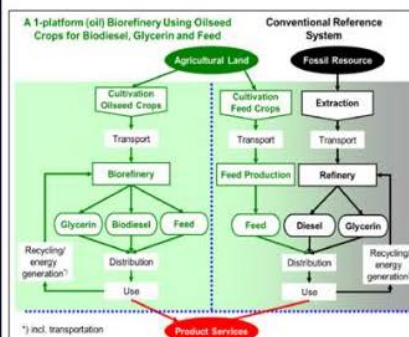
Part B: Value Chain Assessment

Part B: Value Chain Sustainability Assessment

The method of the sustainability assessment - economic and environmental - is given in Annex 1. The main assumptions and modelling choices are documented in Annex 2.

In future the following improvements of the assessment might be possible:

- Reduction of investment costs
- Use of renewable energy for auxiliary energy
- Further products made from glycerine with higher revenues
- Lower area demand due to a yield increase
- Using of straw for various products



Annex:

Methodology of sustainability assessment and data with references

Task42 - Results so far ...

Biorefinery Factsheet Methodology and biorefinery assessment

4-platform biorefinery using grass silage and food residues for bio plastic, insulation material, fertilizer, electricity

3-platform biorefinery using wood chips for pulp, paper, turpentine, tall oil, bark, electricity and heat

1-platform biorefinery using starch crops for bioethanol and feed

3-platform biorefinery using wood chips for bioethanol, electricity, heat and phenols

1-platform biorefinery using oilseed crops for biodiesel, glycerine and feed

1-platform biorefinery using oil based residues for biodiesel, glycerine, bio oil and fertilizer

2-platform biorefinery using wood chips for FT-biofuels, electricity, heat and waxes

3-platform biorefinery using straw for FT-biofuels and methanol

2-platform biorefinery using wood chips for FT-diesel, FT-gasoline, heat and waxes

3-platform biorefinery using straw for FT-diesel and methanol

3-platform biorefinery using wood for renewable gasoline/diesel, biochar and pyrolysis oil

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→For details see Task 42 webpage

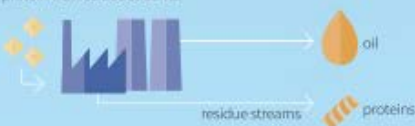
Scope of Task42 protein report

Oil crops

The four most important oil crops in Europe:



By refining of oil crops, oil production is combined with the production of protein-rich residue streams.



Dried distillers grains with solubles (DDGS)

Industrial processes generate residue streams that can contain certain amounts of proteins.



Aquatic biomass

Aquatic biomass forms a new source of protein.



Herbaceous biomass

Herbaceous crops are primarily used as forage and are a source of leafy vegetables.



Refining generally will produce a fibre-rich press-cake and a protein-rich press-juice that both can be processed downstream to co-produce proteins, products and energy.



Starch crops

Starch crops are used as human food, but also as sources of starch, for the production of proteins and ethanol.



Biorefinery increases the functionality of protein in potato.



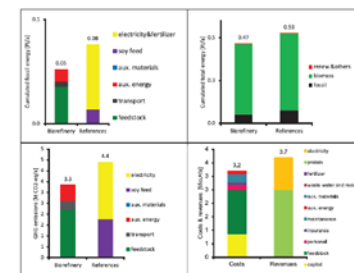
Biorefinery is used to produce bioethanol from maize.



Biorefining of protein containing biomass co-producing protein-based biobased products and bioenergy offers the opportunity to result in market competitive business cases

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...protein rich plants, production, markets, processing, applications, food, feed, charts & tables, new sources, biorefinery pathways, fact sheets...



Networking

IEA Bioenergy and its Tasks work on an international level to push ahead and progress within specified topics. The **work model for this is co-operation and interaction** between the participating countries to create additional momentum and utilise synergies.

Interaction between Task 42 and national stakeholders is vital and can create significant value on both sides!

Task 42 Coordination in Austria



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Thank you for your
kind attention

IEA Bioenergy



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Task 42 Biorefining

