

# Eyes on the track, Mind on the horizon

## A European road map for biofuels

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refuel



## REFUEL - Partners



**Universiteit Utrecht**



**CHALMERS**

**COWI**





## REFUEL - main objectives

*To develop an ambitious, yet realistic road map  
for an effective deployment of biofuels  
until 2030 in the EU25+*

- Land availability
- Feedstock potentials
- (relative) costs of biofuels
- Impacts
- Strategy and policy issues
- Implementation issues







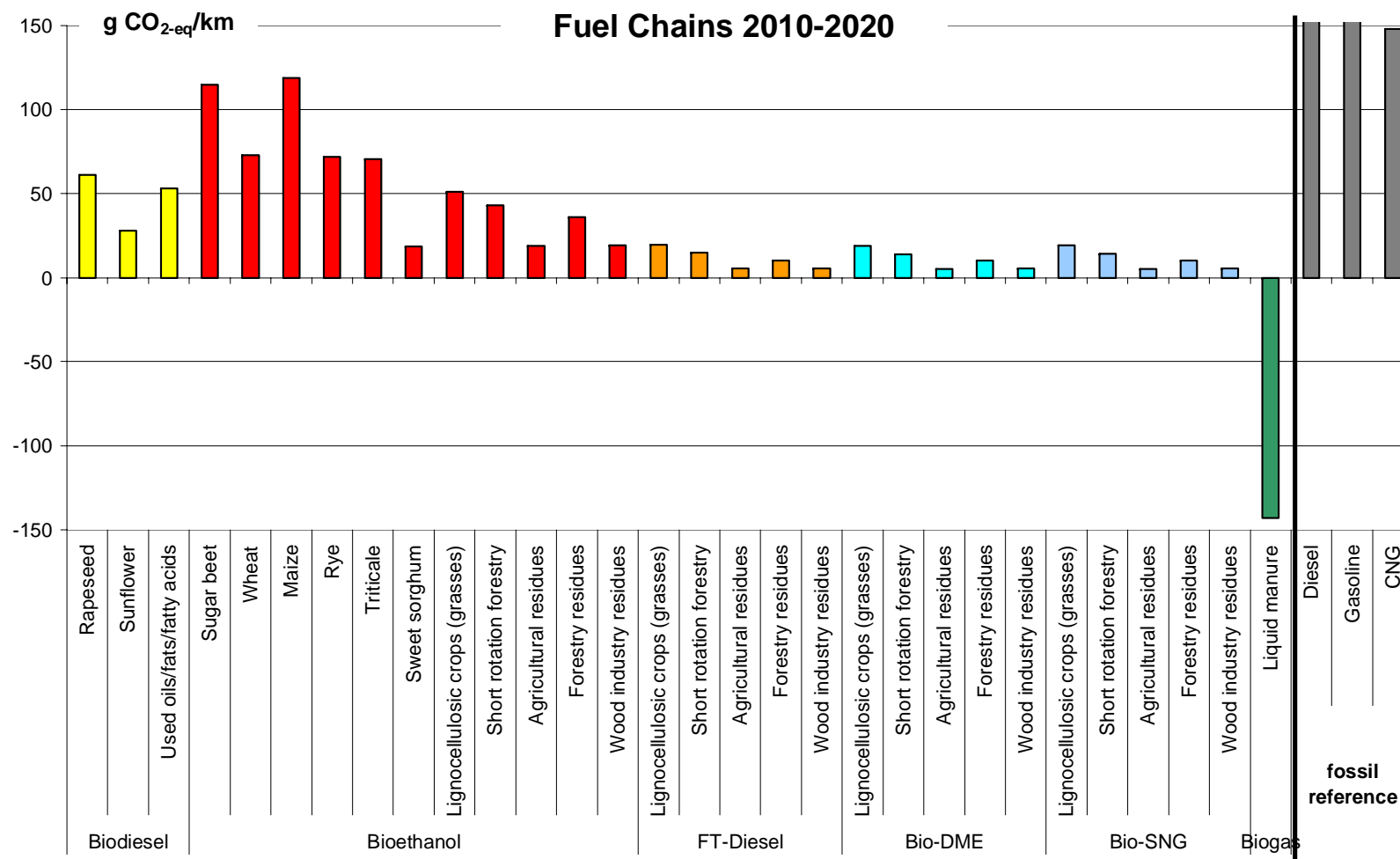
# REFUEL - Biofuels and Feedstocks

Feedstock			Biofuel					
			Biodiesel	Bioethanol	FT-Diesel	Bio-DME	Bio-SNG	Biogas
Energy crops	lignocellulosic crops	Woody plants1)		X	X	X	X	
		Herbaceous plants 2)		X	X	X	X	
	oil crops	Rapeseed	X					
		Sunflower	X					
	sugar crops	Sugar beet		X				
	starch crops	Wheat		X				
		Maize		X				
		Rye		X				
		Triticale						
		Sweet sorghum		X				
Residues	agricultural		X	X	X	X		
	forestry		X	X	X	X		
	wood industry		X	X	X	X		
Waste	organic waste	Used oils/fats/fatty acids	X					
	organic waste	Liquid manure						X

1) Short rotation forestry: poplar, willow, eucalypt

2) Perennials: miscanthus, switch grass, reed canary grass

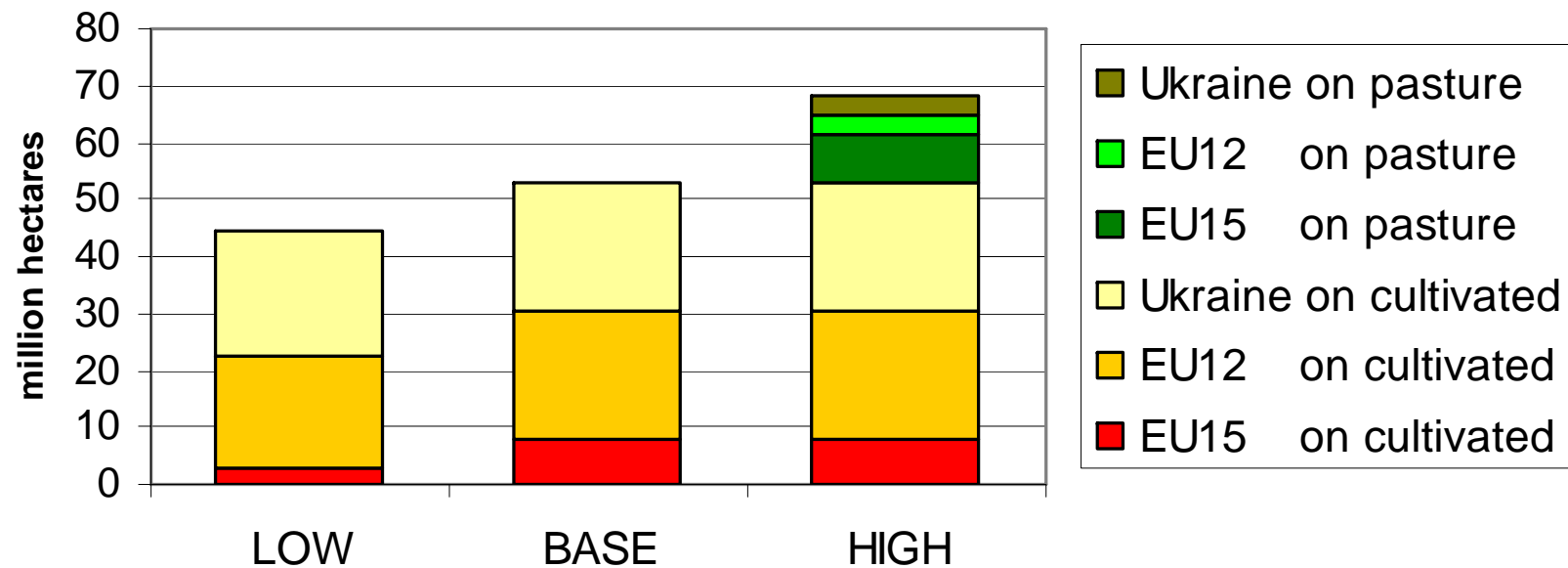
# GHG-emissions WTW [g CO<sub>2</sub>-eq/km]



Data based on: Well-to-Wheels analysis of future automotive fuels and powertrains in the European context; JRC/CONCAWE/EUCAR, Version 2c, March 2007



## Land use scenarios: Available land potential

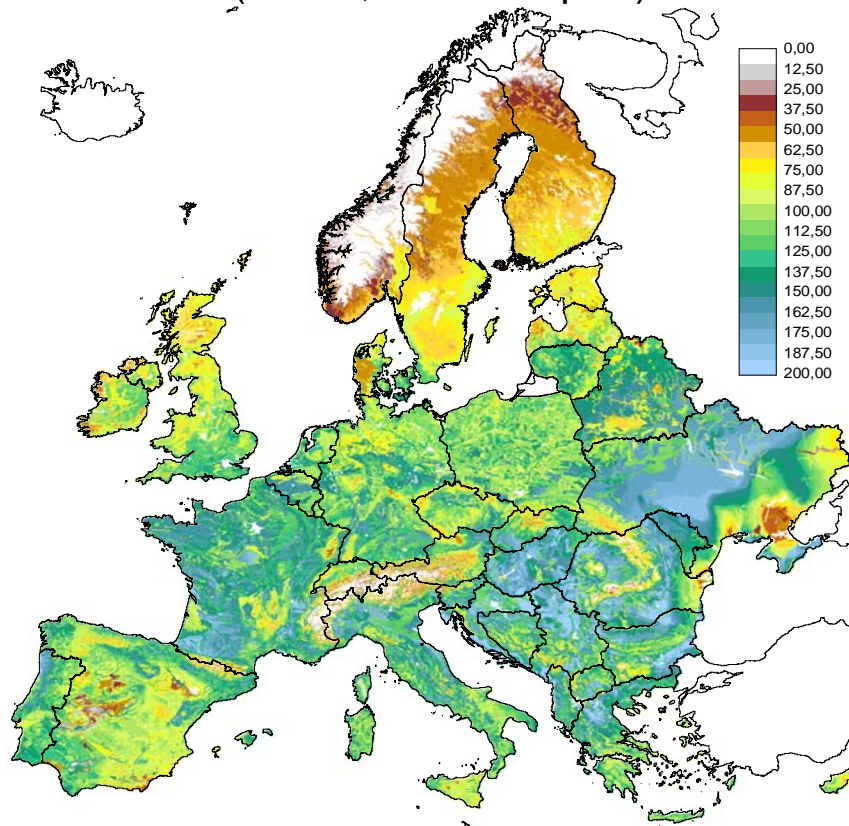


Note: Maximum amount of agricultural land potentially available for bio-energy feedstock production. “Food First” paradigm: Food self-sufficiency remains constant; increase in agricultural productivity frees up land for energy crops

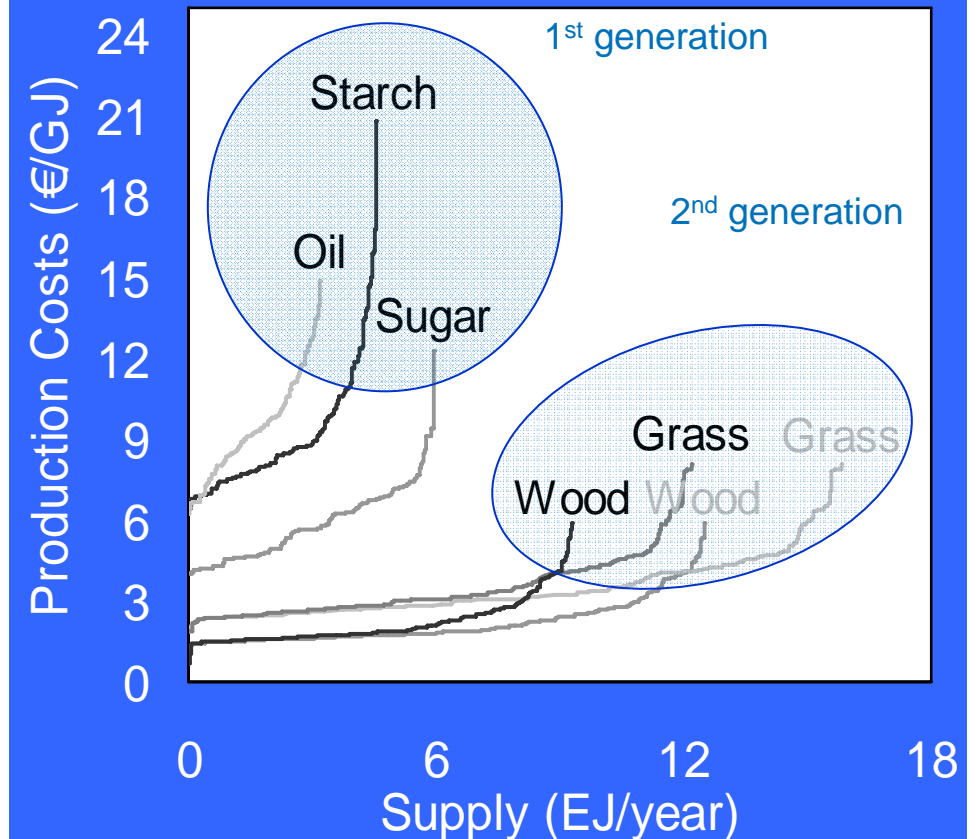


# REFUEL: very detailed feedstock assessment

(b) Attainable energy yields of 2<sup>nd</sup> generation lignocellulosic feedstocks (GJ/ha, biofuel equiv.)



## Summary baseline 2030



1 EJ (ExaJoule) = 24 Mtoe





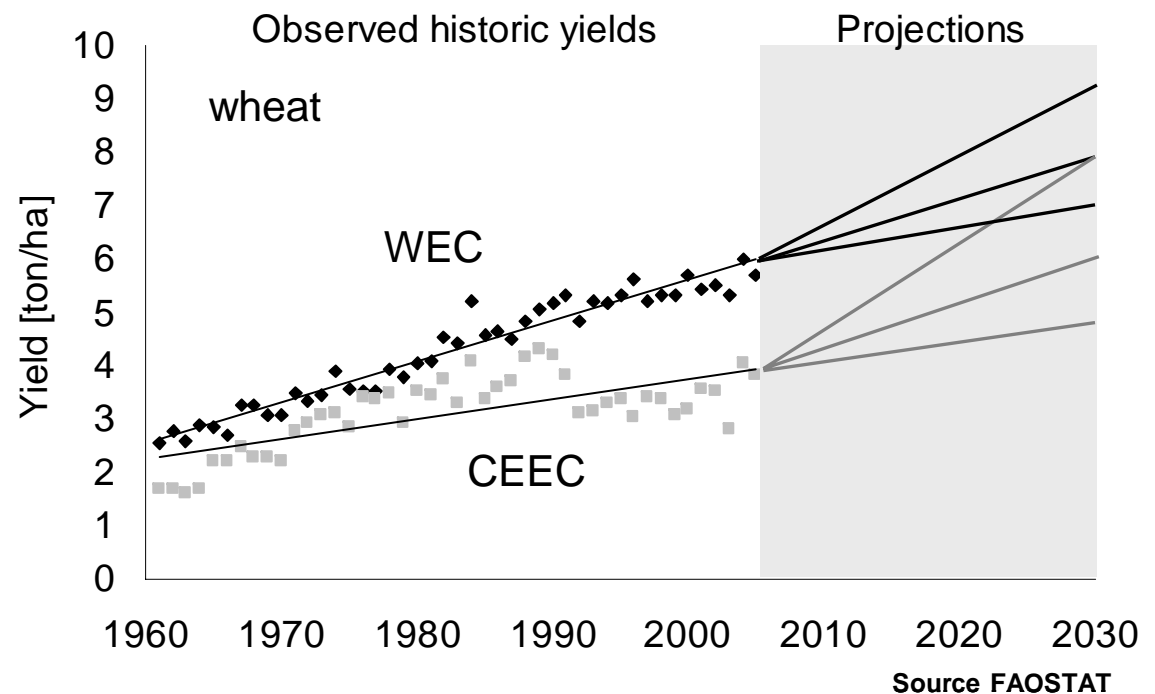
## Critical issue: Yield projections

Observed yields

Extrapolation

Scenarios:

- Progress in (plant) science
- Farm size
- Agricultural management
- Access to CAP support



CEEC (Including Ukraine) is determining

Agri-economics poorly understood, modelled





## 10% conventional biofuels by 2020, but...

- Only moderate answer to the biofuels drivers
  - GHG savings 40-60%
  - Limited land efficiency
  - Moderate options for innovation, competitiveness
  - Supply to 10%,  
but not much beyond

*Second-generation biofuels score significantly better  
on all these criteria*

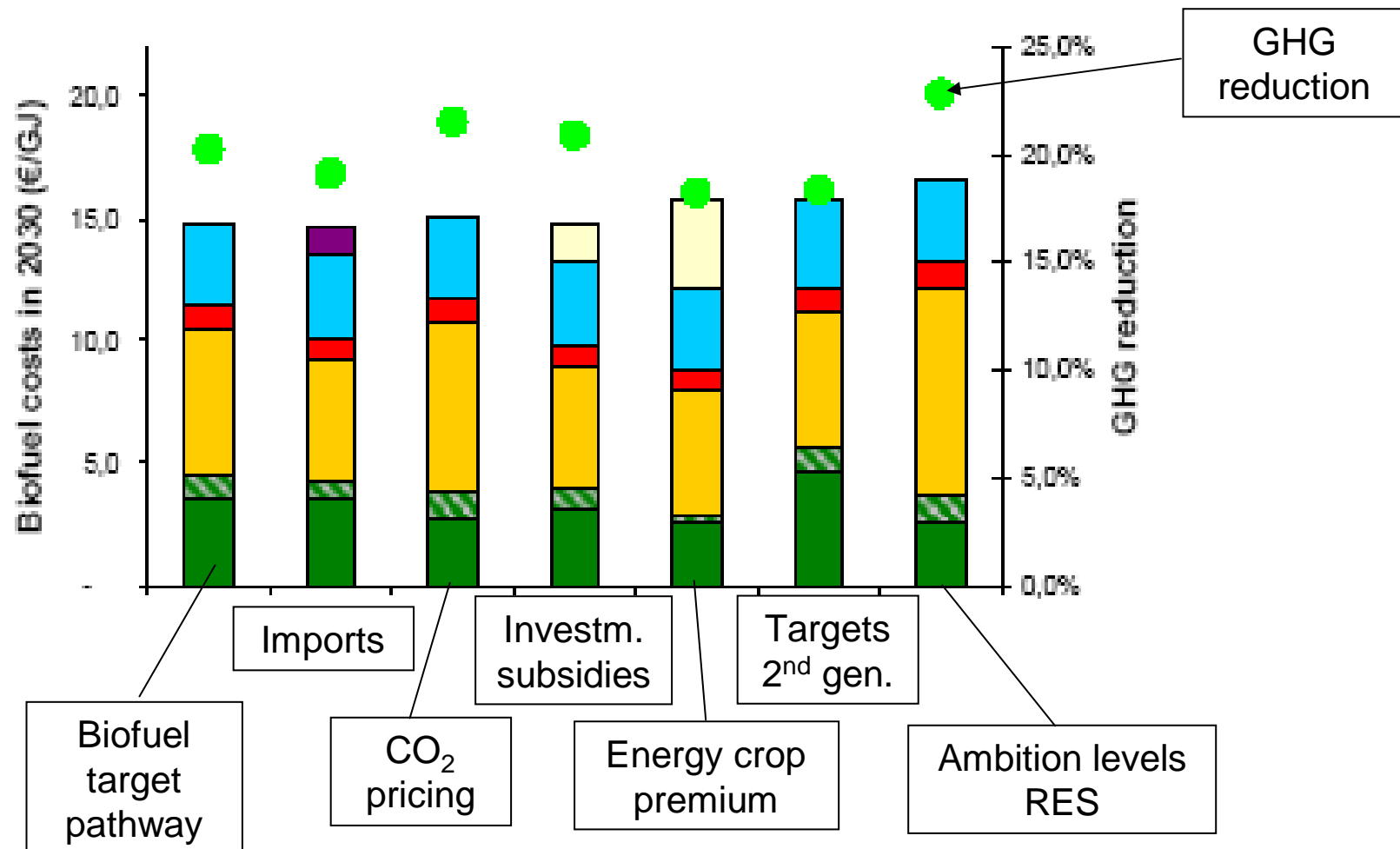


## ...if we define driver-based policy packages...

	Policy making priority			Critical issue		Team
<i>Policy measures:</i>	GHG	SES	Innovation	Biodiversity	Agriculture	'REFUEL'
Biofuels target pathw.	Mod.	High	High	Moderate	High	High
Ambition levels RES	High	Mod.	Low	Moderate	Low	High
Imports	Yes	No	No	Limited	No	Yes
CO <sub>2</sub> pricing	Yes	No	Yes	Yes	No	Yes
Energy crop premium	No	Yes	No	No	Yes	No
Investment subsidies	No	Yes	Yes	No	No	Yes
Targets 2 <sup>nd</sup> gen.	No	No	Yes	Yes	No	No

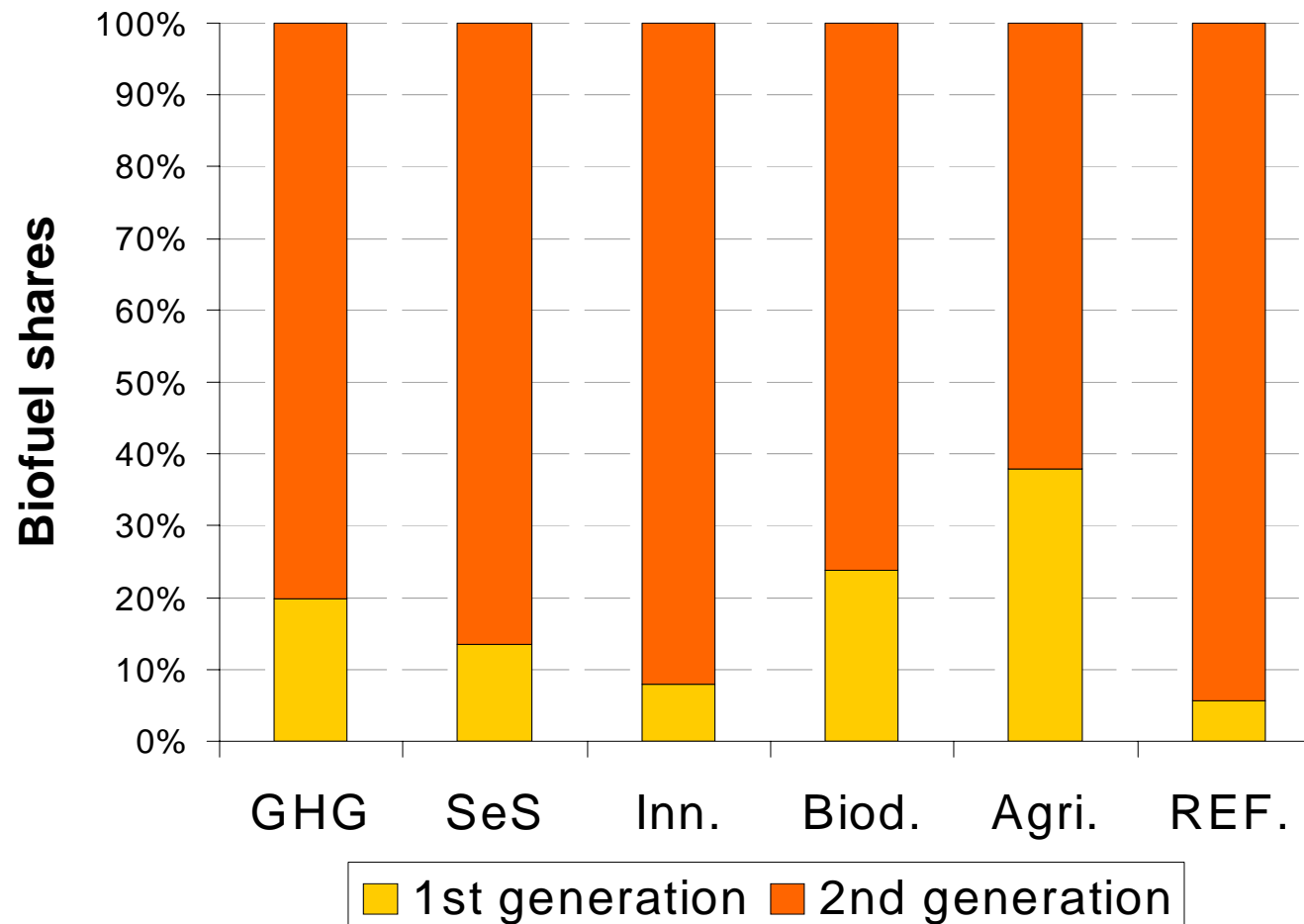


# Influence of policy measures





... 2<sup>nd</sup> generation becomes essential...





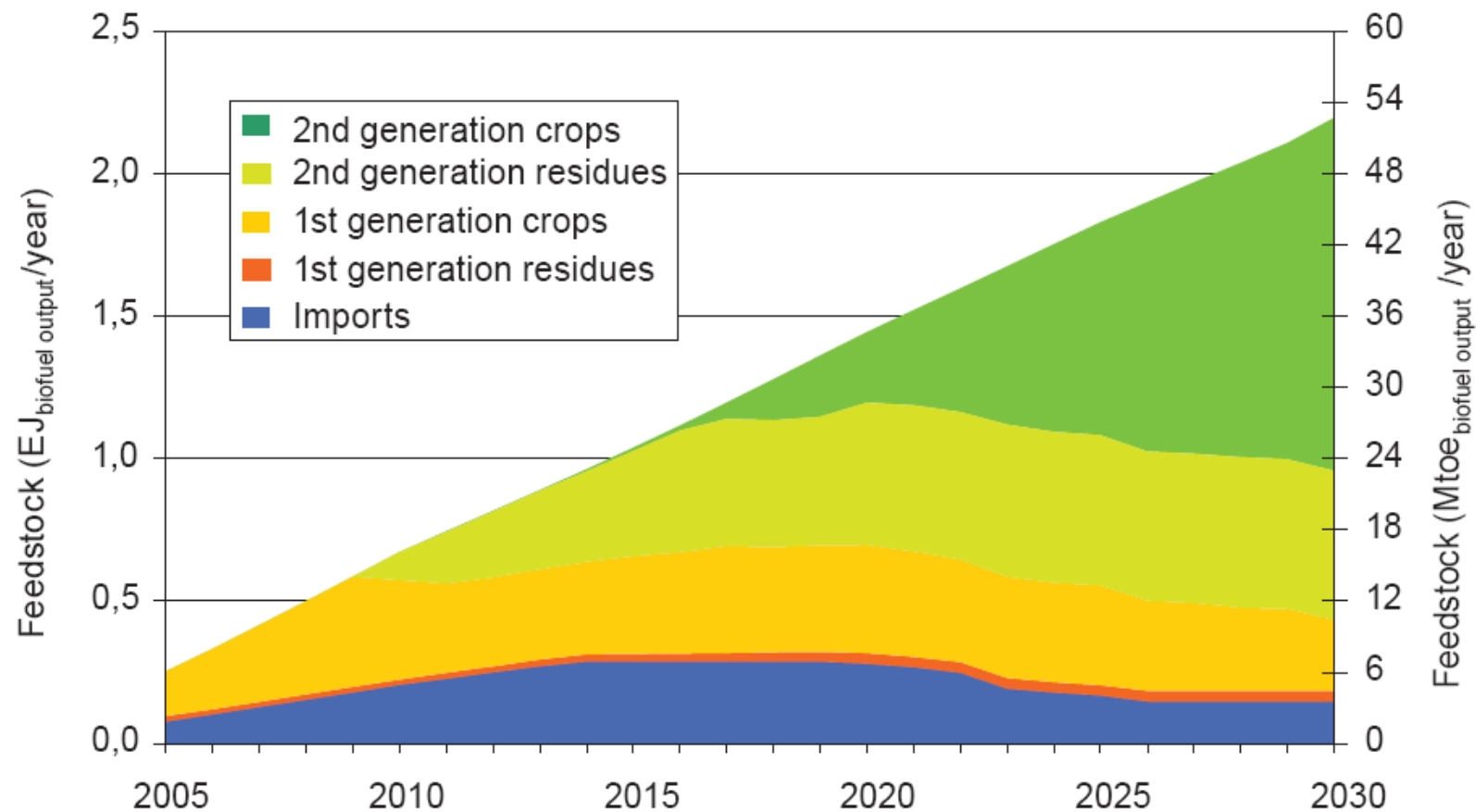


## Key conclusions

- Plenty of land for European biofuels
  - Highest potentials: Eastern EU, Ukraine
  - 10% 2020 can be met with European conventional production
  - No harm to food supply
  - No harm to nature reserves
- 2<sup>nd</sup> generation biofuels crucial to make the difference
  - For all aims behind biofuels
- Specific supportive policies required
  - Measures for 1<sup>st</sup> generation will not suffice
  - Links within energy sector leads to opportunities

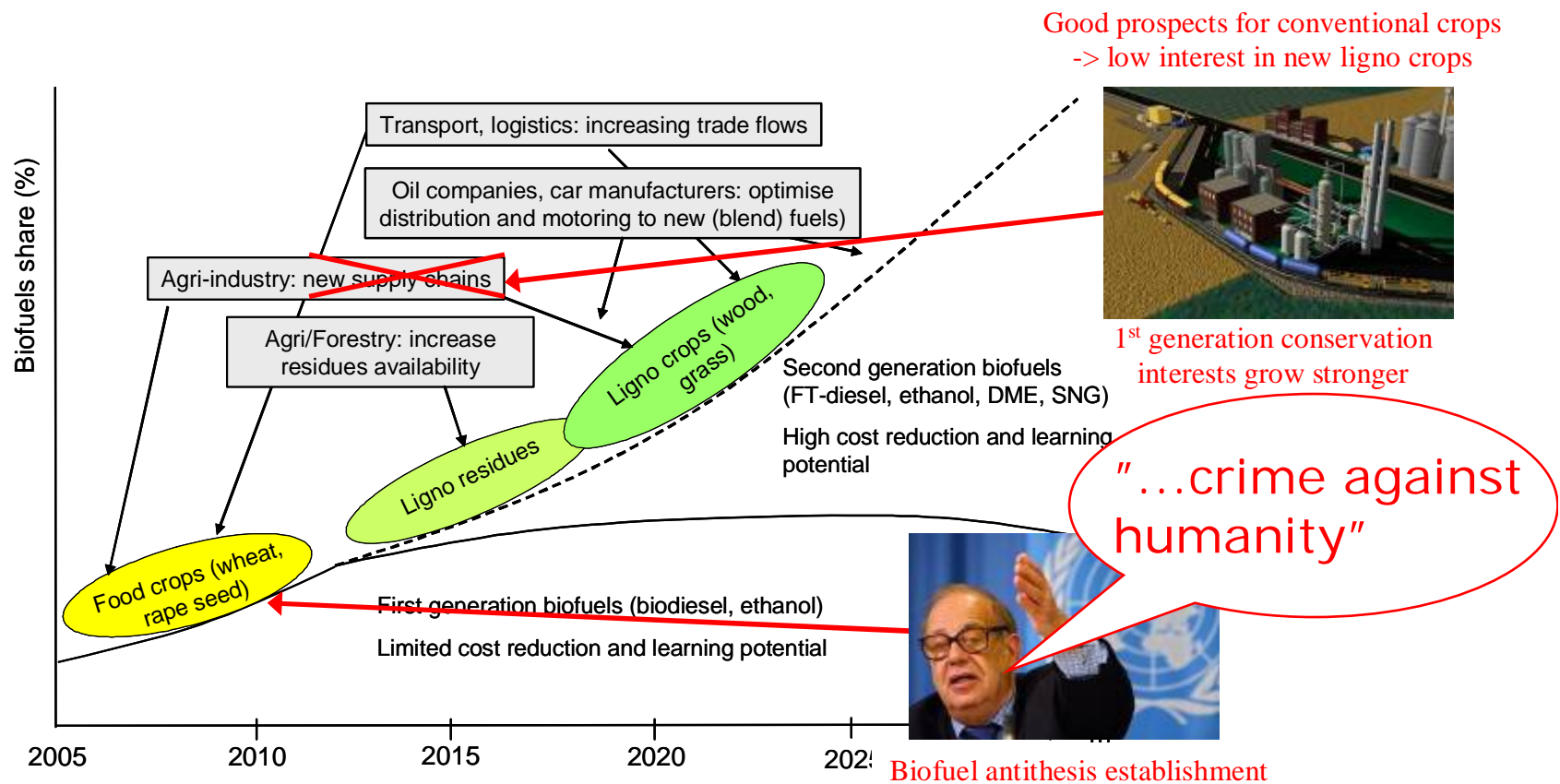


... and is partly based on residues





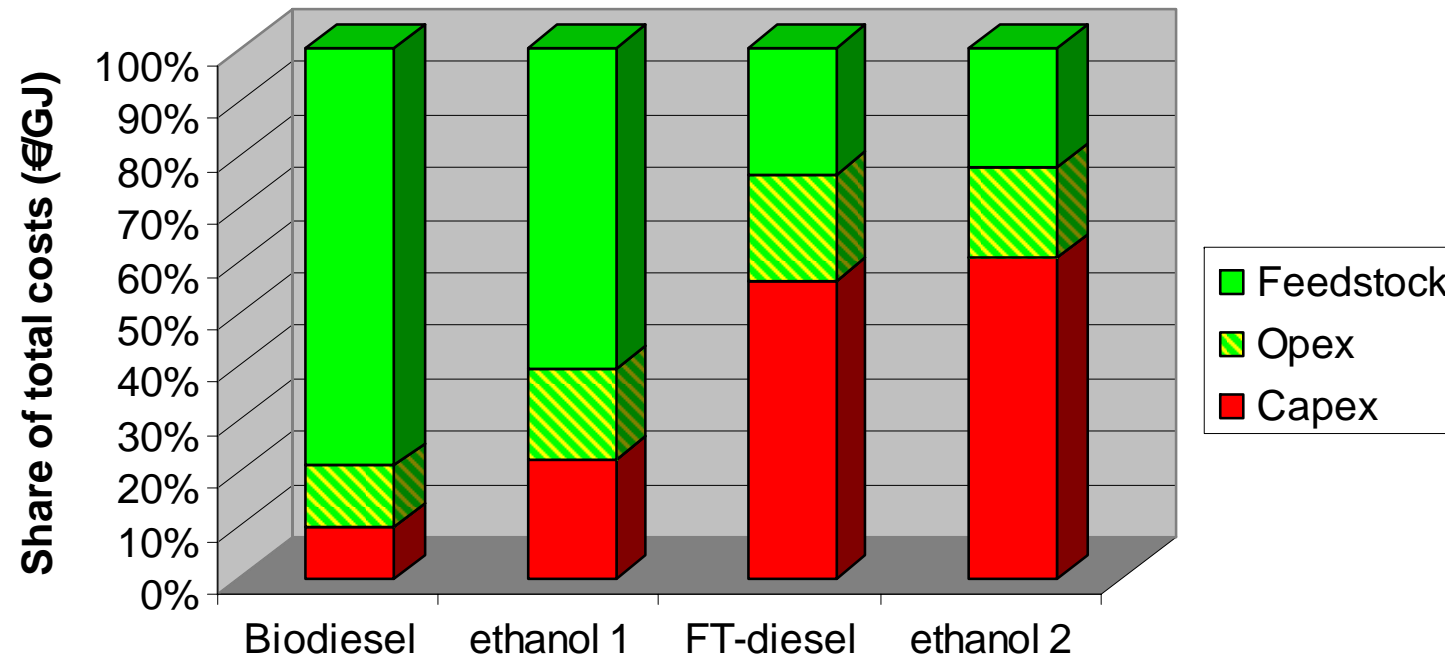
# Policy strategies: paving the way?





## Paving the way...

**“Always on”: more susceptible to volatilities in biofuels prices  
less in feedstock prices**



**Susceptible to variations in feedstock prices  
Flexible in temporary reductions of production**

**2<sup>nd</sup> generation requires a more  
stable biofuels market**





## How to pave the way or 2<sup>nd</sup> generation?

- 'Double-counting' (in quota) will have limited effect
  - Quota: price-inelastic demand
  - 2<sup>nd</sup> gen. competitiveness dependent 1<sup>st</sup> gen. & oil price
  - Creates advantage, but also market uncertainty
- 2<sup>nd</sup> generation costs: Investments are key factor
  - Investment support
  - Biofuel price stabilisation, e.g. minimum price guarantee
  - Policy stability
- Additional: lignocellulosic supply chains
- Search for stepping stones



# Ingredients for an integrated strategy

## R&D policy

Research on development 2<sup>nd</sup> generation conversion technologies

Research on role of biofuels in the hydrogen economy

Research on polygeneration and biorefinery options

## Energy & transport policy

Biofuels target setting, market & chain development

Develop policies rewarding 2<sup>nd</sup> generation fuels advantages

Anticipate on growing competition for feedstocks

Enhance creation of synergies between biofuels and other energy applications

### Stepping stones:

- With co-firing for power
- With district heating

## Agricultural policy

Enhance supply chains of forestry & agricultural residues

Facilitate development of lignocellulosic cropping systems

Integrate lignocellulosic crops policy in CAP

### Development of lignocell. supply chains

## Environmental policy

Develop sustainability criteria for biofuels

Introduce transport sector in ETS

## Trade policy

Maintain 'balanced' approach in trade policy



## Lignocellulosic supply chains

- Lignocellulosic feedstock
  - R&D on cultivation practices
  - Introduction in the CAP
  - Harmonisation between sectors
  - Enhancement of large-scale supply chains
  - Multipurpose use
- Support of further rationalisation in agriculture
  - Land use planning
  - Technology development support





# Thank you!

Sources:

Presentation Marc Londo  
ECN Policy studies

[londo@ecn.nl](mailto:londo@ecn.nl)

[www.refuel.eu](http://www.refuel.eu)

[www.elobio.eu](http://www.elobio.eu)

Biofuels cost developments in the EU27+  
until 2030 - Full-chain cost assessment  
and implications of policy options REFUEL  
WP4 final report  
[www.refuel.at/publications](http://www.refuel.at/publications)

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