

# Availability & supply of biomass: A research roadmap to meet the increasing demand

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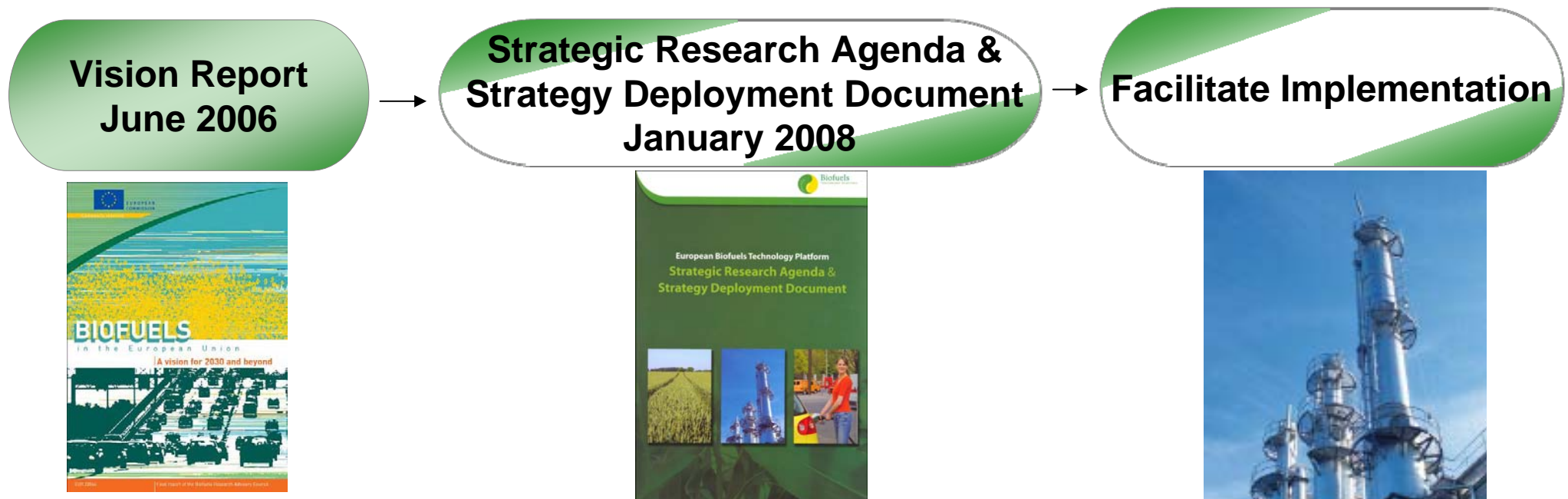
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„Biomass Resources“*

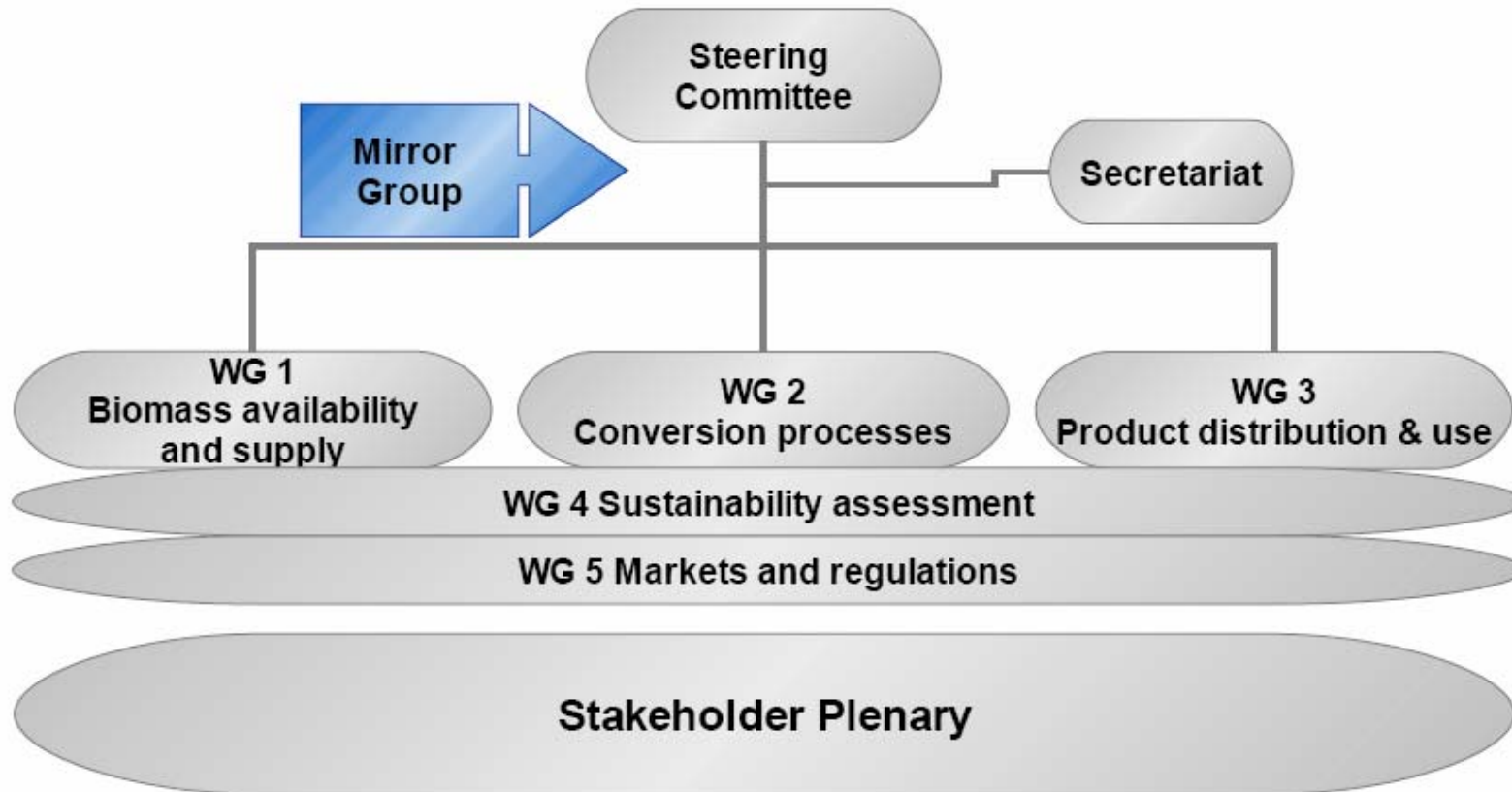
- Biofuels TP: Mission Statement
- Biofuels TP: Organisation
- Working Group 1: Biomass resources
- Key Question and main goal
- Current Supply
- Difficulties to overcome
- Research Roadmap
- Energy crops
- Conclusions: critical areas of technology development and key research priorities

***The Mission of the European Biofuels Technology Platform is to contribute to the development of:***

- **cost-competitive world-class biofuels technologies,**
- **a healthy biofuels industry supplying sustainable biofuels in the European Union,**

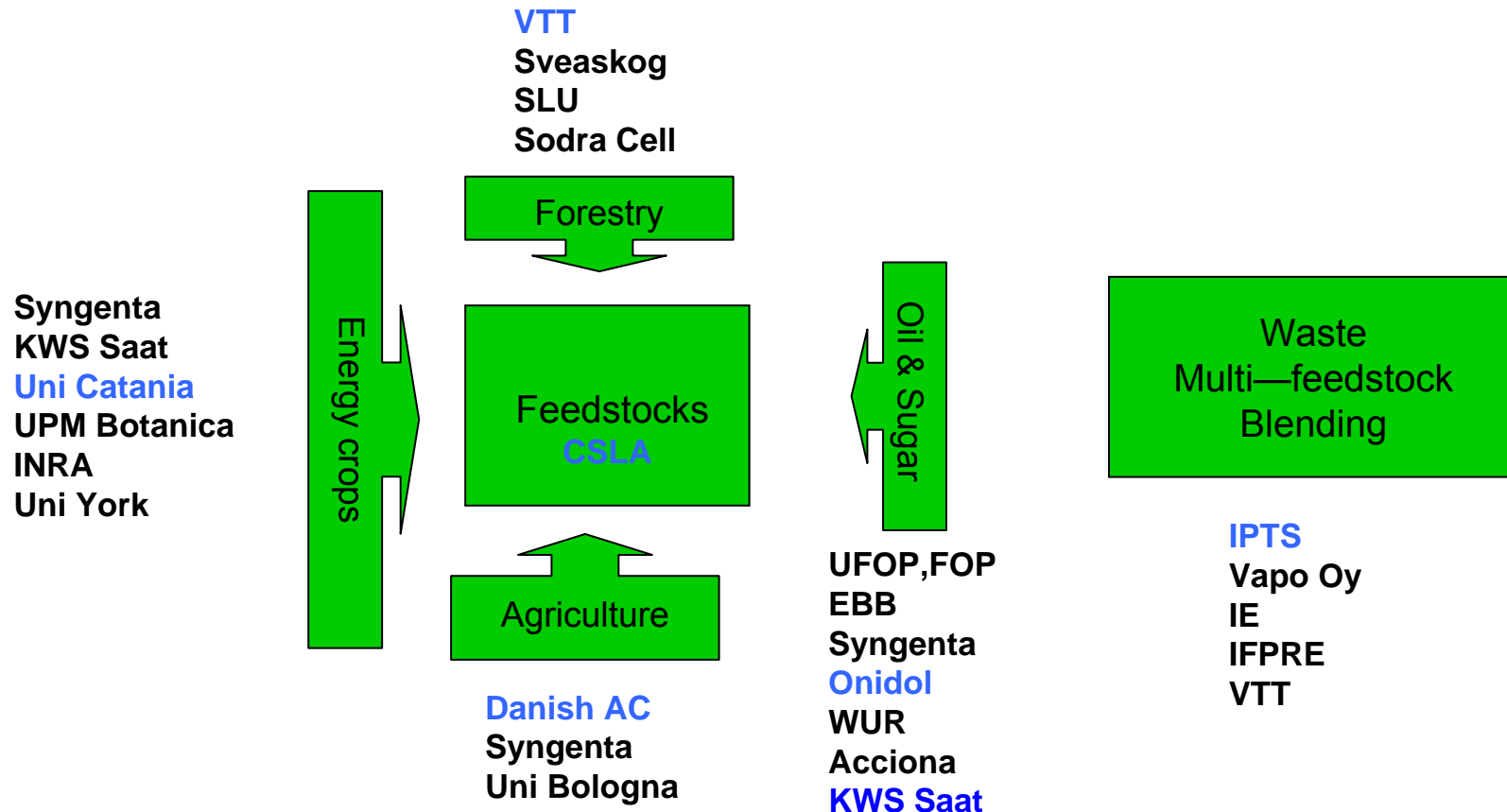
***→ through a process of guidance, prioritisation and promotion of research, development and demonstration.***





# WG1: organisation

Availability, competition & economy  
IE, IFRE, Uni Utrecht, IPTS, **WUR**, CSLA



Interfacing/ whole systems approach  
**Uni Utrecht** , WUR, **VTT** (across all sub-groups)

***“How much resources we have available today and how we can sustainably increase them through research, pilot and demonstration actions?”***

The ***main goal*** of the research priorities is to create favourable conditions in order to expand the feedstock potentials:

- in terms of optimising production systems (yields, system efficiency, etc.) and broaden the feedstock types.
- by making better use of existing bio-based resources through increasing their added value for fuel and products taking into account both demand and supply issues.

# Current supply for biofuels



- In 2005, 3.6 mio ha of agricultural land in the EU-25 was directly devoted to biomass production for energy use.
- The majority of this land (83 %) was used for oil crops (used for biodiesel), and the remainder devoted to ethanol crops (11 %), biogas production (4 %) and short rotation forestry (2 %).
- Rapeseed dominating feedstock for the biodiesel market.
- In 2005, the area under oilseed rape in EU-25 was 4.8 million hectares (2.5 mio ha in 1995). 80 % is concentrated in five countries: Germany (1.35 mio. ha), France (1.21 mio. ha), the United Kingdom (0.6 mio. ha), Poland (0.55 mio. ha) and the Czech Republic (0.27 mio. ha). Cultivated area further increased to 6.2 Mha in 2007.
- Cereals prime feedstocks for EU ethanol.

| (Million hectares)                              | 2004<br>(EU-25) | 2005<br>(EU-25) | 2006<br>(EU-25) |
|---|-----------------|-----------------|-----------------|
| On <b>set-aside area</b> ,<br>of which          | 0,6             | 1,0             | 1,0             |
| – Rapeseed                                      | 0,5             | 0,75            | 0,7             |
| With <b>energy crop<br/>premium</b> , of which  | 0,3             | 0,7             | 1,3             |
| – Rapeseed                                      | 0,2             | 0,4             | 0,8             |
| Without <b>specific<br/>support</b> (estimated) | 0,5             | 0,7-0,9         | 1,4-1,6         |
| <b>Total area</b>                               | 1,4             | 2,4-2,6         | 3,7-3,9         |

► Energy crops : 3 - 4% of the EU-25 arable area

- Limited uptake for non- food crops for energy and fibre (3.7-3.9 mio ha in 2006). FR & DE have larger share with UK, ES, PL, HUN and LI following.

Source: EEA & EC, DG Agriculture and Rural Development

- *Land availability* and quality will define the amount and type of feedstocks produced in EU over the coming years. Production in marginal lands has to meet both economic and sustainable criteria in order to become competitive. Therefore the development of new innovative concepts to explore these issues is highly recommended.
- *Climate change* is likely to have a significant impact on both the availability of biomass as well as on feedstock types produced and their regional distribution.
- *Establishing infrastructure to allow mobilising the biomass* (ownership issues, (small farms)). Various scenarios and strategies should be developed for small and large scale biofuels concepts, as well as for forest, agro and waste based raw materials
- Improve the *efficiency of agricultural lifestyle*, ( ) finding new development pathways that lead to optimised sustainable production will also be a key issue to securing the supply of biomass feedstocks.

# Research Roadmap

## Short term

## Medium term

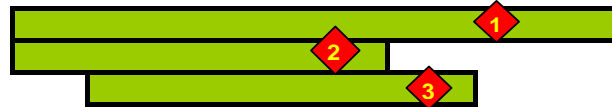
## Long term

2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

### Technology timeline

#### Resource assessments

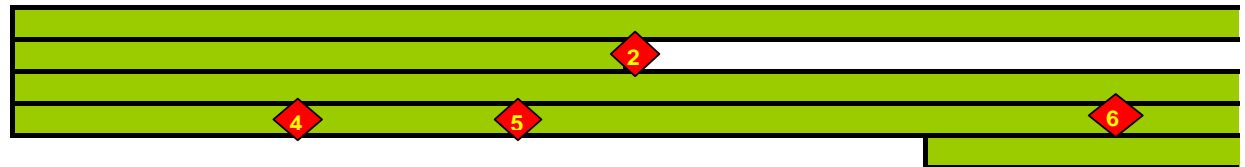
Resource assessments  
Develop integrated approaches for regional forecasts  
Identify and benchmark supply system tools



1. Feedstock type, quantity & regional costs as function of the entire supply system (incl. pretreatment & sto)
2. Update resource maps
3. Cost supply curves at national level

### Feedstock

Feedstock production  
Adjust production & management to meet conv. requirements  
New & innovative production systems  
Crop breeding to meet conversion requirements  
Single-cell organisms and aquaculture sources of new biomass



1. Optimise yields & management practices through sustainable land use
2. Optimise current production systems
3. Innovative cropping systems for the 4F agro-forestry systems
4. Definition of plant/crop ideotypes for EU regions
5. Based on 4. - develop arable land use strategy for energy crops.
6. Energy crop management techniques
7. New crops through plant breeding with optimised characteristics
8. Innovative feedstock concepts

### Handling of biomass

Harvesting/ Collection / Storage  
New & improved integrated harvesting/ logistics systems  
Develop quality & monitoring systems, both wet and dry biomass



1. Optimised logistics for selected systems & scales
2. Integrated harvest & handling for multi- products
3. Improved standardisation schemes (incl. RDF)

### System analysis

System analysis  
Demonstration of a portfolio of systems  
Evaluate synergies of bioenergy and environmental management  
Biomass supply systems in the market



1. Optimised biomass fuel chains for regions
2. Optimised biomass fuel chains for regions
3. Supply and demand of biomass feedstocks and the impacts of policy
4. Biomass availability and supply in prevailing market conditions

“***Energy crops***” may be defined as crops specifically cultivated to produce biomass which, for specific traits to serve as an energy vector to release energy either by direct combustion or by conversion to other vectors such as biogas or liquid biofuels.

Such crops may also be bred to enhance their use in biorefineries where it is anticipated that a wider range of end products, including chemicals and other non-food bioproducts, may be produced in parallel with fuels.

This issue must be seen from the point of view  
of the agricultural/ forest sector

- New crops dedicated to energy production opens a new field of production for the agricultural/ forest sector and may give an opportunity for the economy of the rural areas;
- The cultivation of a new group of crops will allow to diversify the products (food/non food) with a better impact to the market;
- The cultivation of annual or perennial crops with low input techniques will allow to develop a sustainable approach to the agricultural sector more respectful of the environment; moreover this new opportunity will assure the presence of the farmers on the territory with a better control of the land;
- A clear policy must be developed regarding the competition for the land between food and non food according to strategic and political issues;
- The cultivations of these crops must be strictly linked to the industrial sector with agreements between the two sectors

# Definition of a plant/crop ideotype for energy production

An energy crop should gather the following characteristics:

- High yielding close to potential yield of each region
- High radiation use efficiency in relation to the environment (temperature, photoperiod, water availability)
- Specifically developed for an environment
- Resistant to biotic stress
- Resistant to abiotic stress (water, low and high temperature, salt)
- Able to utilize available natural resources
- With quality traits specific for each different use (biogas, biodiesel, ethanol first generation, ethanol 2<sup>nd</sup> generation from cellulose, Biomass to liquid (BTL), Bio-hydrogen)
- Positive energy balance
- Environmentally friendly

# Main lines of R&D&D

- Maximisation of yield and crop resistance to biotic and abiotic factors (pests, diseases, water scarcity, rising temperatures, etc.).
- Initiate innovative cropping systems to allow efficient, bulk material production for food, feed, fibre and fuel (4F agricultural systems).
- Exploitation of marginal land options.



- **Critical areas for technology development**

- ✓ managing competition for land resources (food & fodder vs. bioenergy) and for different biomass applications (transportation fuels, heat, industrial raw materials).
- ✓ Increasing yield per hectare and developing efficient supply logistics both for dedicated crops and residues.

- **Key R&D&D Priorities:**

- ✓ Develop **availability-cost curves for different sources of biomass** (energy crops, forestry and agriculture residues, wastes) **and geographical locations**; develop interfacing systems analysis (supply-demand, market interdependencies, impact of policies).
- ✓ Develop **new high-yield agricultural and forest systems** with breeding of crops and trees **optimised for sustainable biofuels production**.
- ✓ Develop **efficient biomass logistic systems** (harvesting/collection/storage) for different conversion concepts **at different scale**.

# European Biofuels Technology Platform

## Contact us

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