

# Ensuring sustainability of biofuels/bioenergy through certification: challenges and opportunities



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## Renewable Energy Directive 2009/28/EC

- Part of the package of energy and climate measures
- Sets **mandatory targets** for 2020:
  - 20% overall share of renewable energy
  - 10% renewable energy in transport
  - indicative trajectory towards 2020 targets per MS
- Requires **National Renewable Energy Action Plans**
- Introduces **cooperation and flexibility** mechanisms to reach targets cost-effectively
- Creates a **sustainability regime** for biofuels and bioliquids
  - monitoring and reporting requirements

## Sustainability Criteria

The European Commission set up specific Sustainability Criteria for biofuels used in EU (domestic production or imported)

<b>GHG Emission Savings</b>	❖ Minimum 35% GHG Emissions saving (50% from 2017, 60% from 2018)
<b>Biodiversity</b>	❖ not be made from raw materials obtained from biodiverse areas (primary forests, nature protection areas, highly biodiverse grassland)
<b>Land use</b>	❖ Not be made from land with high carbon stock (i.e. wetlands, forested areas...) ❖ Not be grown on peatlands
<b>Good agricultural conditions</b>	❖ Requirements for good agricultural and environmental conditions (Council Regulation 1782/2003) and social sustainability
<b>Traceability</b>	❖ CoC based on mass-balance

## Monitoring and Reporting under Sustainability Requirements

- **Member States reporting on:**
    - bioenergy developments and **availability of biomass resources**
    - changes in **commodity prices** and **land use**
    - impact on **biodiversity**, **water** resources, water quality, **soil** quality
    - estimated net GHG savings
  - **Commission shall monitor**
    - the origin of biofuels and their impact, including impact on land use
    - commodity price changes associated with the use of biomass for energy
    - associated effects on food security
  - **Commission reporting on:**
    - **environmental benefits and costs** of biofuels
    - impact of **increased biomass demand** on sustainability and **biomass using sectors**
    - **indirect land-use changes** in relation to all production pathways
    - impact on the **food security**, and **availability** of foodstuffs at affordable prices
- ... and, if appropriate, propose corrective action**

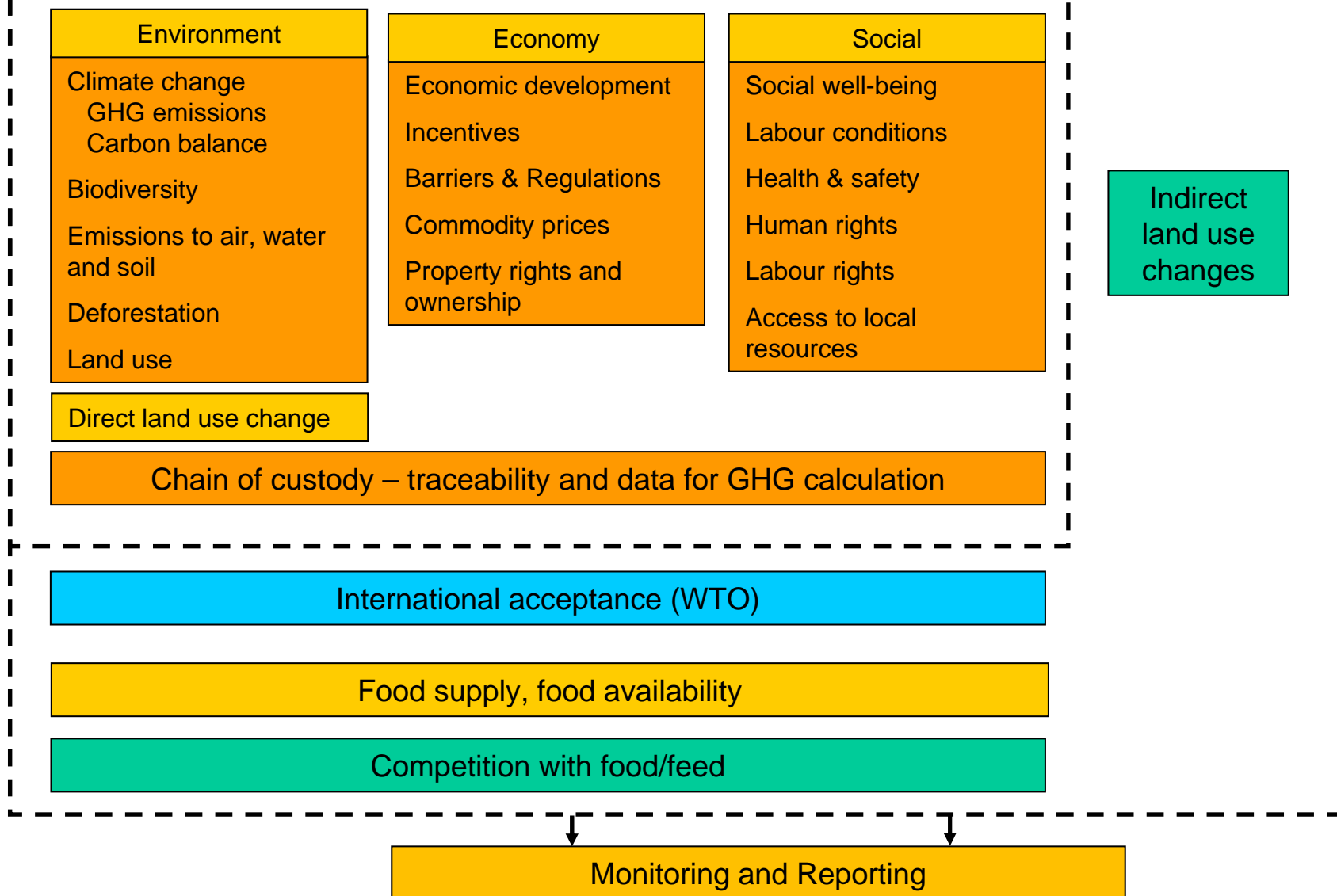
## Sustainability of solid and gaseous biomass COM(2010)11

- National biomass sustainability schemes can be developed
  - recommended sustainability criteria similar to those for biofuels and bioliquids
  - bioenergy installations below 1 MW exempted from sustainability criteria
  - differentiation in favour of installations with high energy conversion efficiencies
  - no sustainability criteria to waste – separate waste legislation
  - waste exempted from the GHG saving recommendation
- Monitoring requirements for Member States
  - origin of primary biomass used in electricity, heating & cooling
  - effects of biomass use on the areas of origin
  - small-scale (mainly household) biomass use
- Commission to reassess this issue by the end of 2011
  - impact of national sustainability issues and bioenergy development
  - additional measures such as common sustainability criteria at EU level

## Sustainability scheme: European Commission's requirements for verification of compliance

Preservation of Biodiverse areas (primary forests and Highly biodiverse grassland)	Establish criteria and geographical ranges to define such areas
Account for C emissions from LUC and preservation of high C lands (forested areas, wetlands)	Guidance to calculate actual values for carbon stock changes
Assessment of impacts on peatlands	Methodology to assess the impact of peatlands drainage on GHG emissions
Respect of environmental and social requirements outside EU	Multilateral agreements and voluntary schemes
Rules for calculating GHG emissions saving for biofuels/biomass pathways	Update of existing default values and addition of new ones
Cultivation on severely degraded / contaminated land	Bonus of 29 gCO <sub>2</sub> eq/MJ – definition and thresholds of degraded/ contaminated
Minimise GHG emissions caused by ILUC	Policy proposal on how to address ILUC in EU legislation
Encourage biofuels from waste, residues, non-food cellulosic, ligno-cellulosic material, algae	Additional benefits (double counting towards the target)

## Sustainability Certification



## Why certification?

- Greenhouse gas (GHG) emissions
- Biofuels/biomass production:
  - climate change mitigation, improved energy security, rural development...
  - no detrimental side-effects on environment, food security, land use, labour conditions...
- Direct and indirect environmental impacts:
  - deforestation, loss of habitats / biodiversity, impact on air, water, soil...
  - biodiversity: exclusion of “no-go” areas
- Direct and indirect social impacts:
  - rural development, labour conditions, health and safety, land rights, food availability and food security
- Bioenergy and water?

**Coherence for bioenergy (electricity, heat, transport) and biomaterials needed**



# Biofuels/bioenergy certification schemes

## Certification systems for:

Agriculture

Forestry

Bioenergy feedstocks

Biofuels



**GLOBALG.A.P.**



## Certification schemes in agriculture

- Certification schemes for agricultural products
  - IFOAM, GlobalGap, LEAF, SAN, FAIR TRADE...
  - sustainable farming practices
  - addressing mainly environmental aspects
  - agrochemical use
  - safety and health
  - food traceability
- Many approaches
- Several national labels for organic agriculture
- No prohibition of the use of land with high carbon stock
- Lacking GHG emissions thresholds
- RTRS, BONSUCRO - similar criteria as EU-RED



## Forest certification

- Forest certification systems
  - FSC, PEFC, SFI, CSA-SFM, FFCS
- Avoid deforestation
- Recommendations and guidelines for Sustainable Forest Management
- Biodiversity issues covered
- Chain of Custody (CoC) certification
- Socio-economic aspects included
- No protection of high carbon land
- GHG emissions not fully covered by the criteria





## Biofuel crops certification

- International voluntary initiatives for
  - palm oil (RSPO), sugarcane (BONSUCRO) and soy (RTRS)
- Higher risk of negative impact
  - deforestation, natural habitats, biodiversity...
- Addressing environmental, social and economic issues – local circumstances
- Traceability systems
- GHG emission calculator
- Integrated Crop Management (RTRS), Best Practices (RSPO), Business Practices (BONSUCRO)
- National Interpretation of principles & criteria – local indicators, guidelines and procedures (RTRS, RSPO)
- Proposed methods for emissions reduction (RSPO)
- Guidance for Environmental Management Plan (BOBSUCRO)



# Biomass for heat and power

## Biomass certification

- Essent - Green Gold Label (NL)
  - Forest biomass: FSC, PEFC, CSA-SFM, SFI or FFCS
  - Agricultural biomass: Organic certification, GlobalGap
  - CoC certification
- Laborelec sustainability certification (BE)
  - sustainability of the raw material sourcing, sourcing of the wood
  - system based upon the energy balance (Flanders)
  - system based upon avoided fossil CO<sub>2</sub> emissions (Wallonia)

## Renewable electricity certification

- Eugene, Ecolabel, Ecoenergia, Milieukeur, Green Power, OK power



## New EU initiatives

### ■ Renewable Transport Fuel Obligation - RTFO (UK)

- report on the carbon sustainability and carbon intensity, feedstock and country of origin
- GHG savings (land use change included), land use change history
- DEFRA: monitor environmental and social issues and indirect impacts
  - UK Renewables Obligation (RO)
  - UK Renewable Heat Incentive (RHI)

### ■ NTA 8080 – biomass for energy (NL)

- company and macro level of reporting
  - availability of food, food prices, land use change, deforestation...
- environmental, social and economic aspects included, competition
- GHG calculation (direct land use change included)



### ■ International Sustainability and Carbon Certification – ISCC

- certification of sustainable biomass and liquid bioenergy (fuel and electricity)
- sustainability requirements for biomass production, for traceability,
- GHG emissions calculation methodology

## International initiatives

- **US-Renewable Fuel Standard**
  - renewable fuels targets to 36 billion gallons by 2022
  - GHG emission reduction: 20% for first generation, 50% for advanced, 60% for cellulosic biofuels
  
- **US-LCFS**
  - reduction of 10% of carbon intensity of fuels by 2020
  - carbon intensity: all direct emissions and any other effects, both direct and indirect
  
- **Roundtable on Sustainable Biofuels - RSB**
  - socially, environmentally and economically sustainable production of biomass and biofuels
  - risk assessment tool and a greenhouse gas calculator (including land use change)
  - 50% GHG savings compared to fossil fuel



## International initiatives

- ISO/TC 248 sustainability issues related to bioenergy (ISO 13065)
  - social, economic & environmental aspects of production, supply chain and use
  - globally harmonised sustainability criteria
  
- CEN/TC 383 Sustainably produced biomass for energy applications
  - biodiversity and environmental aspects and chain of custody
  - calculation method for the GHG emission balance
  - reporting requirements and conditions for tackling indirect effects
  
- Global Bioenergy Partnership (GBEP)
  - voluntary criteria and indicators
  - GHG calculation methodology

**sustainable biomass can be standardized in CEN or ISO**



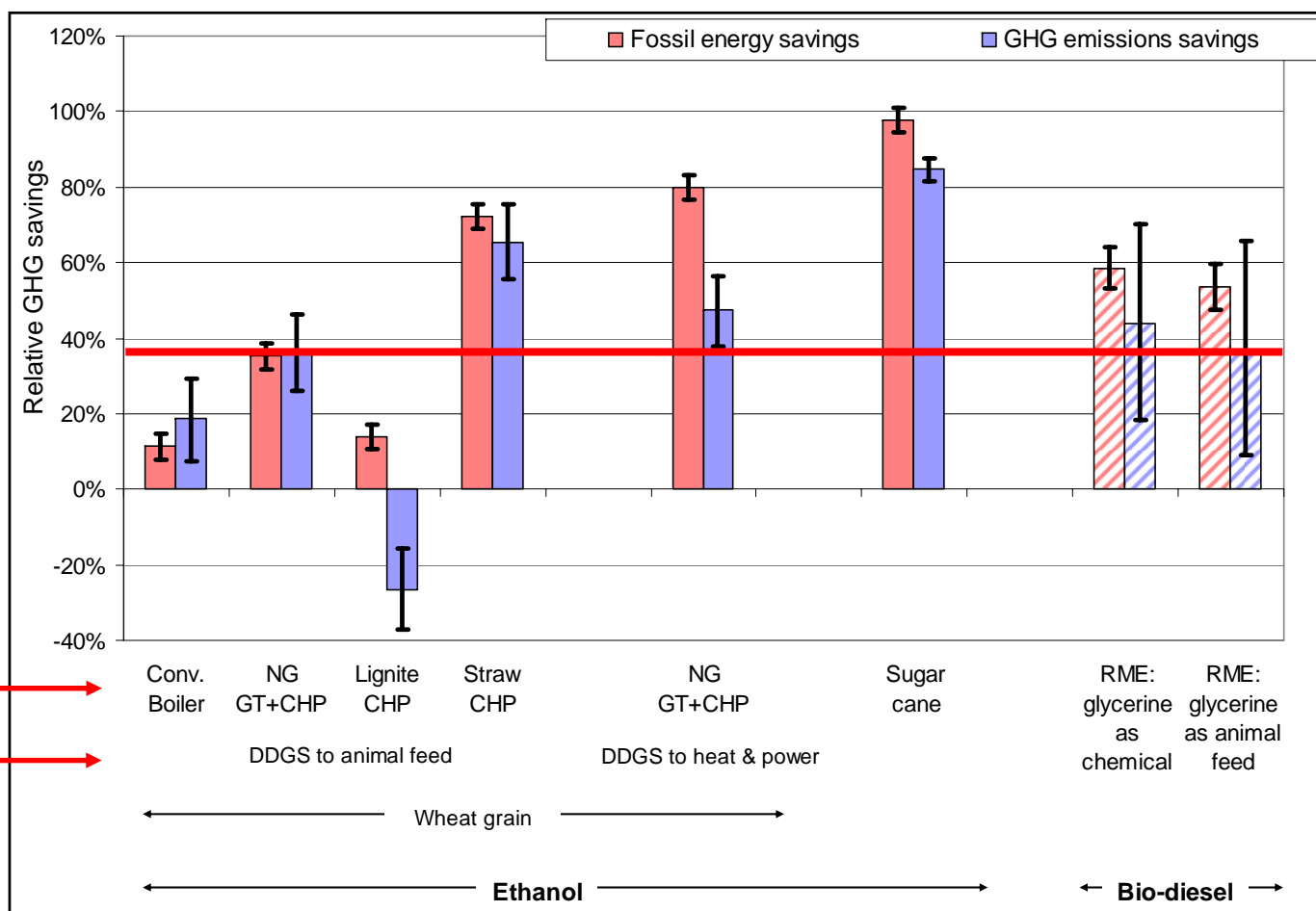
## EU Recognised Voluntary Schemes

- **ISCC (International Sustainability and Carbon Certification)**
  - all types of biomass and biofuels
  - received recognition for all criteria of the RED
- **Bonsucro EU**
  - sugarcane based ethanol with a strong focus on Brazilian sugarcane production
  - recognition for all criteria of the RED, except for the provision on highly biodiverse grasslands
- **RTRS EU RED (Roundtable for Responsible Soy)**
  - soy based diesel with a strong focus on Argentinean and Brazilian soy production.
  - recognition for all criteria of the RED.
- **RSB EU RED (Roundtable on Sustainable Biofuels)**
  - covering all types of biofuels and a global scope.
  - recognition for all criteria of the RED.
- **2BSvs (Biomass Biofuels Sustainability voluntary scheme) - French initiative**
  - covering all types of biofuels
  - received recognition for all criteria of the RED, except for the provision on highly biodiverse grasslands.
- **RBSA (Abengoa RED Bioenergy Sustainability Assurance) - industry initiative**
  - RBSA is covering ethanol and has a global scope
  - recognition for all criteria of the RED
- **Greenergy Brazilian Bioethanol verification programme - industry initiative**
  - applied to sugarcane based ethanol produced in Brazil.
  - received recognition for all criteria of the RED, except for the provision on highly biodiverse grasslands.

## Lessons from existing certification systems

- Certification schemes for agricultural products
  - standard development
  - organisation structure
  - traceability
  
- Forest certification systems
  - application and impact
  - opportunities and limitations
  
- Biomass certification systems in power sector
  - consumer oriented
  - CoC systems

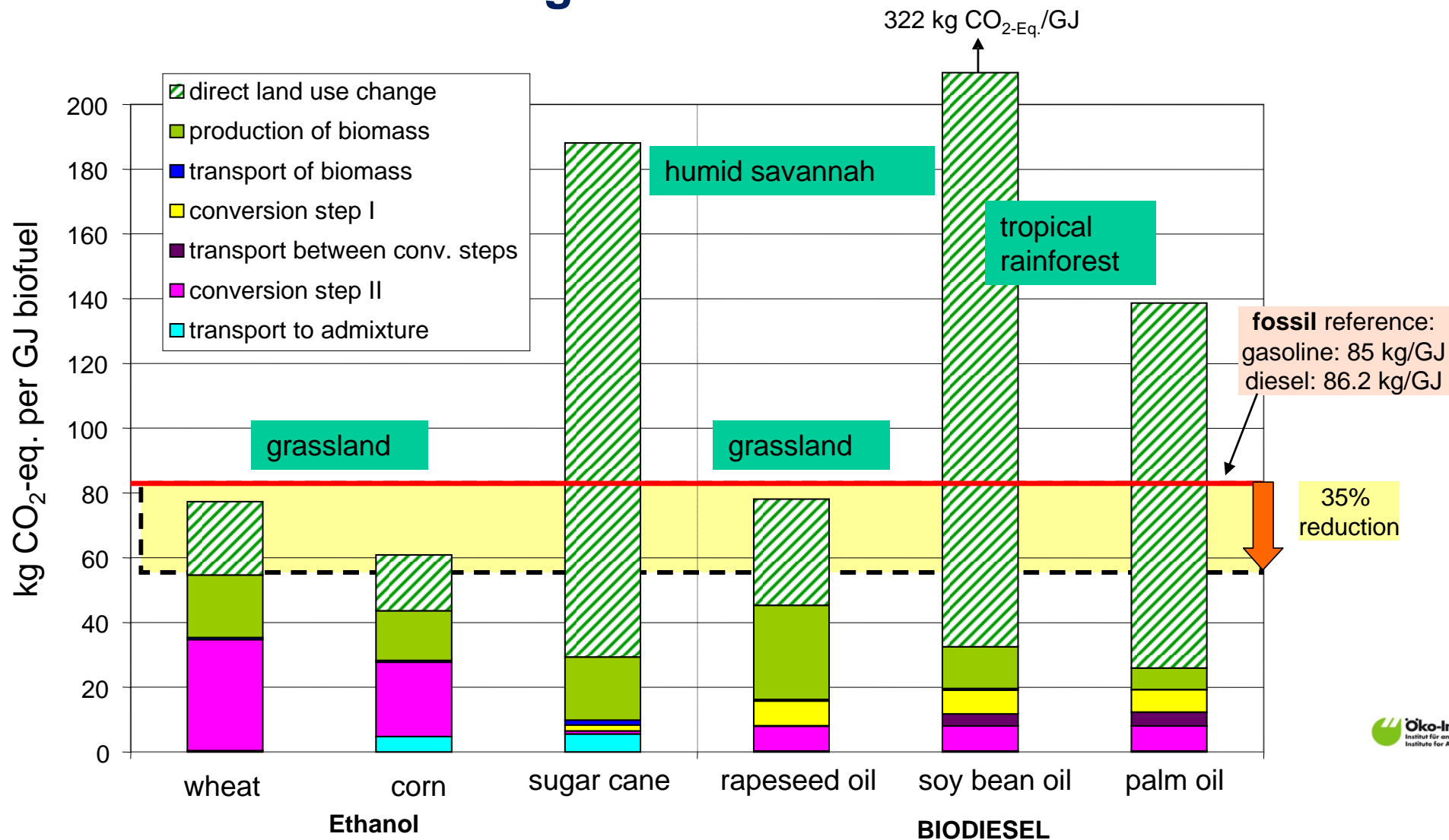
## GHG emissions



Results depend on  
the process  
by-product use

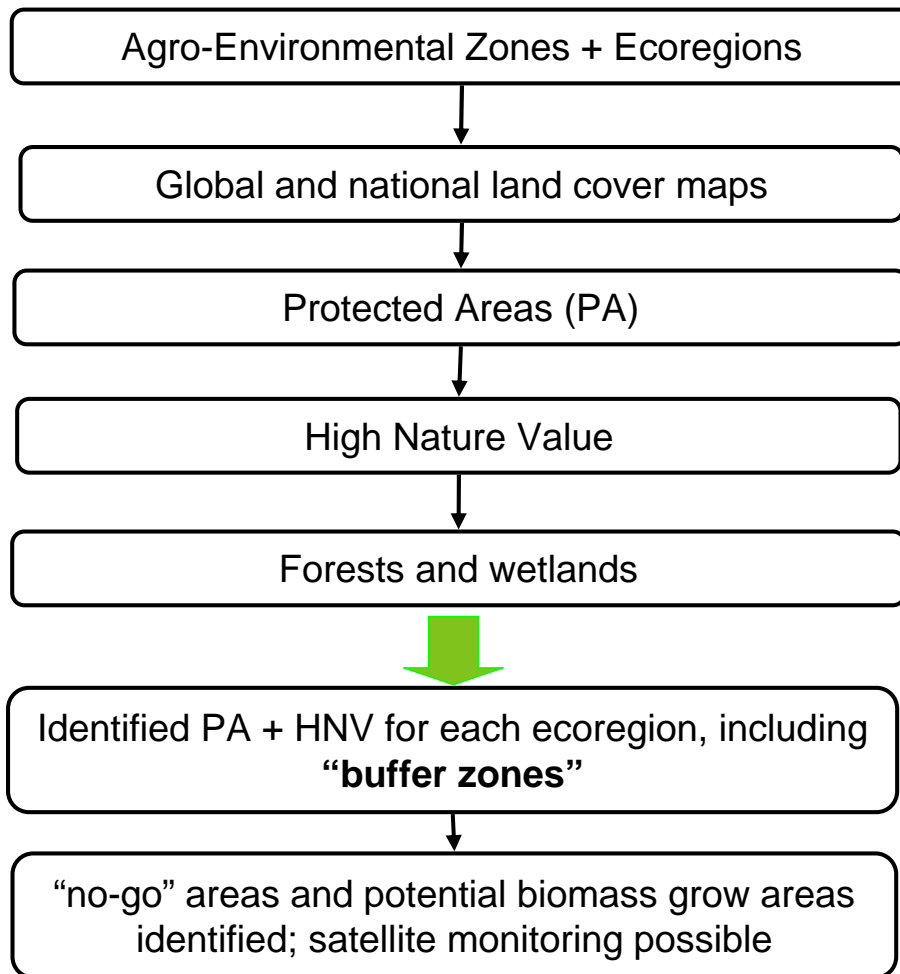
Figures do not include land use change emissions

## GHG emissions including Direct LUC



High emission range induced by land use changes depending on land use changed

## Mapping “no-go” areas



AEZ + ecoregions

- GLC 2006 based on LCCS,
- National land cover mapping

Location of Protected Areas (WDPA, UN List of PA)

Database of protected HNV, e.g. Biodiversity Hot spots, Important Bird Areas, Important Plant Areas...

Database on forests and wetlands

...identification of HNV using clearly defined international criteria; buffer zones around areas

PA+HNV areas are “no-go” → other areas **might** be suitable for biomass development, depending on water, social issues...

**Change detection possible through monitoring**



# Monitoring land use/land use change

## BioResources Map

- mapping tool of sustainable biomass resources and plantations
- test case for certified and other plantations of energy crops
- possible common reporting / verification tool for certified plantations



Employs an interactive mapping of protected areas:

- NATURA 2000
- Nationally designated areas (CDDA)

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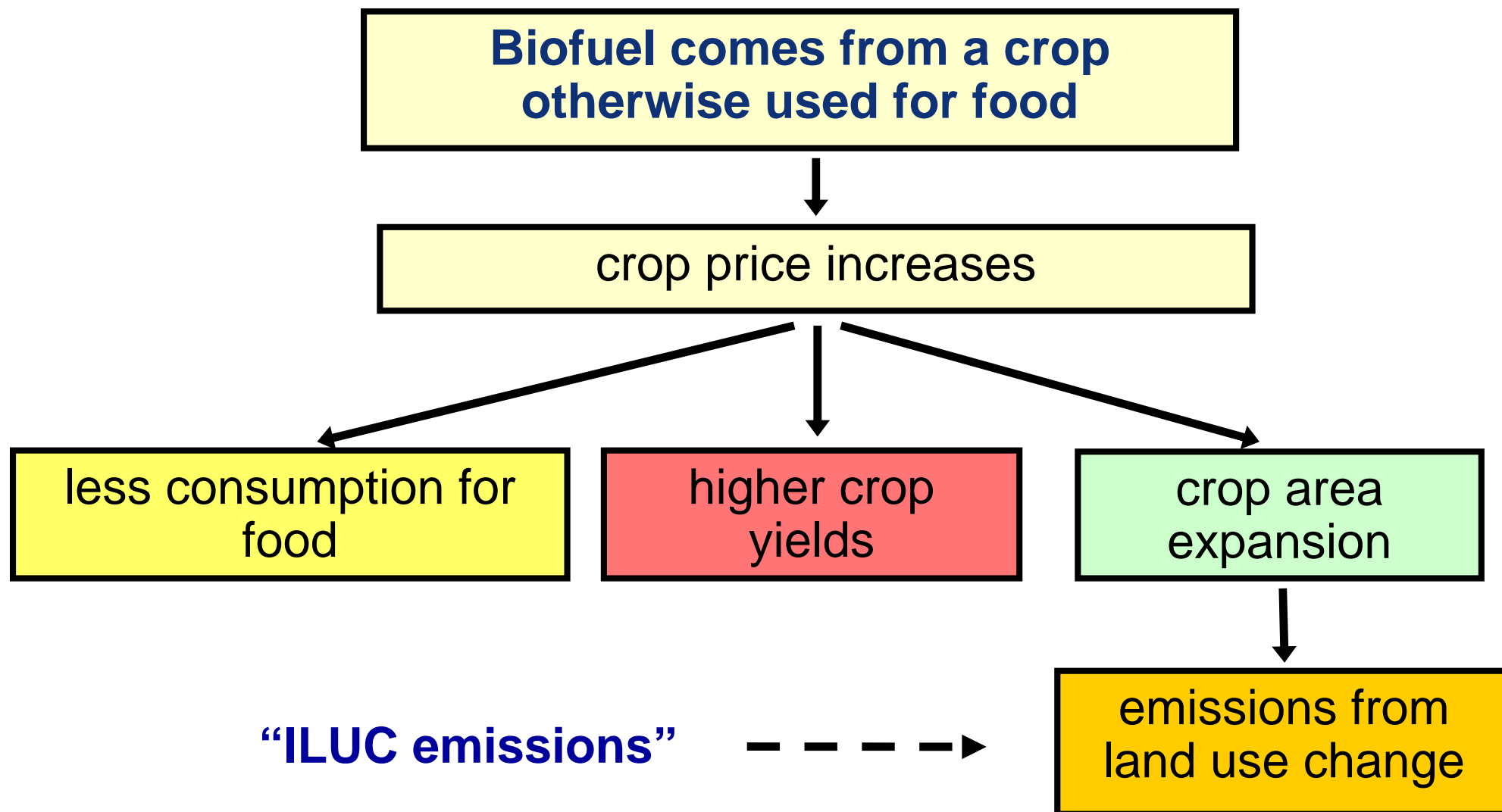
**Mapping  
book**



## Indirect Effects

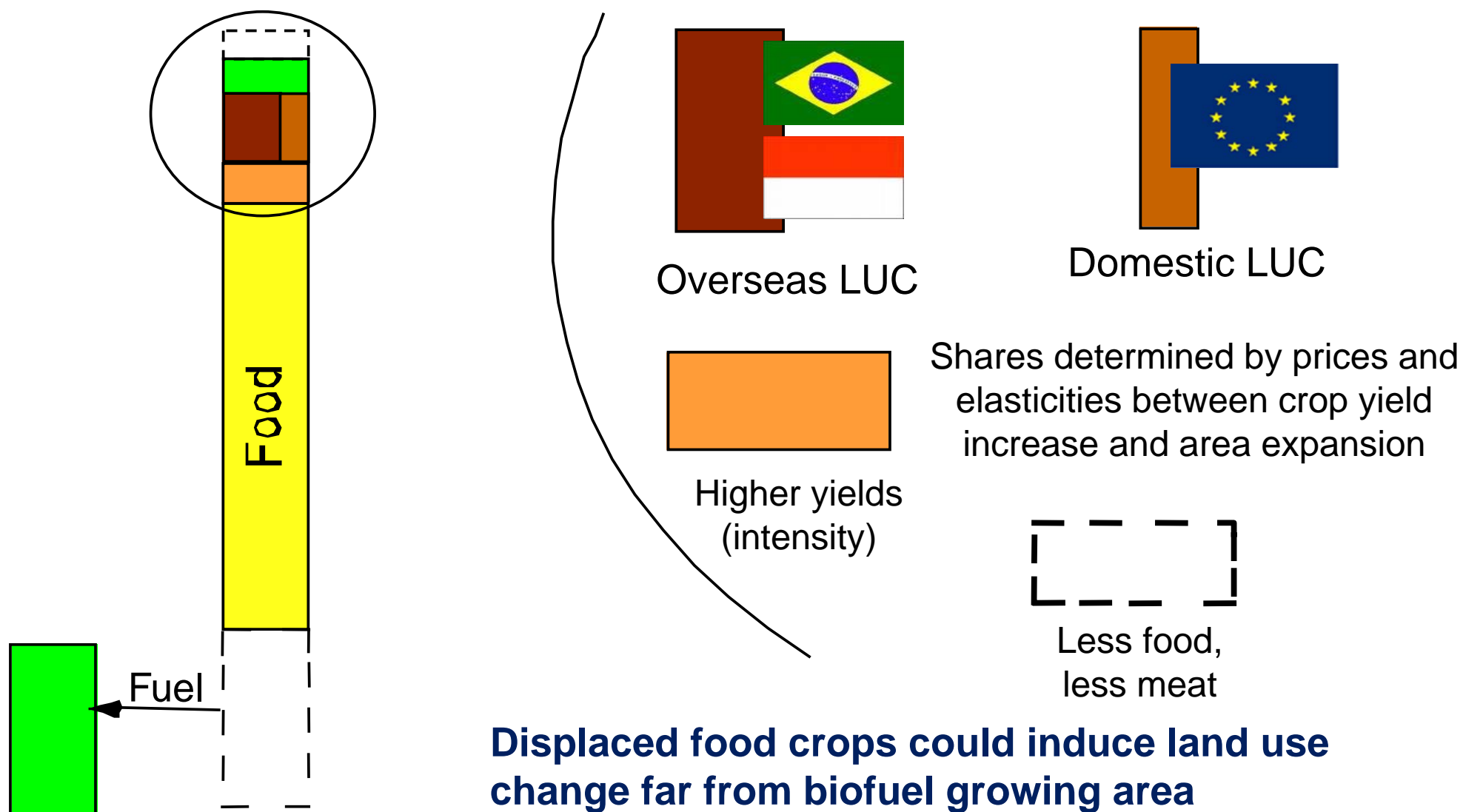
- the most complex issue, with global dimension
- affected by policies (agriculture, environment, energy, trade, rural development...) as well as markets
- difficult to monitor, measure and control
- multiple links between feedstocks & food market (4Fs: Food, Feed, Fuel and Fibre)
- ILUC cannot be directly observed or monitored
- ILUC is a highly controversial issue – uncertainty as to the best way to deal with
- **Better understanding of LUC is needed!**

## How models estimate ILUC emissions





## Indirect Land Use Changes due to biofuel production



## Assessment of GHG emissions from ILUC: JRC approach

### ① Agro-Economic modelling

10% biofuel share

☞ extra-land required per crop  
type/region



### ② Spatial allocation of the extra lands per crop type



### ③ Spatial estimation of land carbon stock changes (IPCC)



### ④ Spatial estimation of GHG emissions (IPCC)



### ⑤ Total ILUC emissions from biofuels production

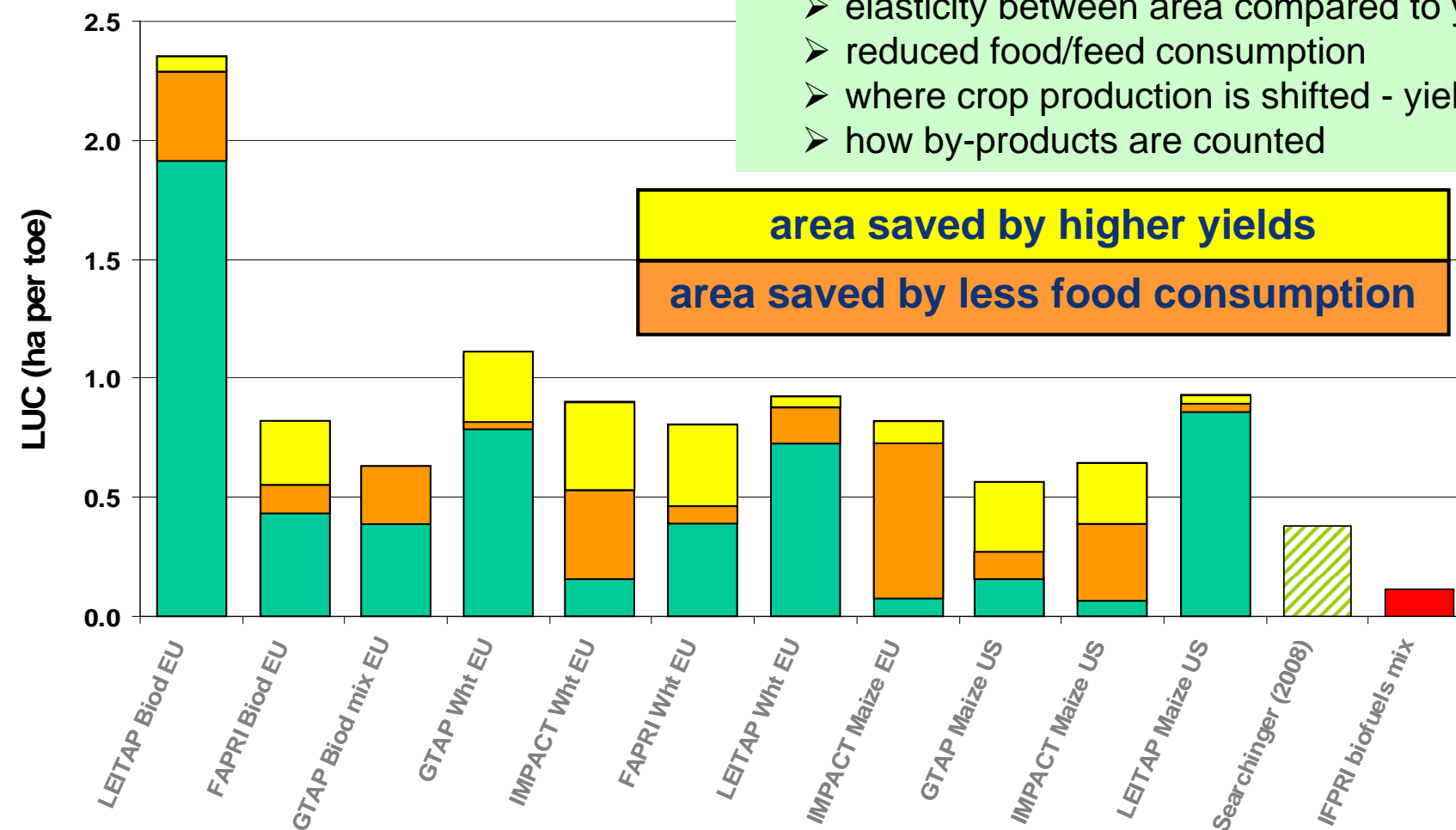
## ILUC due to biofuels

LUC impact vary considerably

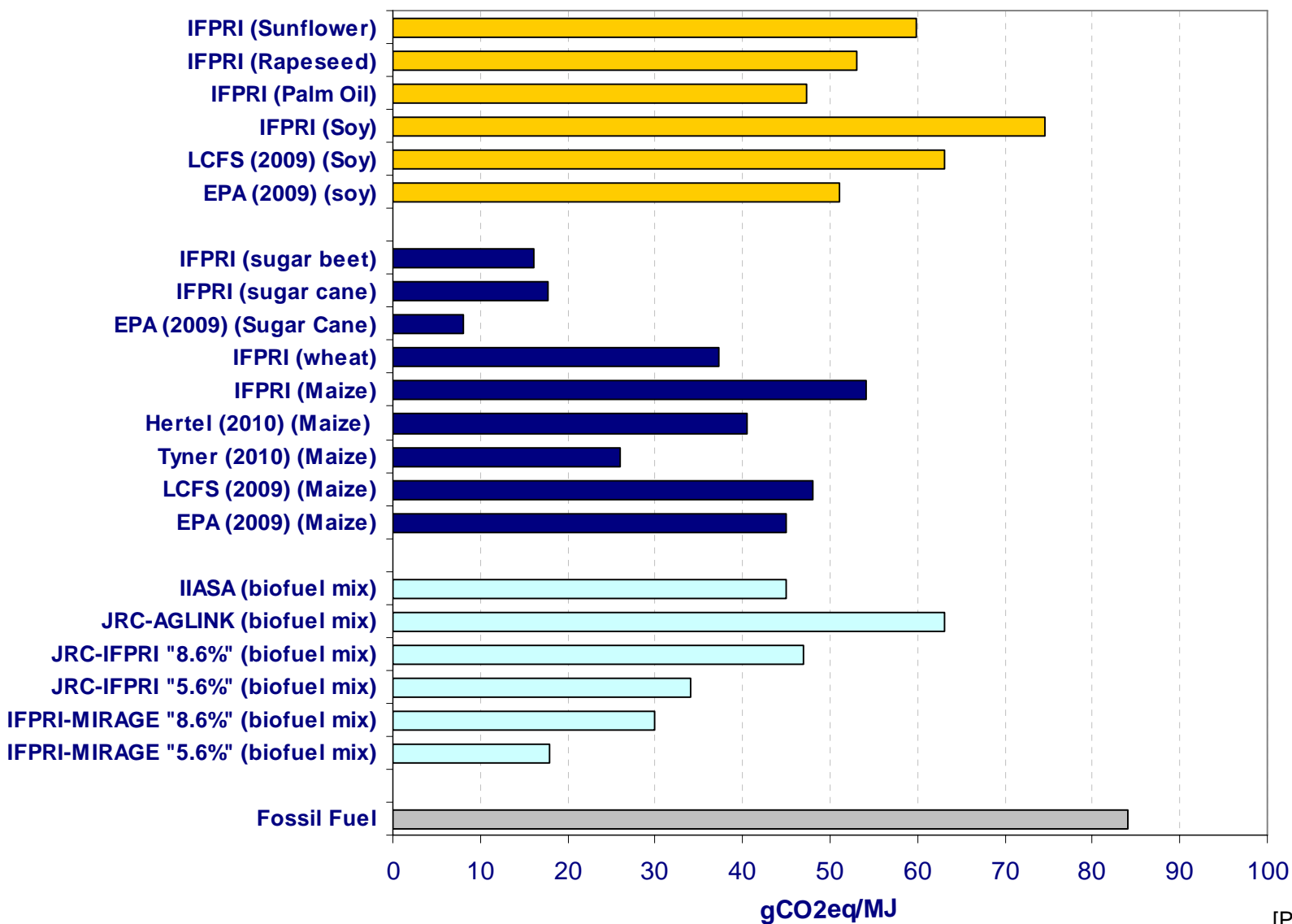
- elasticity between area compared to yield increase
- reduced food/feed consumption
- where crop production is shifted - yield
- how by-products are counted

area saved by higher yields

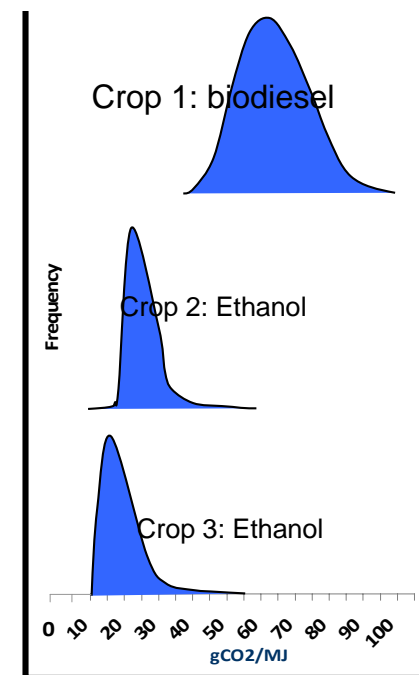
area saved by less food consumption



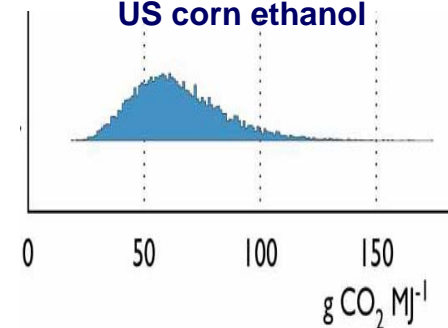
## Compare ILUC Emissions



## Probability distribution in new IFPRI "8.6%" scenarios



## Probability distribution for US corn ethanol



[Plevin, O'hare, 2010]

## Socio-economic criteria

- Feasibility: Successful applied in several schemes
- No specific criteria for social sustainability in the EU-RED
- Social Impact Assessment required - RSB, Bonsucro, RSPO, SAN
- Report on socio-economic performance – RTFO
- ILO conventions available and applied – Bonsucro, ISCC, RSPO, RTFO, RTFS
- WTO compatibility
  - human rights law/socio-economic rights
  - not certain that all social criteria are WTO compatible
- Key challenges
  - improving implementation and monitoring

## Food Security

- **Competition for resources - land and water**
  - displacement of land
  - raise input costs for food production
  - water depletion in sensitive areas
  - food availability
  - + market diversification
  
- **Increasing prices**
  - + expand production
  - + increase income for farmers
  - + enhance farm productivity
  - access to food of poor

## Key gaps and challenges

### General

- complex production chains - various types of direct or indirect impact
- large diversity of feedstocks: difficult to establish criteria to cover all possible types
- many key biofuel feedstocks are not covered by an operational sustainability scheme
- some criteria not relevant for certain crops in certain countries
- unambiguous formulation of criteria difficult
- land use/competition with food/feed difficult to translate into effective criteria and indicators

### Practical

- difficult integration of GHG balance in certification systems
- CoC system development
- law enforcement and governance

### Legal

- international agreement necessary
- governance and enforcement
- compliance with WTO rules

## Certification is not a „silver bullet”

- Only addresses direct impacts with any certainty
    - biodiversity, natural habitats, emissions to air, soil, land use...
  - Land use change and tropical deforestation: not a recent problem
    - wood logging, expansion of agricultural farming and cattle ranching
    - offsetting climate change benefits due to carbon debt and long payback time
  - Certification will not address indirect effects:
    - displacement: displacement acts across crops and borders
    - indirect land use changes significantly influence the GHG balance
    - competition with food/feed
  - Additional measures are needed
    - land-use planning, land use change monitoring – “no-go” areas
    - linking support to GHG performances
    - support bioenergy production from residues/waste products
    - promoting higher efficiency pathways
    - promote production on idle / degraded land
- to what extent can certification prevent negative land use change?**



## Ways Ahead for Bioenergy

**Agriculture = 4 Fs = Food, Feed, Fuel, Fiber  
+ Bio-materials and green chemistry**

**How much land do we need ?**

**What land shall we use ?**

**Will there be enough land left for food production?**

**What really is the best use of biomass ?**

**Challenges, threats and opportunities ?**



**Thank you for your attention!**

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