from plant biotechnology to bio-based products

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CHALLENGES

- increasing GHG emissions
- climate change
- decline in fresh water
- decline of fossil reserves
- population growth
- urbanisation
- loss of biodiversity
the need for sustainable development in a political world

- water availability
- population dynamics
- food security
- natural resources
agriculture – a global industry

productivity - realising the potential of the plant production system
SOCIETY IS IN TRANSITION

implications for land-use, agriculture
and the use of agricultural feedstocks
solar energy

photosynthesis

ancient sunlight

today’s sunlight

BIOLOGY TO BENEFIT SOCIETY
ancient sunlight
\[\downarrow\]
fossil reserves
\[\downarrow\]
photosynthesis
\[\downarrow\]
bioproducts
\[\downarrow\]
today’s sunlight

fuel chemicals materials food animal feed

the full potential of the plant production system
climatic change… land availability… virtual water…

the politics of land-use decisions

developed world ↔ developing world

productivity and sustainability

food  animal feed  chemicals  materials  fuel

sustainability criteria for ALL agricultural production
15/20 years and beyond?

- food
- animal feed
- chemicals
- materials
- fuel

multiple demands on agricultural feedstocks

need for productive land … use of marginal land … politics / policies of virtual water … food security and quality …
from plant biotechnology to bio-based products

Workshops have been held on the following topics:

- 18th Meeting of the EC-US Task Force on Biotechnology Research, Joint Research Centre, June 5-6 2008, ISPRA, Italy
- 2nd EPOBIO Workshop: Products from Plants - from crops and forests to zero-waste biorefineries, 15-17 May 2007, Athens, Greece
- Future of plant biotechnology, Arlington, VA, USA, June 2005 | Report
- Biobased product research, Beltsville, MD, USA, March, 2005 | Report
- Engineering plants for bio-based products and biofuels, Albany, CA, USA, April 2004 | Report
- Biotechnological approaches to disease resistance in plants and animals, Washington, DC, USA, June 2003
- Comparative research on biotechnology and the public, Baltimore, MD, April 2003 | Proceedings
- Forecasting the future of biotechnology; the blue sky workshop, Washington, DC, September 2001 | Report
- Plant and animal bioinformatics, Arlington, USA, September 1999 | Final report
- Biotechnology and genetic resources, Airlie, VA, USA, October 1992
- Methods of communicating biotechnology to the public, Dublin, Ireland, March 1992 | Report
EC-US TASK FORCE ON BIOTECHNOLOGY RESEARCH

plant-based bioproducts: creating value from renewable resources

SIXTH FRAMEWORK PROGRAMME
PRIORITY 8.1 Policy-orientated research
Tools and assessment methods for sustainable agriculture and forestry management
Task 2 - Non-food policy Research

SPECIFIC SUPPORT ACTION

Project acronym: EPOBIO

Project full title: Realising the economic potential of sustainable resources - bioproducts from non-food crops
a process to ensure sustainable development

in the epobio project, desk researchers identified and integrated the science, technology and supply chains needed for the design, success and sustainability of new bioproducts

support analyses of environmental impacts, the economic and regulatory environments and social attitudes established context

the epobio process – a holistic analysis of the issues to provide a thorough evidence-base to inform decision-making by funding agencies and policy-makers
epobio – selection criteria for priorities

- user / consumer benefit
- societal benefit across the entire supply chain
- scientific challenge
  requires large-scale, complementary, multinational input
- economic benefits and risk analysis
- the project as a continuum – research to proof of concept
- private sector involvement
  pre-competitive, demonstration of value
the first priorities identified

- plant cell walls
- plant oils
- biopolymers

support themes

- economics / regulations
- environmental impacts
- attitudes / expectations
- communication strategies

a holistic approach to decision making
epobio – a novel process widely applicable

a framework for validation of research priorities
  - by the international scientific and industrial community

recommendations provide a thorough evidence-base
  - to inform decision-making by funding agencies and policy-makers
The 2006 epobio Workshop:
PRODUCTS FROM PLANTS – the biorefinery future

The 2007 epobio Workshop:
PRODUCTS FROM PLANTS – from crops and forests to zero-waste biorefineries
epobio reports

www.epobio.net
the plant production system

clean technology
renewable
high capacity
complex chemicals

many different products can be made cheaply
plants

plasticity

developmental

metabolic

the plant production system – food and non-food
The need for integrated supply chains

growers of the feedstocks → users of the feedstocks

raw materials → extraction → processing → manufacture → markets
discovery development demonstration deployment

the need to integrate research into application
fundamental plant biology … 
arable agriculture and food crops

plant biotechnology

bio-based products … non-food crops
fundamental plant biology ... 
arable agriculture and food crops

plant biotechnology

increased yield
defence and resistance
drought tolerance
low inputs
higher utility

close working relationship between the research community,
the growers and the users of the feedstocks
plant biotechnology

bio-based products … non-food crops

increased yield
bulk chemicals
energy
higher utility
improved processing

close working relationship between the research community, the growers and the users of the feedstocks
fundamental plant biology ... arable agriculture and food crops

plant biotechnology

bio-based products ... non-food crops

science photosynthesis application

FOOD FEED CHEMICALS MATERIALS FUELS

integrated, multipurpose, biorefineries
agronomics  economics  environmental science

germ plasm development

fast track breeding platform
the knowledge based bio-economy

complementary strategies and technologies

plant production systems
biorefineries
extraction

biocatalysis
fermentation
processing

end-user requirements

pipelines of new products

realising the potential of agricultural feedstocks