



# from plant biotechnology to bio-based products

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# CHALLENGES

increasing GHG emissions

population growth

climate change

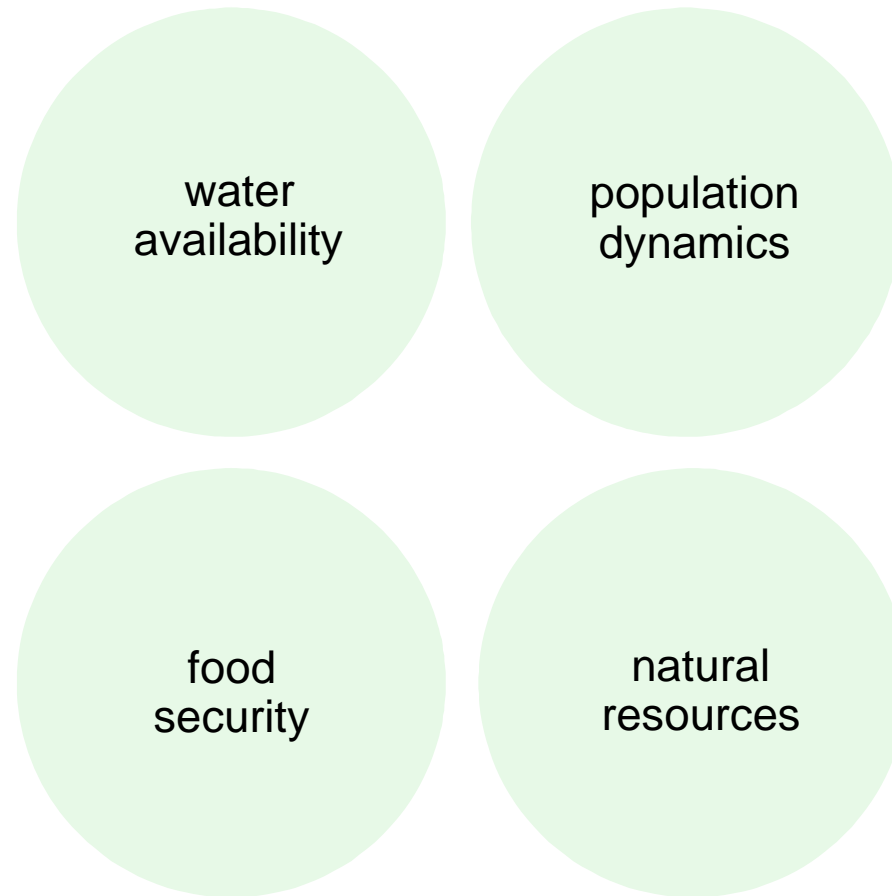
urbanisation

decline in fresh water

loss of biodiversity

decline of fossil reserves

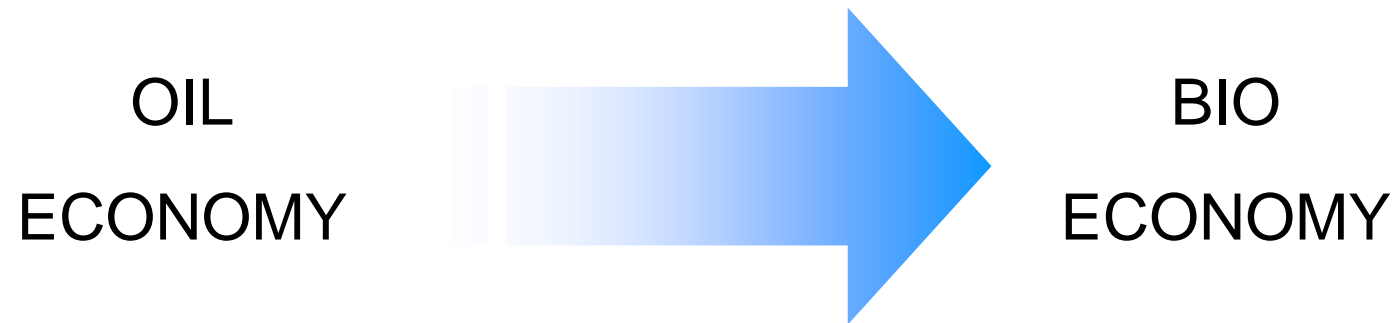
## the need for sustainable development in a political world



# 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**

ancient sunlight



fossil reserves

oil...refineries

**photosynthesis**

today's sunlight



bioproducts

bio...refineries

fuel    chemicals    materials    food    animal feed

the full potential of the plant production system

climate change... land availability... virtual water...

## the politics of land-use decisions



**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
- [Biotechnology for the development of sustainable bioenergy](#), 21-22 February 2008, San Francisco, California, US
- [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

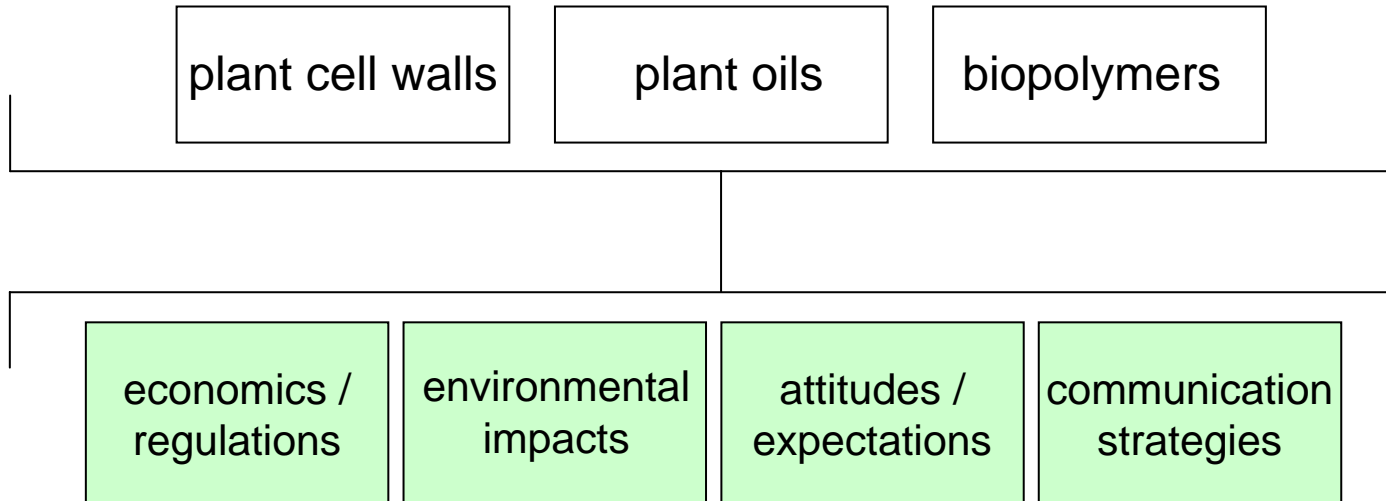
economic benefits and risk analysis

the project as a continuum – research to proof of concept

private sector involvement

pre-competitive, demonstration of value

### the first priorities identified



### support themes

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

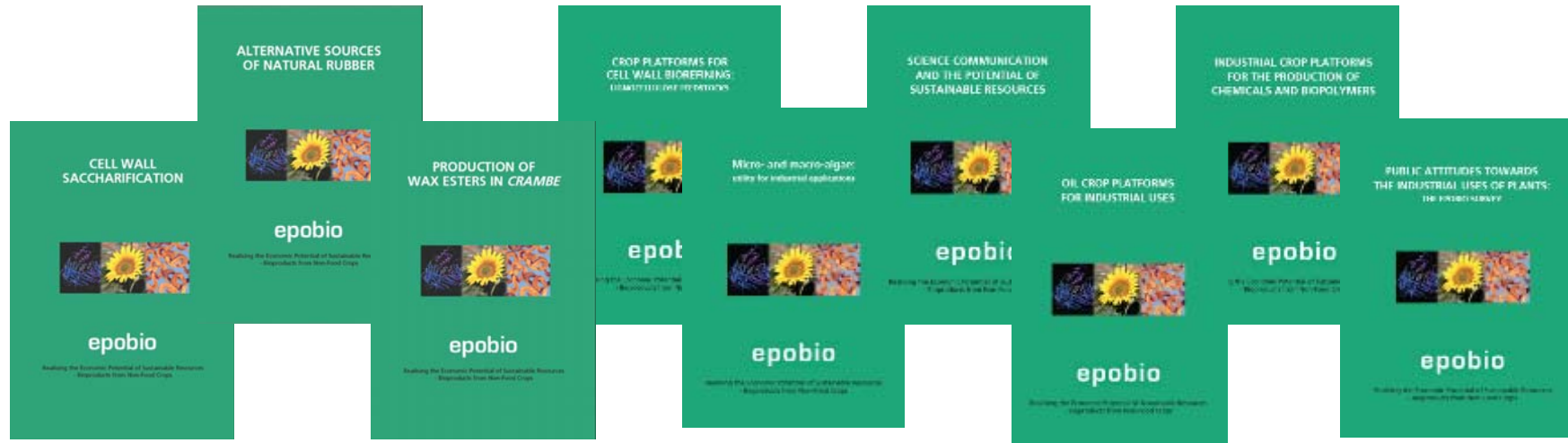
recommendations provide a thorough evidence-base

- 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

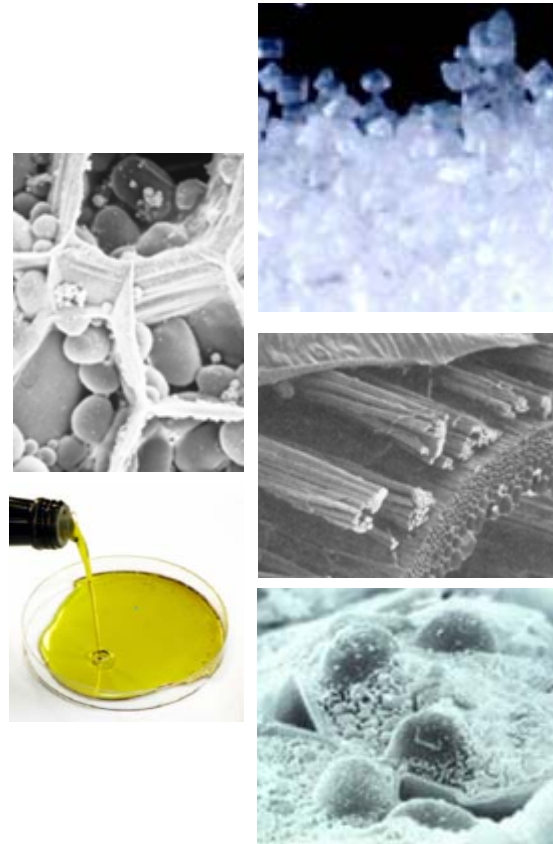
# epobio reports



[www.epobio.net](http://www.epobio.net)

## the plant production system

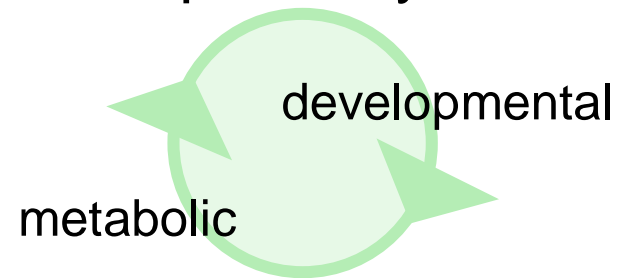
clean technology  
 renewable  
 high capacity  
 complex chemicals



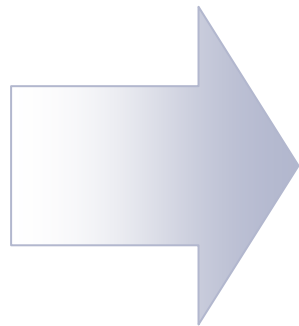
many different products can be made cheaply

# plants

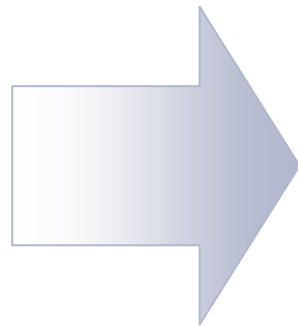
plasticity



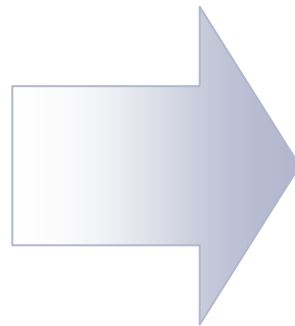
**the plant production system – food and non-food**



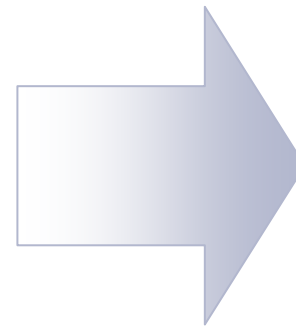
**raw materials**



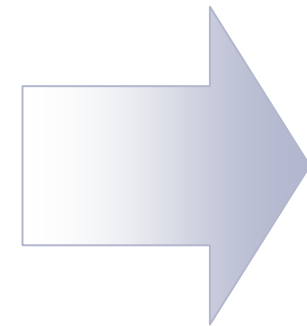
**extraction**



**processing**

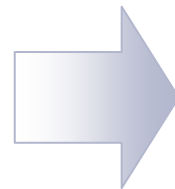


**manufacture**



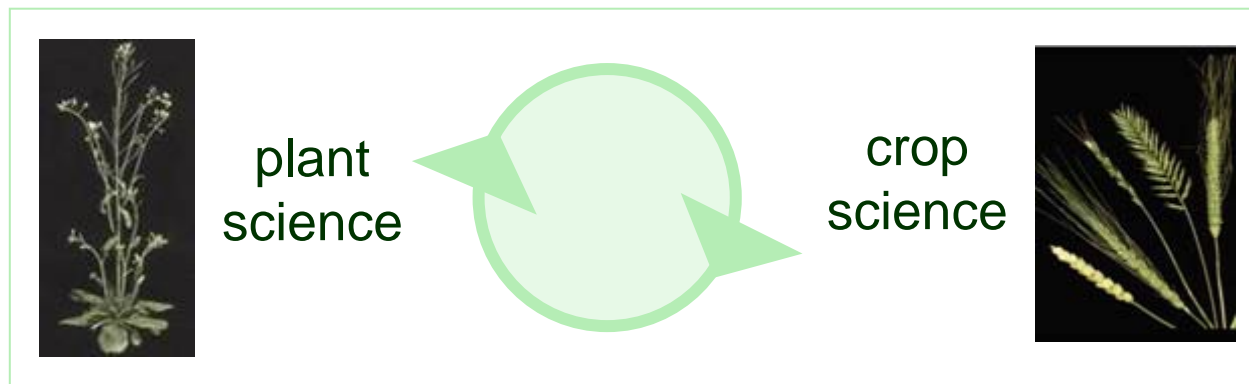
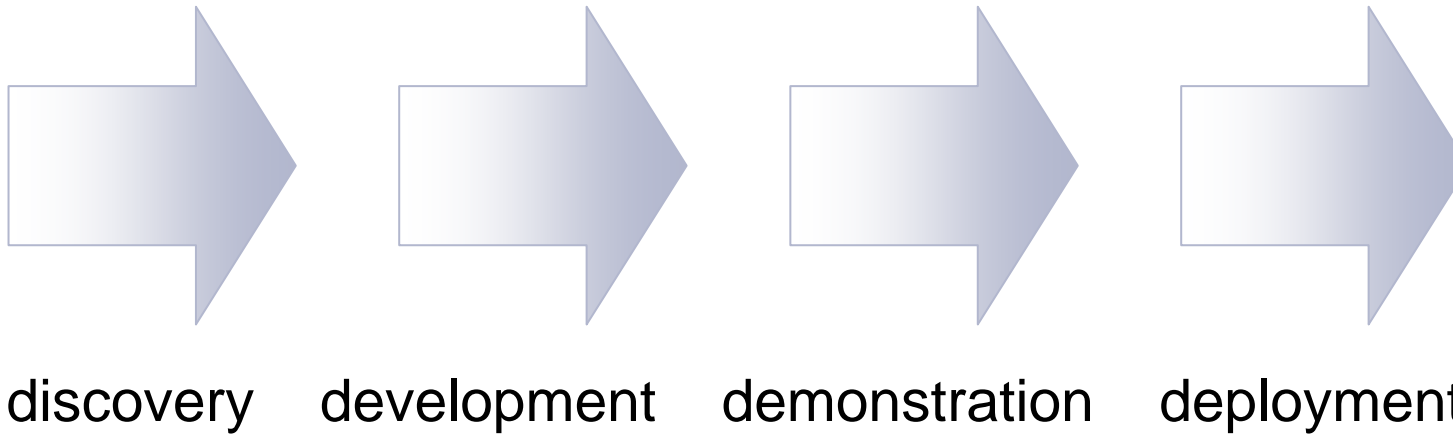
**markets**

growers of the feedstocks



users of the feedstocks

the need for integrated supply chains



the need to integrate research into application

fundamental plant biology ...  
arable agriculture and food crops

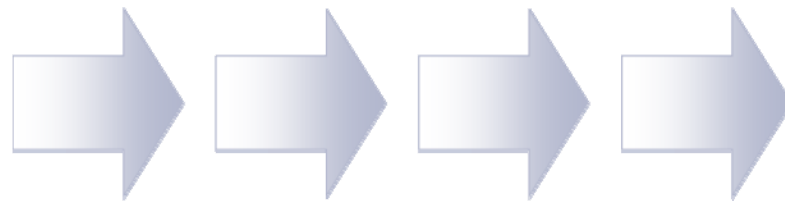
plant biotechnology

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

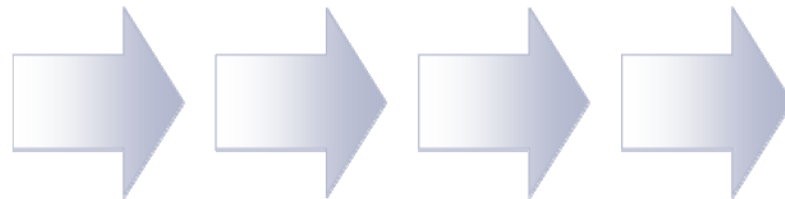


close working relationship between the research community,  
the growers and the users of the feedstocks

# plant biotechnology

bio-based products ... non-food crops

increased yield  
bulk chemicals  
energy  
higher utility  
improved processing

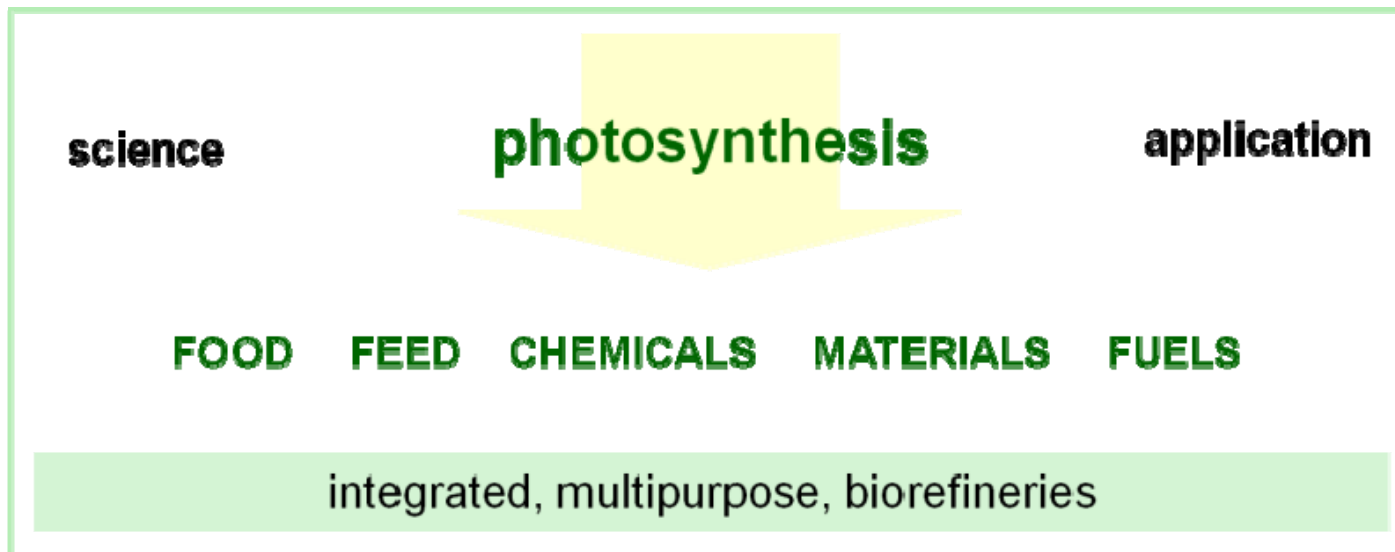


close working relationship between the research community,  
the growers and the users of the feedstocks

fundamental plant biology ... arable agriculture and food crops

# plant biotechnology

bio-based products ... non-food crops



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**