IEA Bioenergy Task 40
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Biomass work programme at the IEA secretariat

- Current and future

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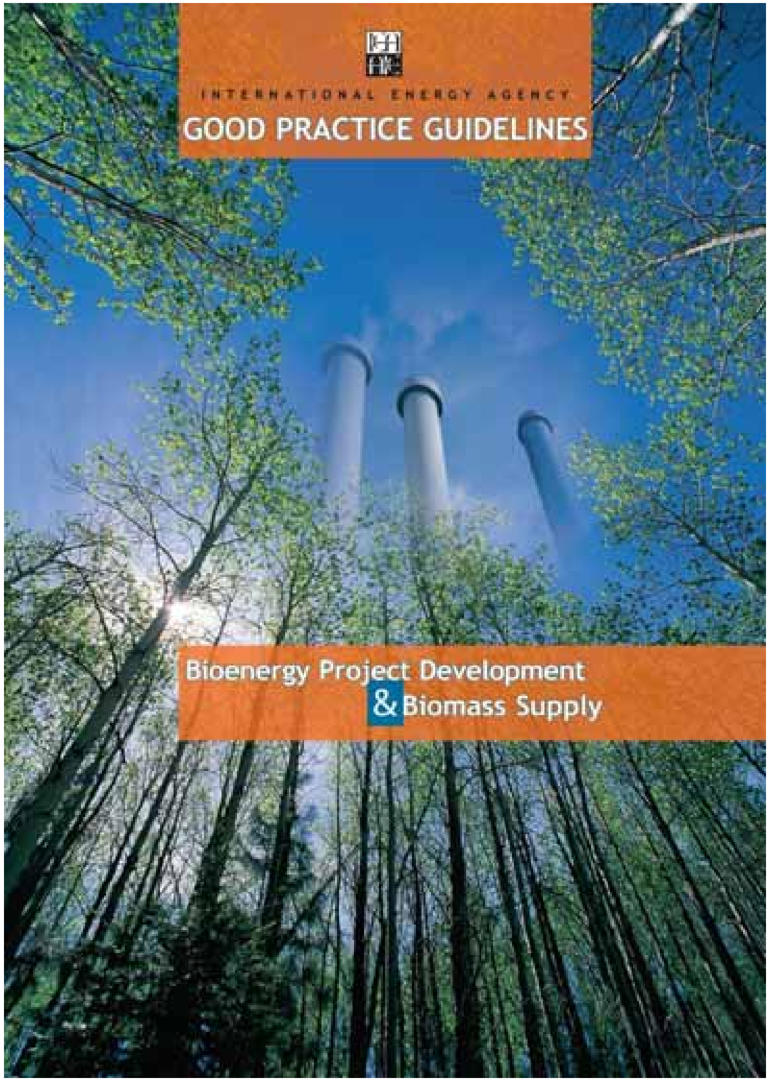
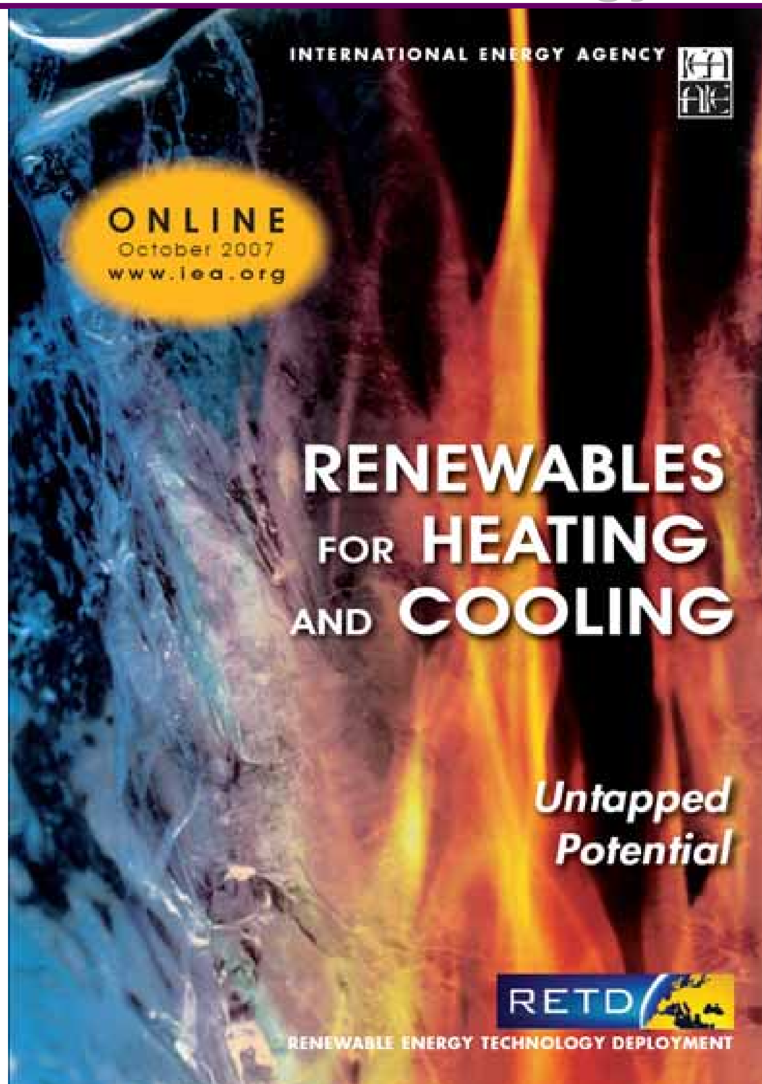
By how much can the deployment of bioenergy projects be speeded up?



A publication to assist the difficult experiences of sourcing sustainably produced biomass and developing a bioenergy plant.

A joint publication by the IEA Renewable Energy Technology Deployment Implementing Agreement and the Renewable Energy Unit of the IEA Secretariat



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with major contributions from the

- Bioenergy,
- Geothermal,
- Solar Heating and Cooling and
- SolarPACES

Implementing Agreements

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The report examined the various REHC technologies and markets.

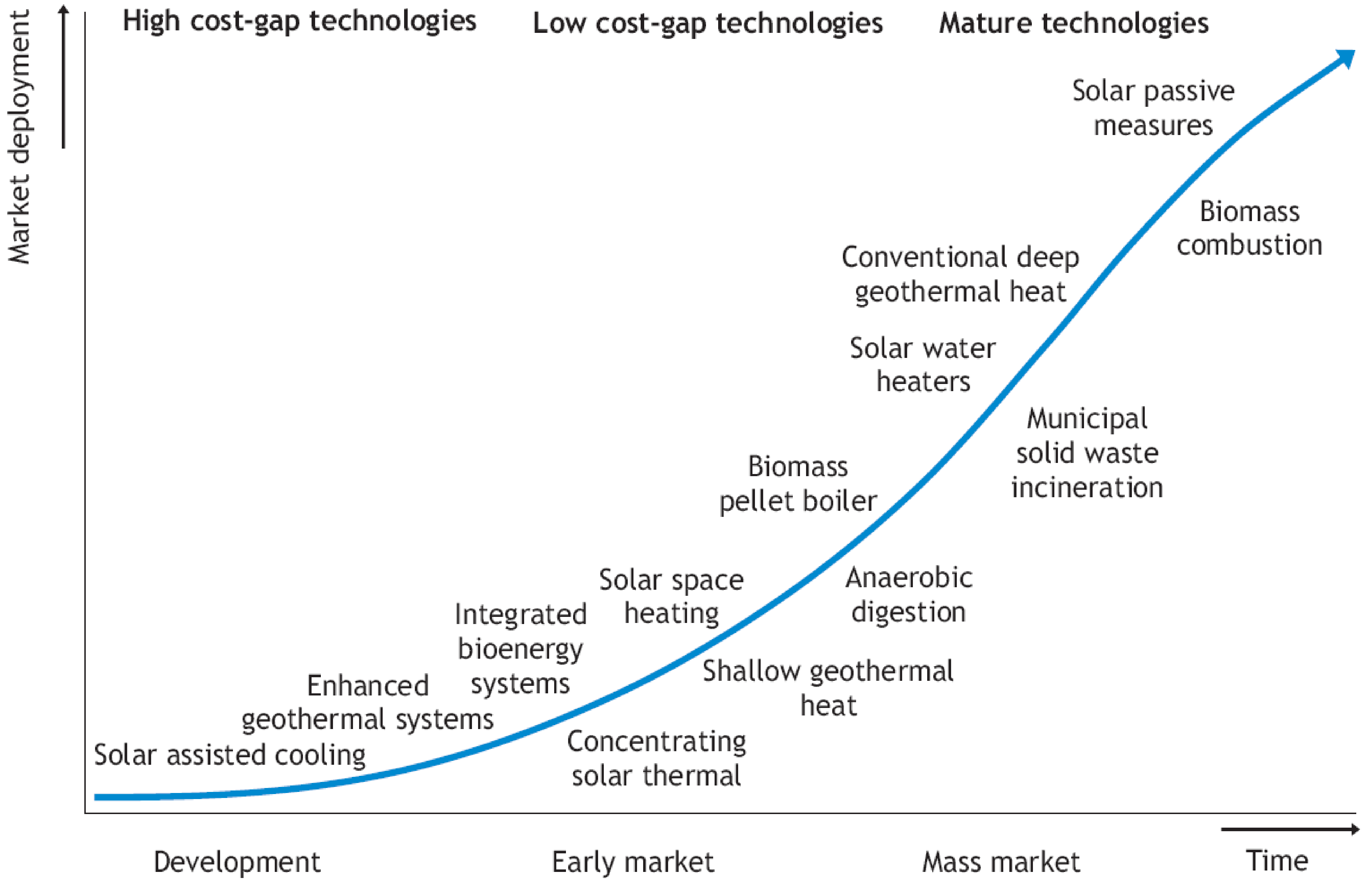
	Installed capacity GW_{th}	Energy output PJ/yr
Solar thermal	**100-110**	**200-220**
- water and space heating		
- solar assisted cooling	<0.05	
Bioenergy	**1000-1200**	**3000-4000**
- pellet heating		
- CHP		
- anaerobic digestion		
- MSW waste-to-energy		
Geothermal	**25-30**	**270-280**
- deep conventional		
- deep advanced		
- shallow geothermal		

By way of comparison:

Biofuels use is around 1200 PJ/yr

Renewable electricity (excluding hydro) is around 1800 PJ / yr.

Market deployment of REHC technologies



Government policies in 12 OECD countries 1990 -2007

Training, marketing campaigns, brochures, newsletters

~16% Guidance

~18% Stick

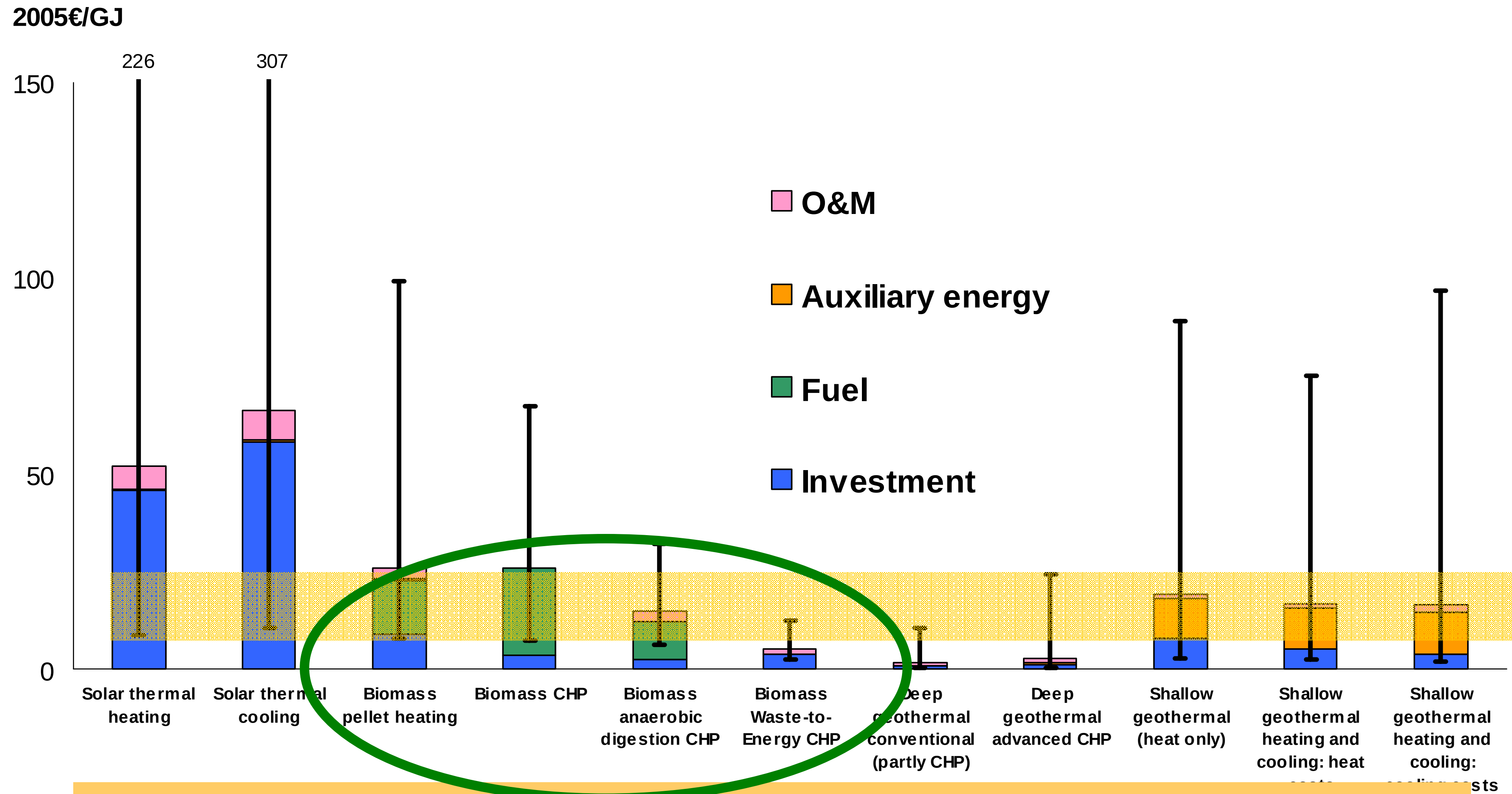
Building regulations, standards

~67% Carrot

Capital grants, subsidies, fiscal incentives, soft loans

Relative costs for heat and cold production using biomass, geothermal and solar-assisted systems.

Cost breakdowns 2005 – average and range



Current price band for heat supplied from gas, coal and electric sources for industrial (bottom) and residential (top) applications.

ETP report: What technology improvements in bioenergy conversion plants can be expected by 2050?

- Gasification – including BIGCC and black liquor.
- Bioenergy linked with Carbon Capture and Storage?
- Bioenergy linked with soil carbon uptake – bio-char?

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How much biomass will become available for “bioliquids” use?

Sustainable production of biomass and certification could limit supply.

Which biomass use has the lowest $/t carbon avoided?

Heat, Power, CHP, Bio-materials,
Bio-chemicals, Soil conditioning
Bio-refineries, Transport fuels, Aviation fuel

Are LCAs useful and can they be compared?

When will 2nd generation become commercial?

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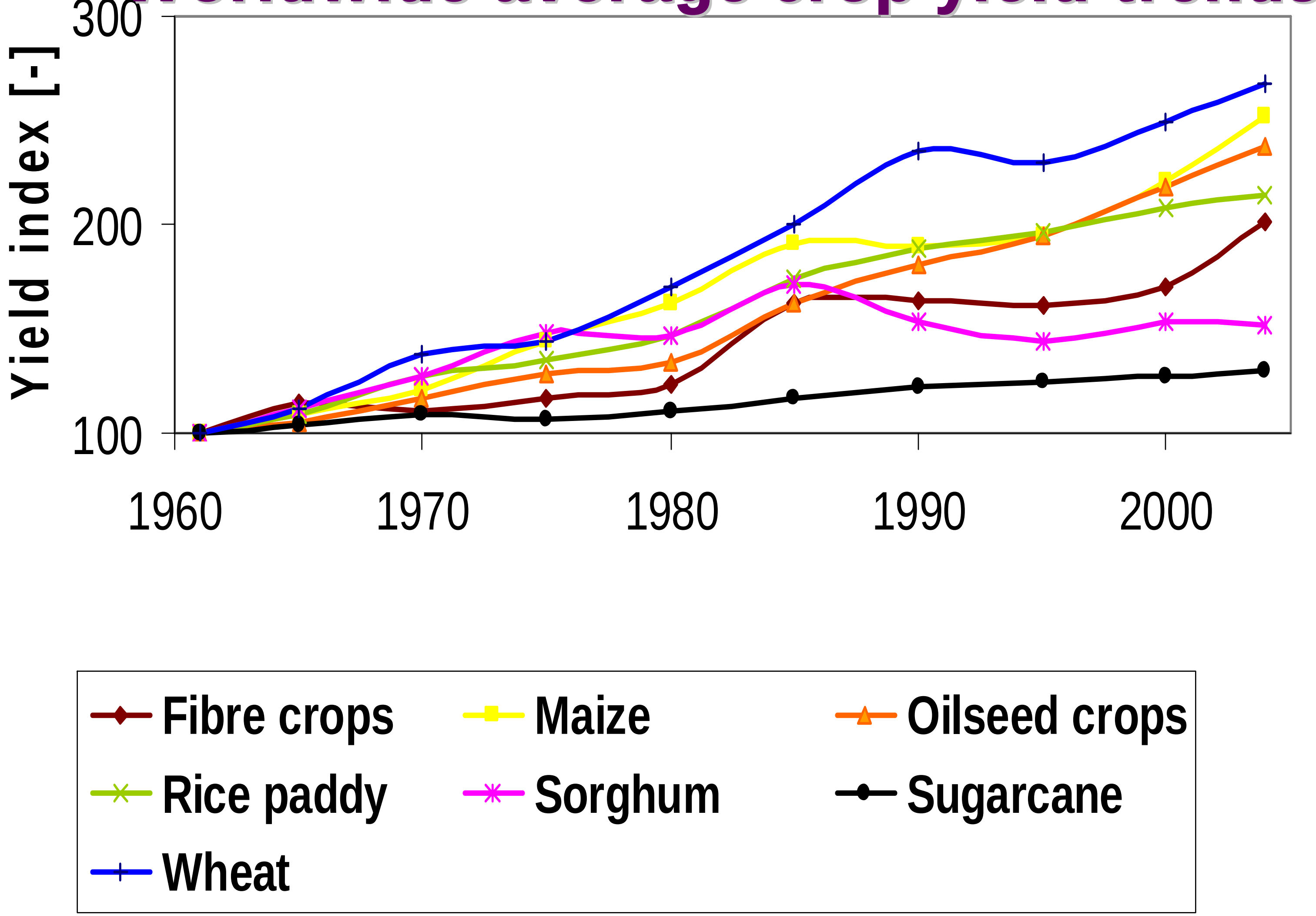
Can historic increases in crop yields continue, how will they affect land use, and are they sustainable?

Worldwide average crop yield trends.



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In summary

- The future potential for the contribution of sustainable biomass to future world energy supply is uncertain - but significant - using agricultural and forest residues initially and a transition to specialist energy crops.
- Further analysis will be needed to better determine transport logistics, life cycle analyses, carbon emission reductions, 2nd and 3rd generation biofuel processes etc.
- Project deployment by 2050 will vary widely with the biomass feedstock and conversion technology under consideration.
- Biofuels for transport have potential for up to 1 $GtCO_2$ greenhouse gas mitigation by 2030 and increasing going out to 2050 and beyond but it may not be realised.

The world of Biofuels – according to the IEA

Biofuel use worldwide in 2005 was roughly equivalent to 1% of the total road transport fuel consumption.

Bioethanol provided 17 Mtoe/yr of gasoline fuel substitution, its production having doubled between 2000 and 2005. More recent IEA data are not yet available. However, according to the REN21 Renewable 2007 Global Status Report, production increased by 10-15% annually both in 2006 and 2007 and has reached 48 billion litres per year.

Biodiesel contributed 2.5 Mtoe/yr of diesel substitution in 2005 since when, according to REN 21, world annual production has doubled to 8 billion litres.

The IEA is well aware that there are different kinds of biofuels. Some can be produced in more sustainable ways than can others. This depends on a series of site specific factors including type of crop, agricultural management practices, and the use of fertilizers and irrigation. How environmental and social impacts are allocated between co-products is still under debate.

The use of either fossil fuels or renewable energy (e.g. bagasse from sugar cane) in the production and processing operations, and the process efficiencies at the plant, impact on the potential greenhouse gas emission savings. GHG emission reductions per km with respect to conventional petroleum fuels can vary between as low as 10% savings for some corn-based ethanol up to 90% for ethanol from sugar cane.

The IEA is currently reviewing a series of life cycle assessment (LCA) studies on biofuels and will present the comparative results later this year.

One particular issue is land-use change relating to biofuels and the consequent possible negative impacts in terms of carbon release from soils and vegetation. For example, increased corn production in the US, if it displaces soybean production, could trigger increased soybean production on sensitive lands in other countries, with a consequent one-time release of CO2 from this land use change. While such concerns are understandable, much uncertainty exists with respect to how much land-use competition is really induced by biofuel production or from other reasons such as the increasing demands for traditional food and fibre crops or food shortages from drought. This is an area with additional research is urgently needed.

Sustainable second-generation biofuels are essential to shifting towards a sustainable transport system at reasonable cost, given the limited alternatives for shipping and air transport. Ligno-cellulosic feedstock for second-generation biofuels can be from crop and forest residues or grown on marginal or degraded land, avoiding competition with food production. Estimates of the global production yield vary, but are large.

Biofuels policies will have to be co-ordinated internationally and be integrated with agriculture and forestry policies in order to ensure sustainability.

While it is true that some biofuels are more sustainable than others, too simplistic conclusions are being made and “black & white” statements should be avoided.

Deeper analysis both on LCA and on the land-use change issue is under way both at the IEA and elsewhere. In this respect, the potential use and environmental benefits from using forest and crop residues and non-food energy crops for advanced biofuel production is being carefully assessed.

This will allow for more balanced conclusions and recommendations to be made to policy makers and business investors.