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From land demanding to low input & high efficiency feedstocks

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- Critical supply chain components
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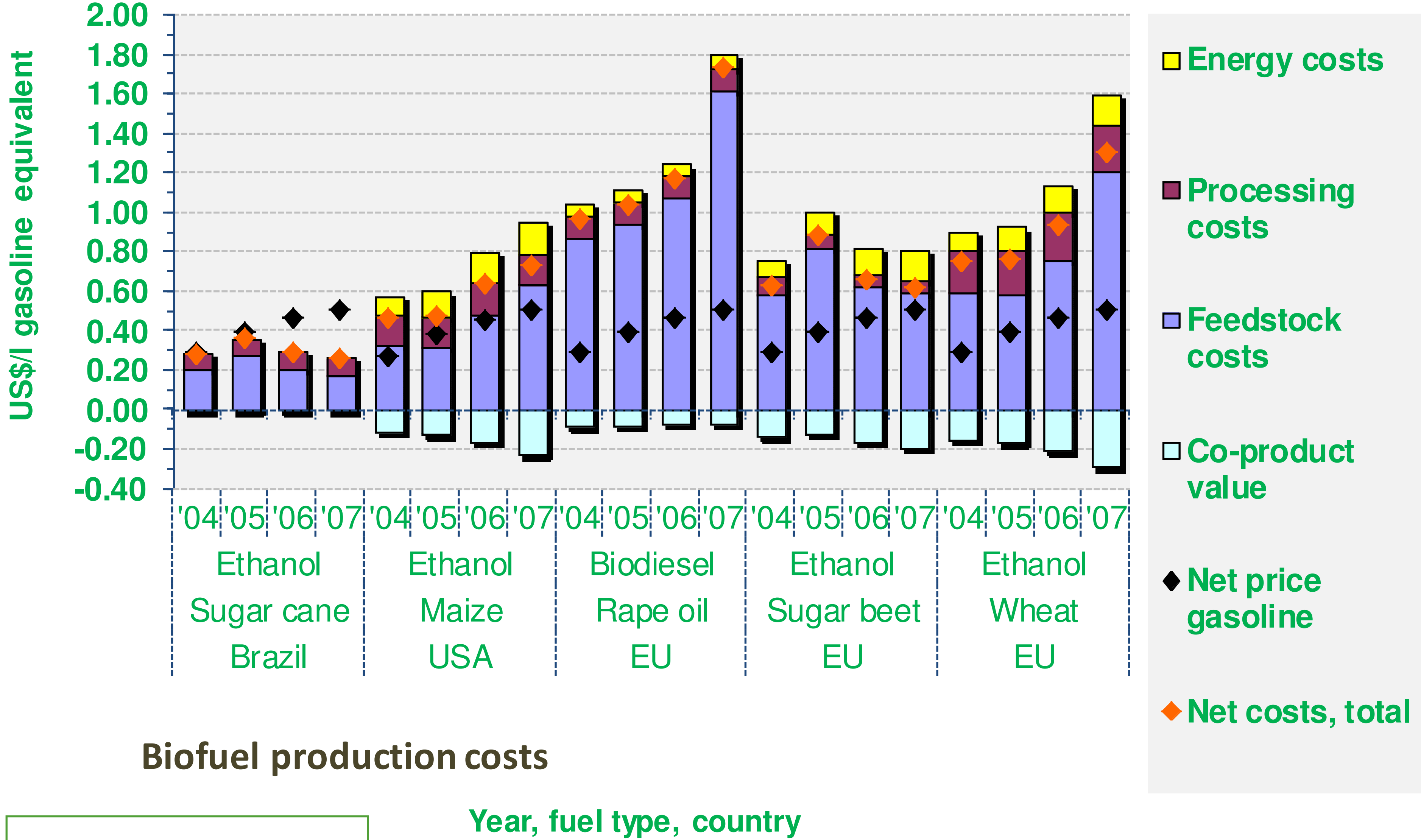
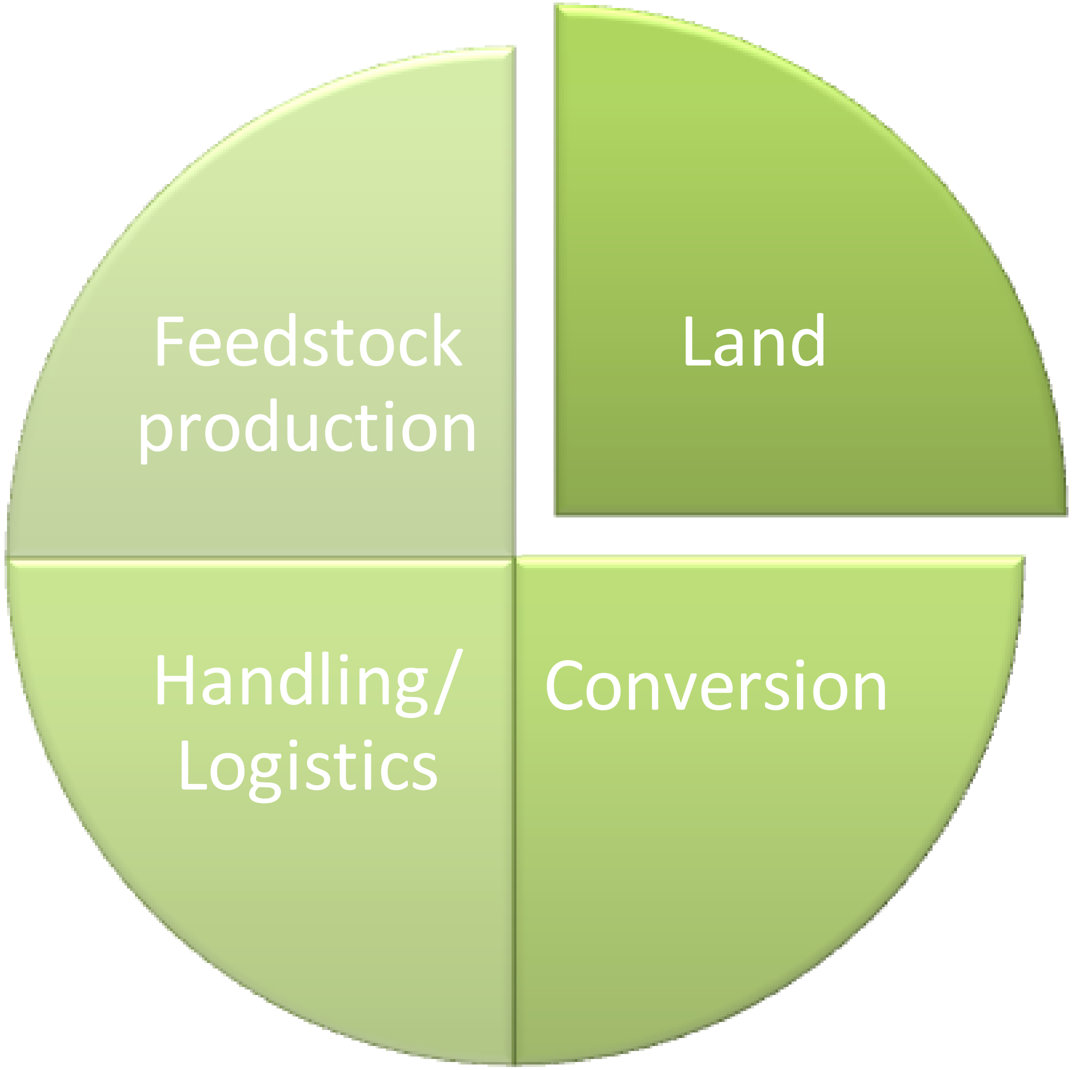
Why feedstocks „high“ on the agenda?



Biofuel production costs

Source: OECD

Critical supply chain components

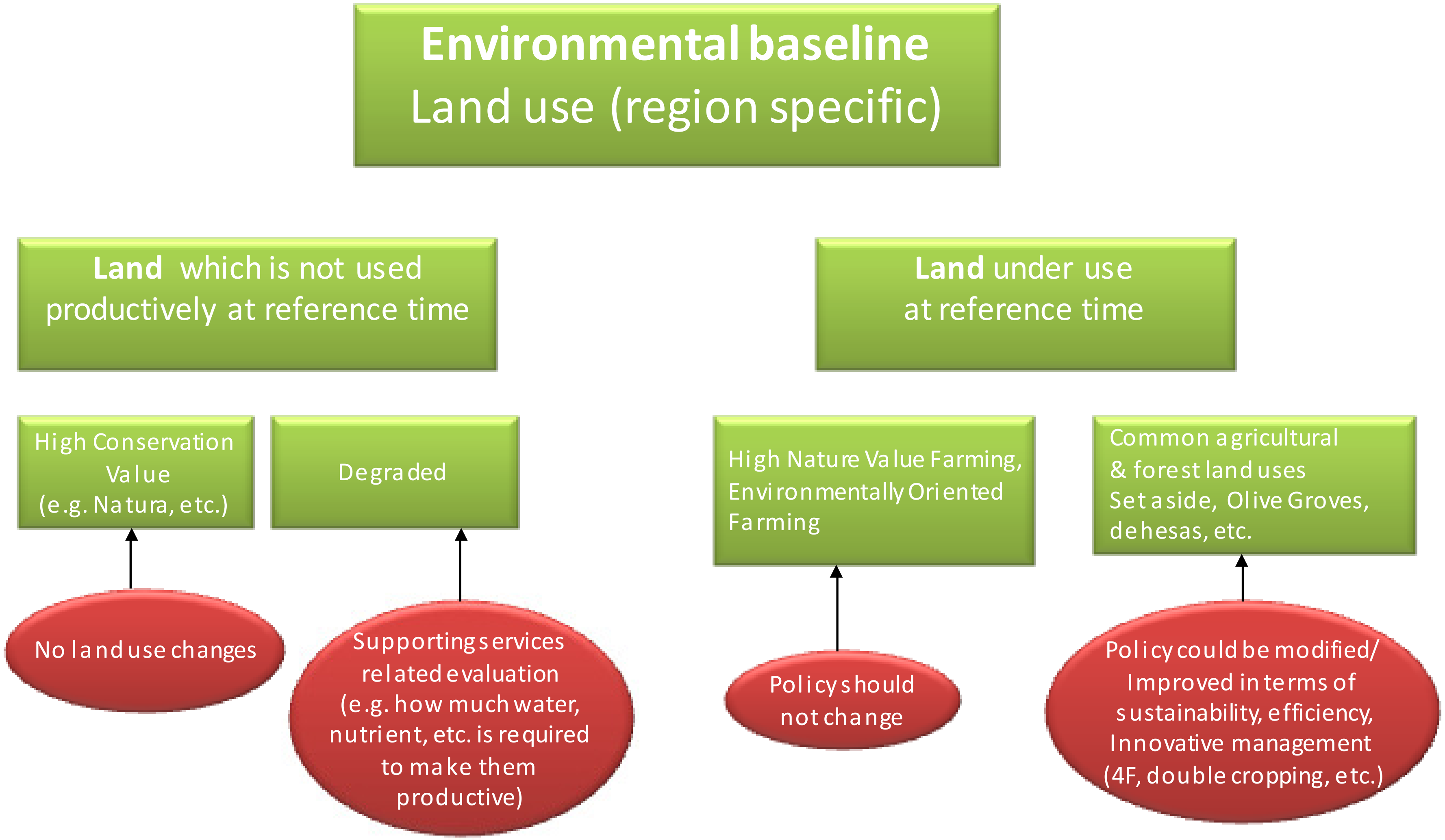


The "land" limit

- Availability/ conflicting uses
- Yields & cropping practices
- Technology & Infrastructures (efficiency & compatibility)
- Scale of production
- Sustainability criteria Land, water, biodiversity

- 4-5 t/yr wheat (~ 50 GJ/ yr)
- 5-6 t/yr corn (~ 60 GJ/ yr)
- 9-10 t/yr s/beet (~ 110 GJ/ yr)
- 10-15 t/yr e. grasses (~ 170- 200 GJ/ yr)
- 3-10 t/yr e. grasses in marginal lands (~ 30-120 GJ/ yr)

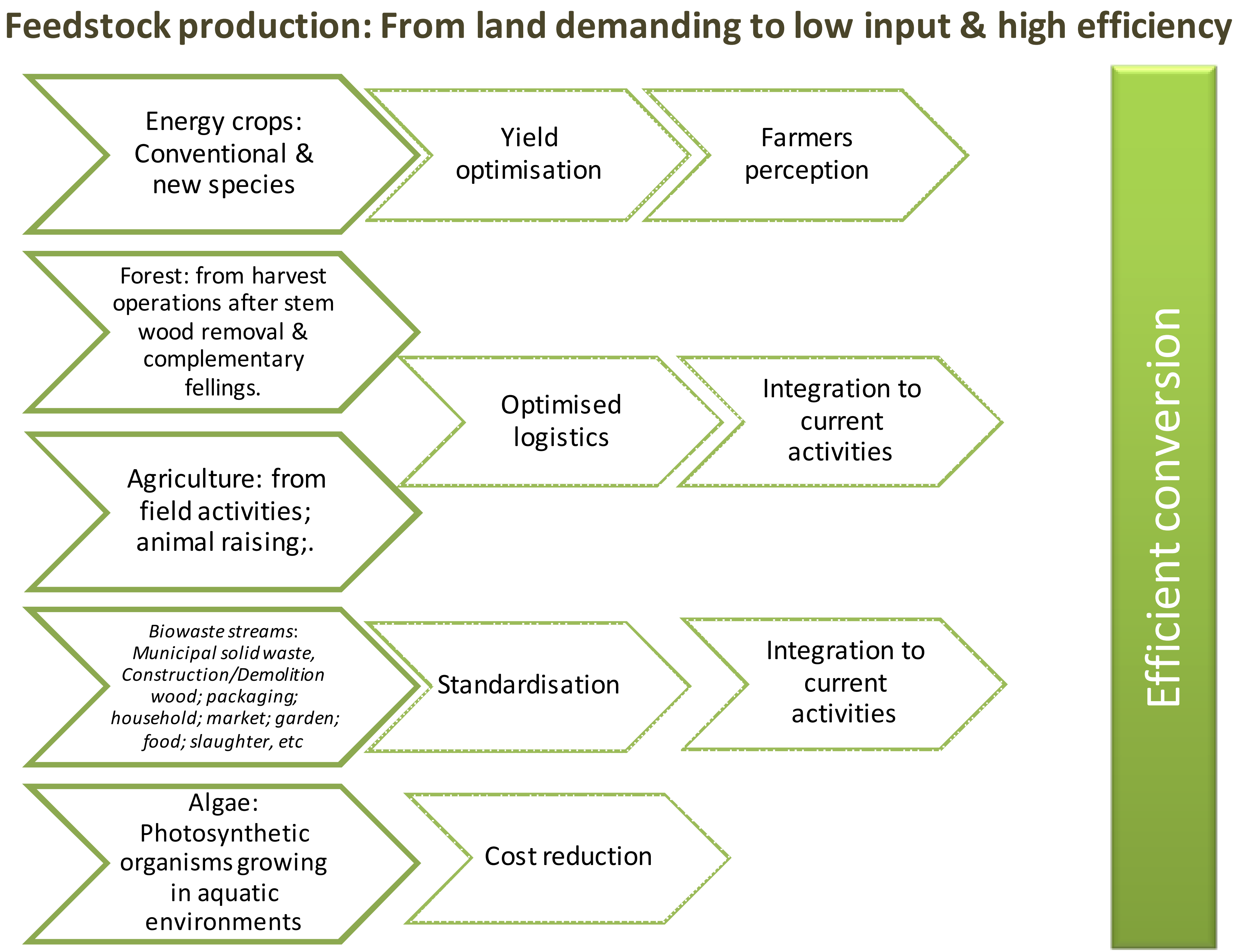
So we need to introduce land use strategies, subject to regional ecology & climate



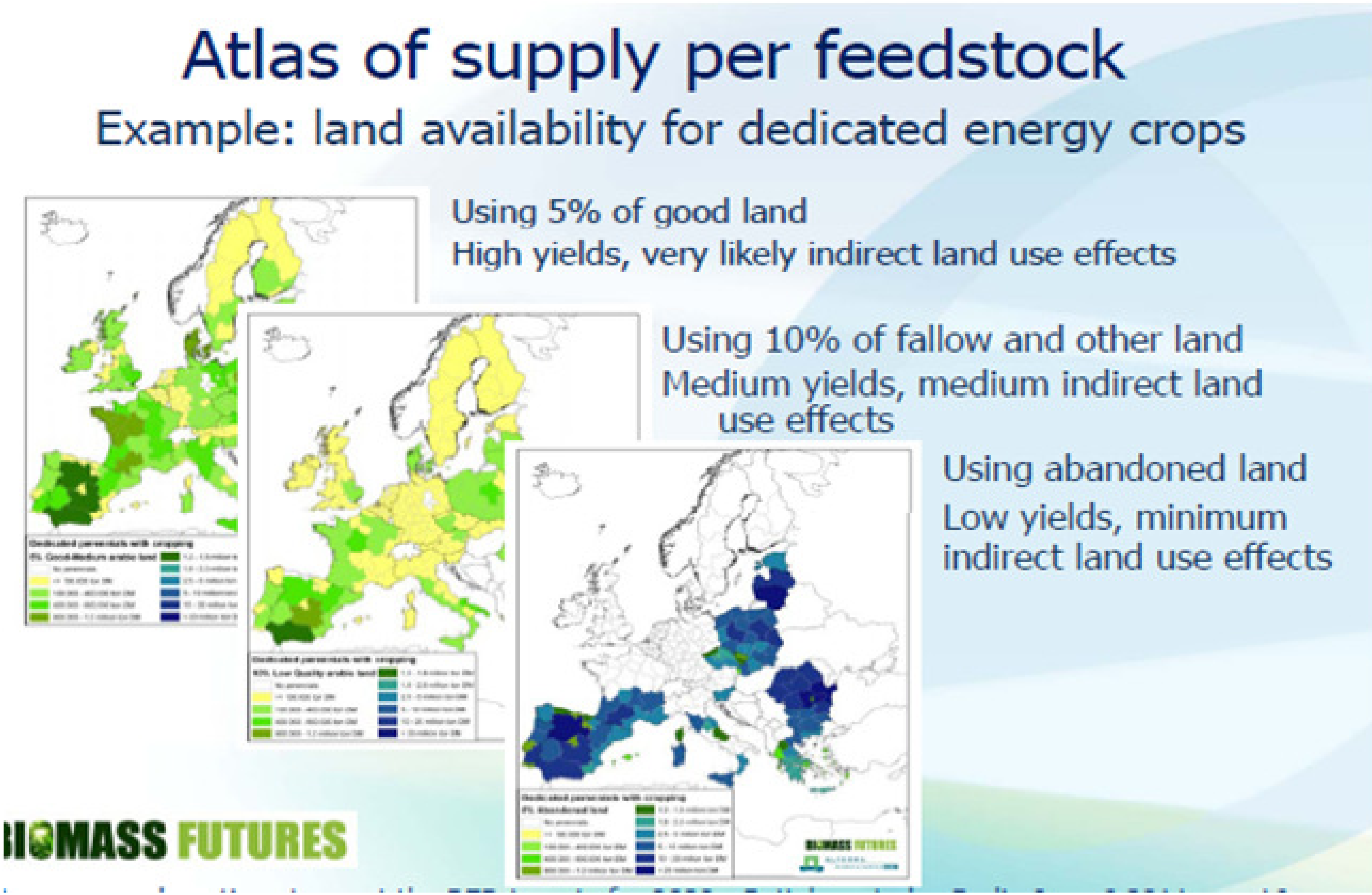
Issues under consideration when evaluating land use for biomass & biofuels

- Land use allocation
  - Land use changes :
    - Within one land cover (e.g. agriculture)
    - Between land cover classes (e.g. grassland to biomass, etc.)
  - Evaluation parameters:
    - Carbon balance
    - Soil erosion
    - Water management
    - Species richness
- Land use intensity
  - Crop choice & pattern
  - Management intensity
  - Influence on the structural diversity of farmed landscape (e.g. effect of annual & perennial crops is different)

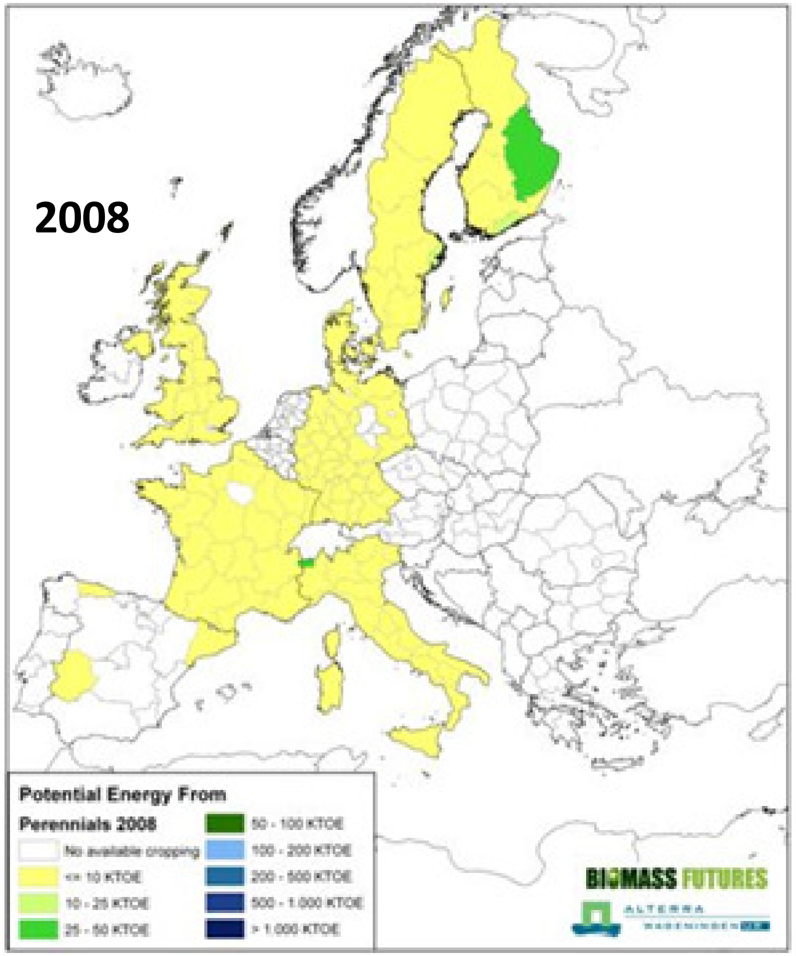
Sources: O'Connell *et al*., 2005; EEA, 2007; Pettersen, 2008

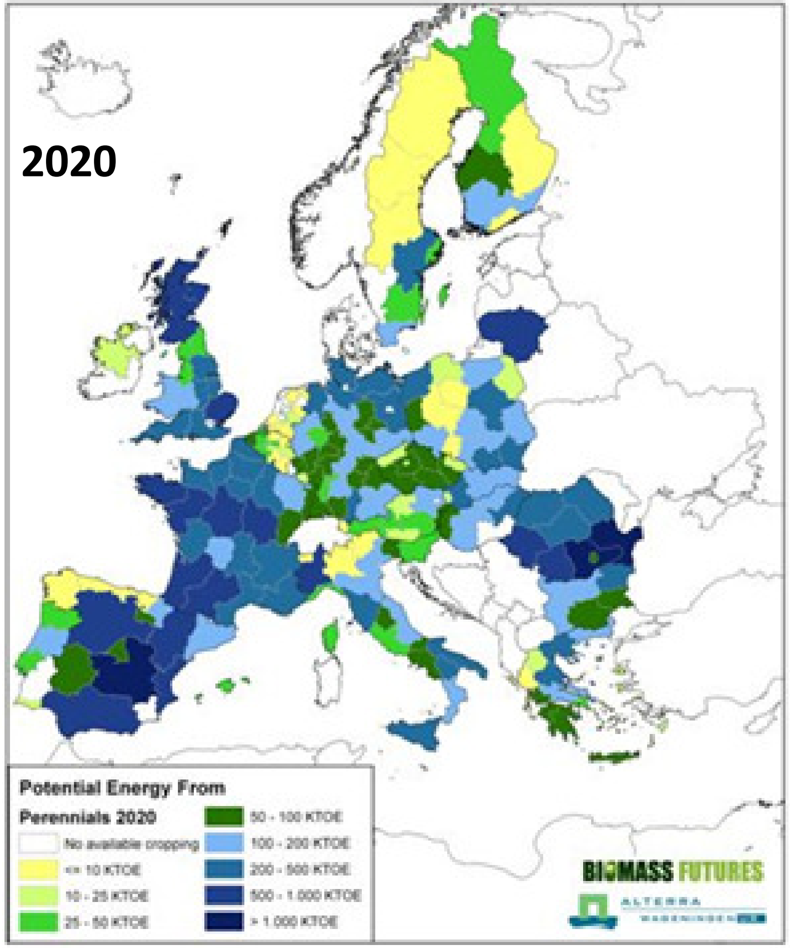

Feedstock production: From land demanding to low input & high efficiency
Energy crops: Conventional & new species
Yield optimisation
Farmers perception
Forest: from harvest operations after stem wood removal & complementary fellings.
Agriculture: from field activities; animal raising;.
Optimised logistics
Integration to current activities
Biowaste streams: Municipal solid waste, Construction/Demolition wood; packaging; household; market; garden; food; slaughter, etc
Standardisation
Integration to current activities
Algae: Photosynthetic organisms growing in aquatic environments
Cost reduction
Efficient conversion

By November 2011: www.biomassfutures.eu



Perennial crops potential





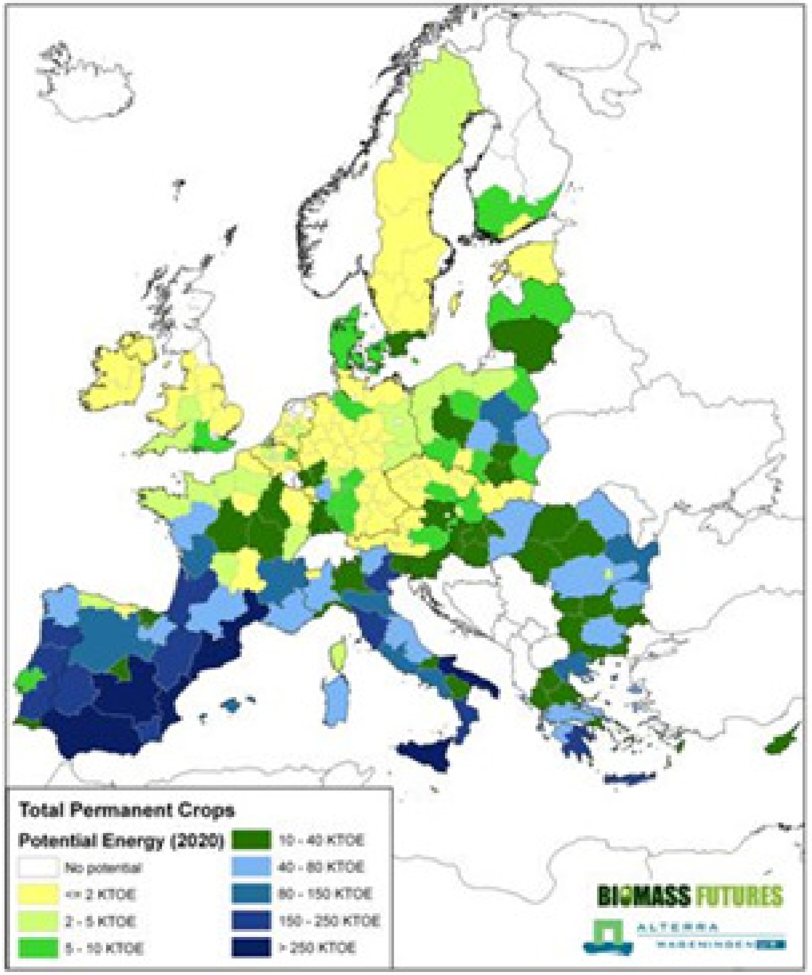
RES-Directive + NREAP targets reached
No use of biodiversity rich areas (HNV farmland)
No use of areas of high carbon stock

Perennial crops released land:
- Preference for >50% GHG mitigation (whole pathway)
- Cheapest crop mix per region

But not only: Cuttings-prunings permanent crops 2020

Factors determining potential:

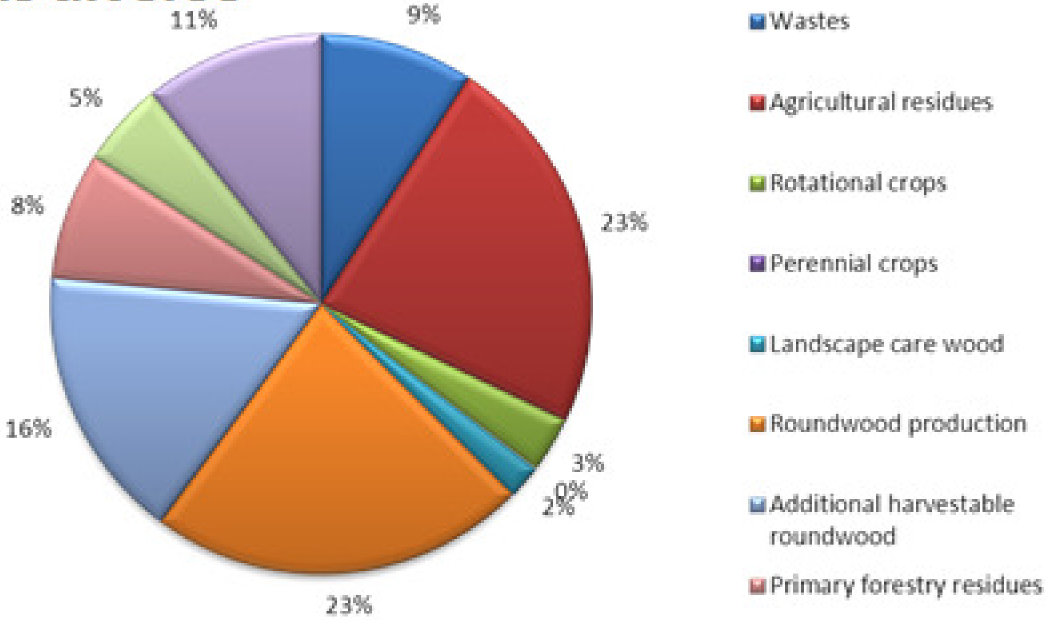
- Permanent cropping area (e.g. vineyards, fruit trees, nuts and berries, olives and citrus)
- Sustainability constraints:
  - Some risk of soil compaction, if heavy machinery used
  - Loss of soil carbon when roots removed of old plantations, certainly when ploughed up after many years
- Source data used: Capri baseline 2020, Biomass Futures modelling



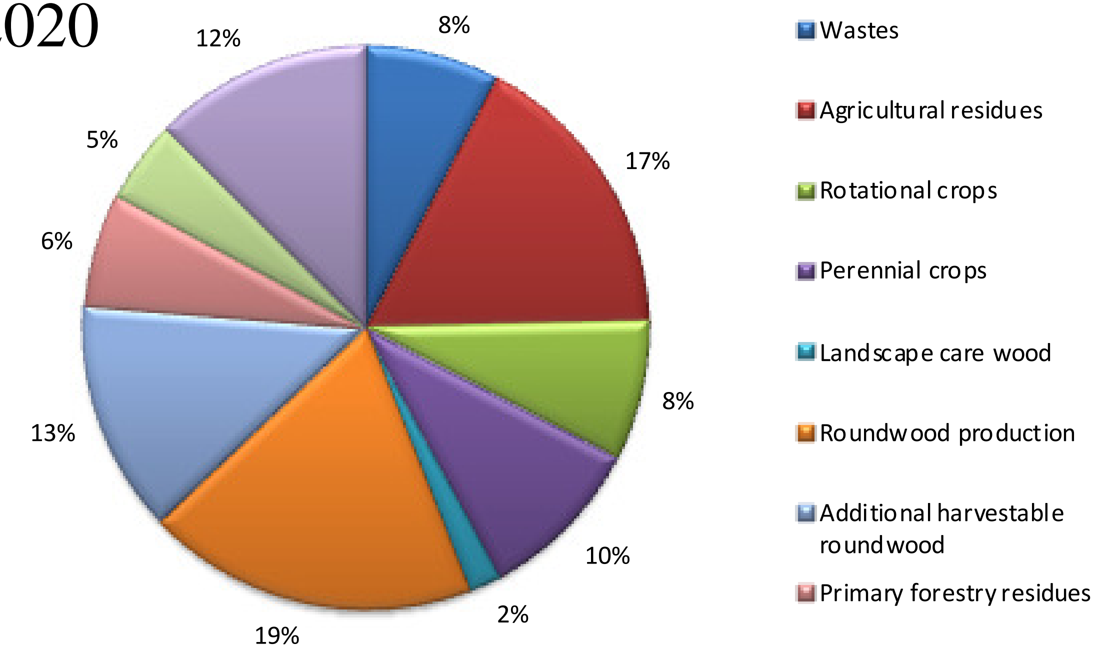
EU: 7302 Ktoe (2% of total potential)

Feedstock matrix remains diverse

2010



2020



BIOMASS FUTURES

How can we mobilise existing streams while working with optimising new species?

Improving quality & optimising logistics

(Source: Markku Karlson, UPM)

Handling

Potential handling stage	Overview
Separating and sorting	Consists of operations that segregate components of plant material based on shape, size, or density.
Mixing / blending	Involves bringing two or more of the same or differing materials together for the purpose of preparing a mixture with improved biomass characteristics.
Drying	May be used to reduce the moisture of biomass. The goal is to change the moisture content of the biomass to levels that are safe for long-term storage or final processing.
Densification	Can be any operation that changes the state and/or reduces the volume of a given mass of biomass. This size reduction can increase the unit density of biomass, resulting in a smaller space required for storage and transportation.

Feedstock production

- Develop plant/ tree varieties and optimise management practices to meet conversion requirements (integrated solutions for fibre and energy).
- New biomass production system concepts on arable and forest land to optimise yielding potentials under sustainable management practices.
- Improve knowledge of breeding tools and apply existing biochemistry techniques to relevant species

Harvesting/ Collection/ Handling

- Develop harvesting and collection systems (new equipment, new chains) to maximise supply by minimizing costs per unit.
- Develop feedstock quality and monitoring systems both for wet and for dry storage.

Storage & Transport

- Develop feedstock quality and monitoring systems both for wet and for dry storage.
- Test efficient transport systems according to location; existing infrastructures, etc.

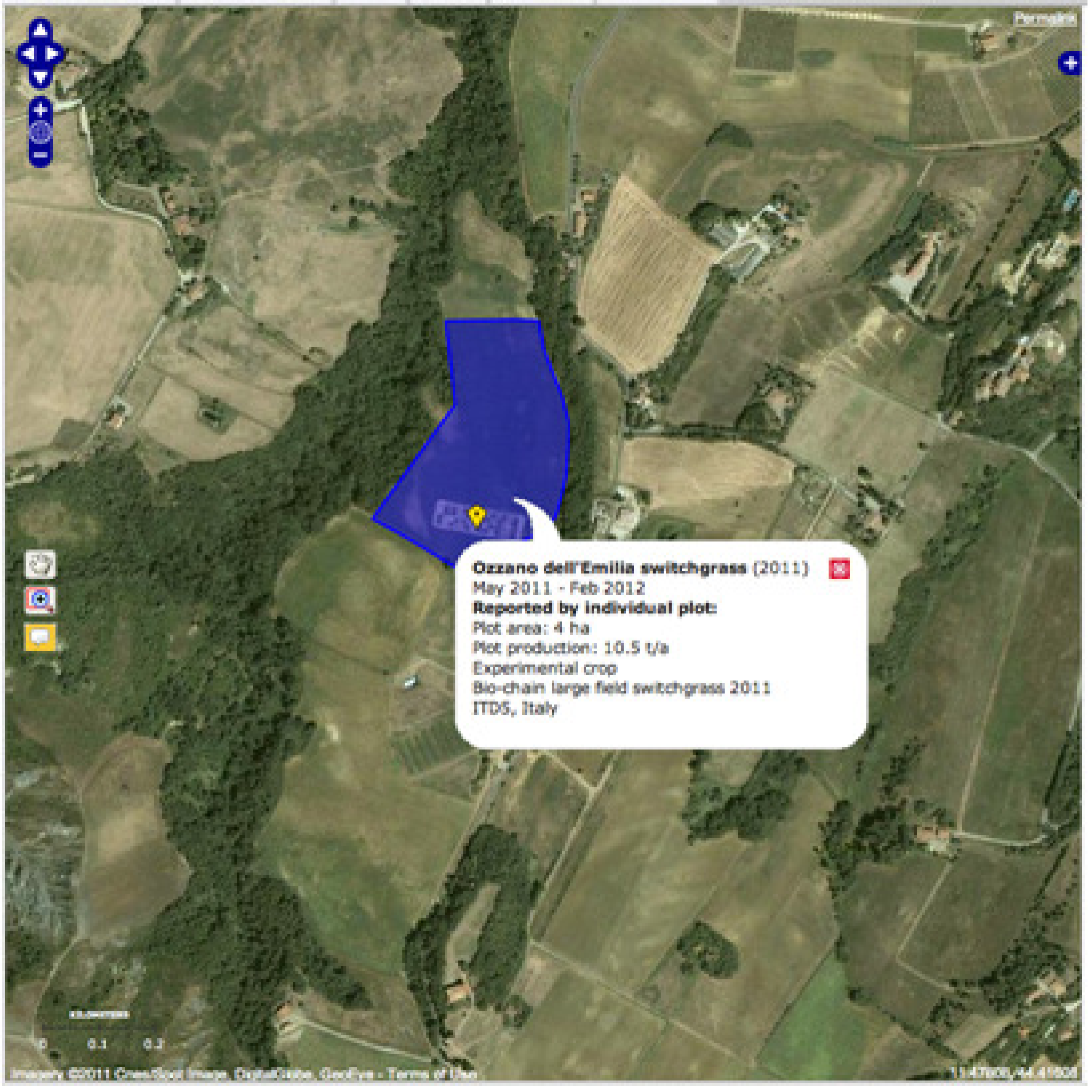
BioResources Map

The BioResources Map is a mapping tool for sustainably produced biomass resources and plantations.

This tool will initially be used as a test case for certified and other plantations of energy crops. These can be located anywhere in the world.

The information provided stays confidential within the core team of the BioResources Map project which consists of EC officials, the project coordinator Acconia, the BioResources Map developer Mappingbook and some key external advisors.

The BioResources Map is still under development but we expect it will be finalised by the end of the 2011. Of interest is the possibility of using the BioResources Map as a common reporting tool for certified plantations.



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Critical issues

- Which are the most promising feedstock types (within each category, ie forestry, energy crops, agriculture, algae) in time sequence (starting from now to 2030- 2050)
- What are their yields now & what changes are expected in the future?
- Do they have conflict with other sectors (or expected to have in the future) like food; biomaterials, etc.
- What is the cost & how much it is expected to "change" for 2030-2050?
- Which are the most efficient ways of mobilising such feedstocks (covering the full supply chain-to the plant gate)?
- At which stage along the supply chain (is it higher yields? or optimised logistics for example) should the emphasis for future development be placed?
- What are the most important sustainability issues related to their production & use?

Conclusions

Land demanding feedstocks

- Require optimisation in production & management/ handling
- New business concepts with intermediate companies undertaking the handling/ logistics & providing interface between farming/ forest community – end users
- Strengthen communication with farmers
- Estimate the European capabilities for indigenous feedstock production

Low land demanding feedstocks

- High yielding with no requirements for "useful" land BUT
- Capital intensive and still need substantial RTD across all the supply chain steps

Thank you

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