POWER4BIO webinar series: Food & Feed, session 1.

Introduction to biomass valorization for food and feed in the global picture

28 October 2020, 9:15am CET, Jan Broeze, Marieke Bruins – Wageningen Food & Biobased Research

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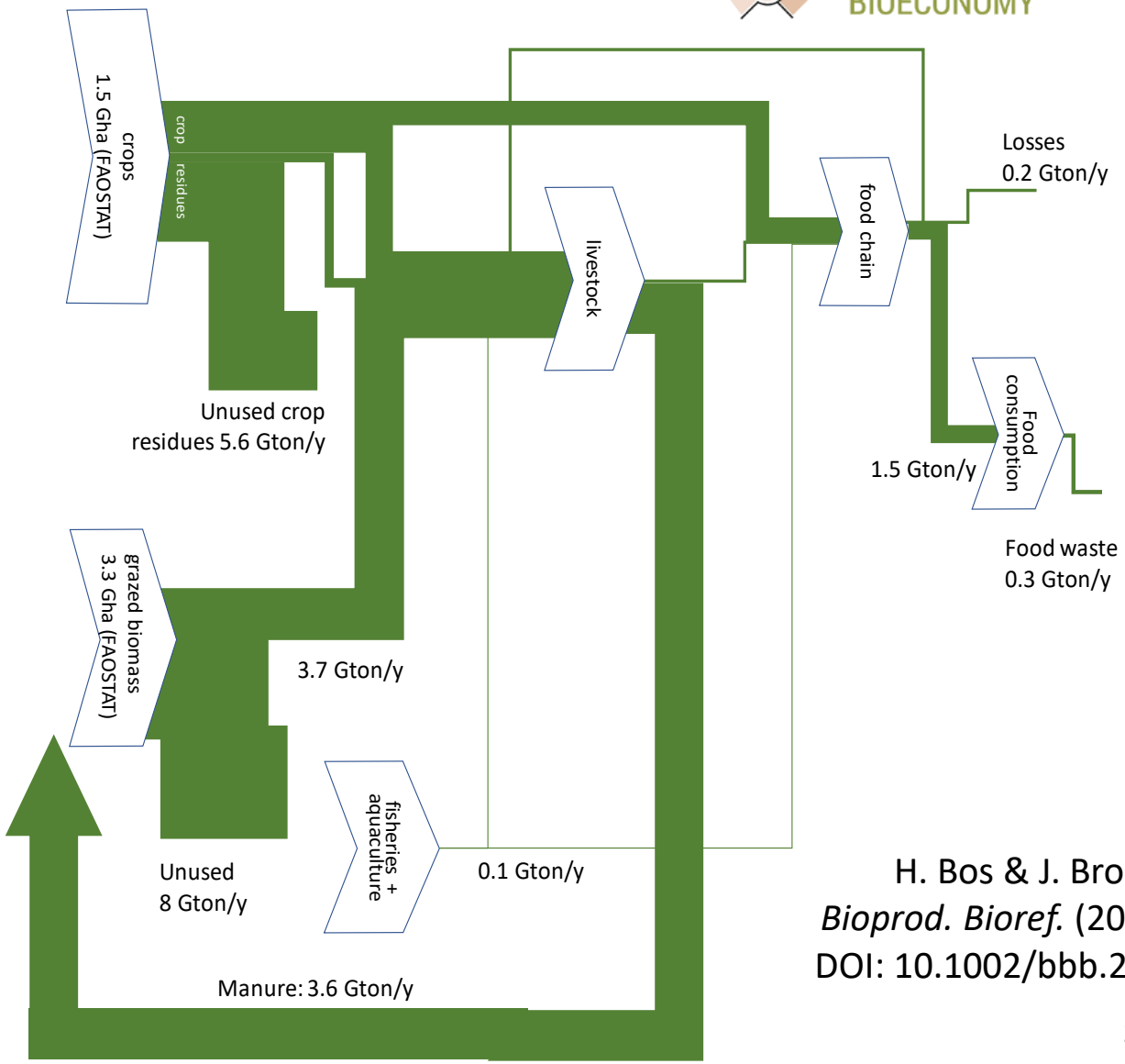
Content of this session

- Global challenge: fulfilling (projected) human demands for food, feed & biobased
  - quantitative assessment: global biomass productivity & demand
  - inefficiencies in the system
  - role of biobased developments including biorefinery approaches
- Drivers
  - resource oriented: total biomass valorisation, increase value for a biomass stream
  - reduce material costs by using a side-stream or waste stream
  - market oriented: address new demands (food trends), find cheap biomass derived sources
  - social drivers / regional development / EU policy agenda
  - incentives
- Some typical drawbacks, challenges
- Characteristics of (circular) valorisation of biomass (side-)streams for food and feed

Global biomass balance (agro-food system)

- Global growth crops + grass
  ≈ 20 to 25 Gton/y
  (of which < 50% harvested)
- Food consumption ≈ 1 to 1.5 Gton/y

- Large “inefficiencies”
  - livestock
  - losses along chain
  - unused crop fractions
- Reducing “inefficiencies”
  - reduce hunger
  - fulfil changing diets
  - fulfil expected biobased demands



H. Bos & J. Broeze, *Bioprod. Bioref.* (2020); DOI: 10.1002/bbb.2080

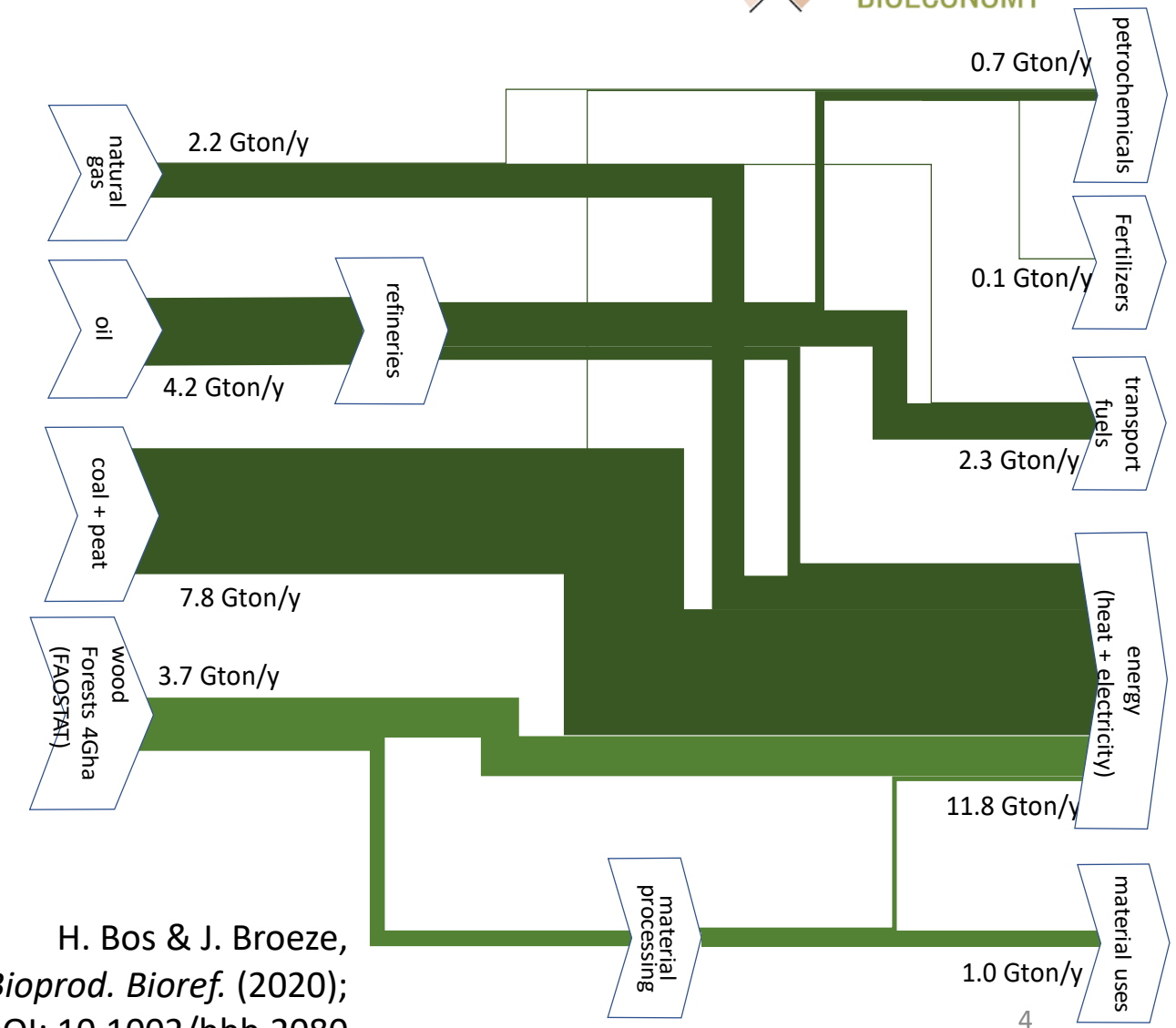
Global biomass balance (fossils/non-food)

- Global ‘production’ fossils + forestry ≈ 18 Gton/y
- Total use 16 Gton/y

- Challenge biobased economy: 14 Gton/y fossils
  - ≈ sum of all unharvested crop residues + grass + losses along food chains

We will need smart solutions!

with a.o. interactions between food & non-food domain



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Necessary developments

- increase production (breeding, intercropping, smart fertilisation)
- higher share of biomass utilisation, whole crop usage, valorisation of side-streams and ‘wastes’, (sugar beet leaves)
- cascading and more complete use of crops
  (including functional use of processing ‘wastes’ and recycling minerals)
- functional use of individual components (biorefinery)
- reduce losses
- reduce inefficient steps (like animal production based on crops)

- circular solution for maintaining soil health: recycling nutrients to the soil

Drivers and opportunities within the agro-food system (1)

Production orientation: reduce waste and add value

- reducing waste (ban on landfill, costs of composting, etc)
- reducing environmental impact (taxes/incentives)
- reducing dependency on market prices for one product.
- sum of value of individual components > value of combined stream
- skip inefficient steps

Pull: market orientation

- fulfil increasing demand for resources
- cheap sourcing (frequent driver for food and animal feed)
- specific functionalities and 'clean label' food ingredients (like fibres, anti-oxidants, natural colorants; bio-stimulants; natural flavours)
- Revision of the regulations related to the food sector (labelling ingredients)
- meat replacers

Societal drivers and opportunities

- Sustainability ambitions
  - GHG
  - nitrogen emissions
  - sustainable energy
  - circularity
  - biobased products
  - total crop valorisation

  incentives/subsidies

  NGO's, 'third parties'

  "license to exist"

- Regional development
- Supporting farmers through sustainable government support programs
  - soil health
  - attract the younger generations to the agri-food sector in order to reduce unemployment rates and cover necessity issues regarding workers
  - high value chains

Drivers: highlights EU policy agenda on agro-food-biobased

- wish to become more self-sufficient
- circular economy
- biobased developments
- move to climate neutrality,
- conservation of natural resources
- maintain/create jobs
- economic growth
- …

Drawbacks, challenges, etc. (1)

Institutional challenges

- Market disturbances of incentives
- Very often still linear thinking; we need to move to more circular production chains
- Lack of common posture: strategies climate, sustainability, transport, energy, food, industry are part of the bioeconomy with different aims

Legal & safety status

- Inexistence of certification for bioproducts
- Material categorized as residue cannot be used for food additives
  - quality management/HACCP required along whole production/supply chain
  - Novel Food Regulation / limitations on declaration of food functionality
- safety hazards, anti-nutrients (e.g. high levels of limiting compounds peels/cakes)

Drawbacks, challenges, etc. (2): Technological & marketing issues

- Withdrawing biomass from traditional function
  - when harvesting a crop residue, soil fertility may be harmed,
  - feed materials that can be transformed to food threatens availability of nutritional feed
- Biorefinery often focuses on multiple markets,
  - diverse business lines per company,
  - knowledge of these different markets is required
  - biorefineries present many requisites e.g. biorefineries cannot be installed near a food production site where fresh product is handled.
- Technologies are not flexible regarding feedstocks and products.

Principles for circular use of biomass (side-) streams for food and feed

- Try to make best use of the biomass' value:
  - when possible try to prevent loss of function (e.g. keep protein in native state)
  - choose applications in which nutrients (proteins!) keep their value
  - eliminate intermediate steps that do not add nutritional value
- When only a small fraction of the biomass is functional/valuable in an application, separation may be wise
- Prevent hurdles for next cyclic use

Thank you for your attention

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Next session at 10 am CET

Session 2. Technical examples on added value generation

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