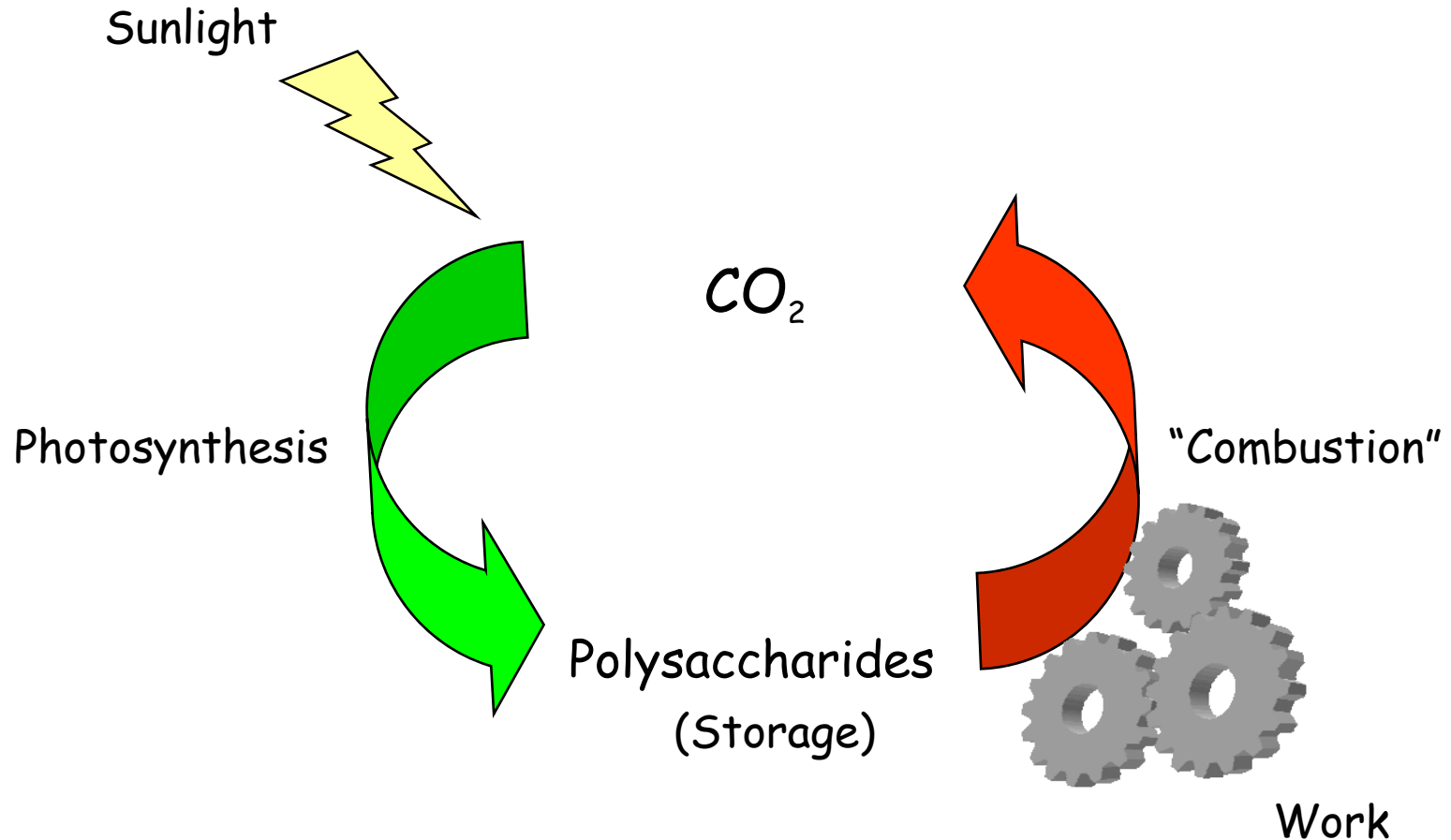


Cellulosic Biofuels

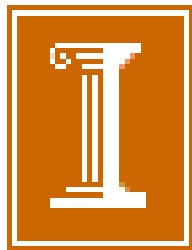


Chris Somerville
Energy Biosciences Institute
UC Berkeley, LBL, University of Illinois

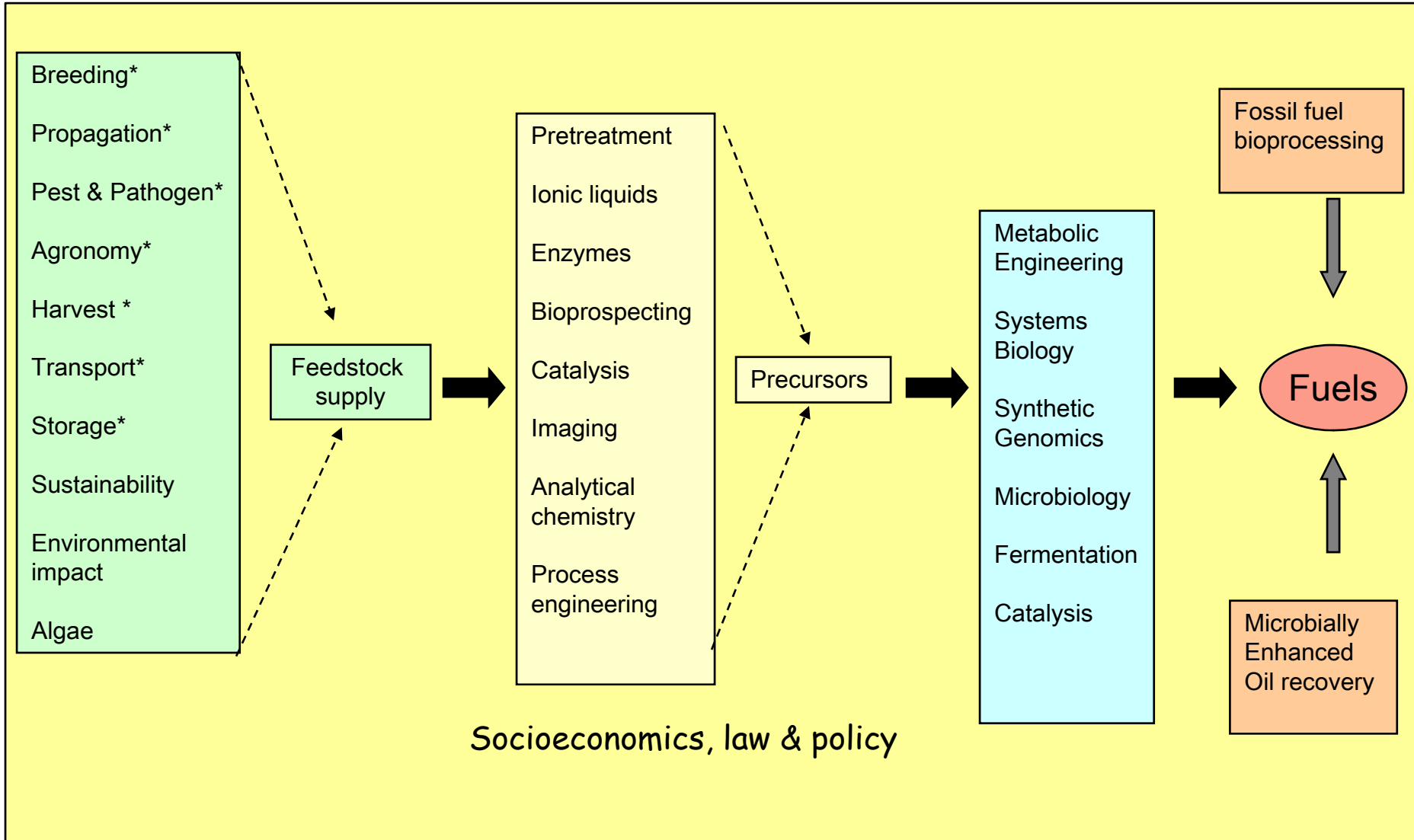
2/27/2009

The Energy Biosciences Institute

- Mandate to explore the application of modern biological knowledge to the energy sector
 - Cellulosic fuels
 - Improved fossil fuel recovery and processing
 - Other



Technical reach of the EBI



Responsible Biofuels

- No conversion of undeveloped land
- Sustainable
- Net GHG benefits based on full lifecycle accounting
- No effect on food production

What plants can be useful?

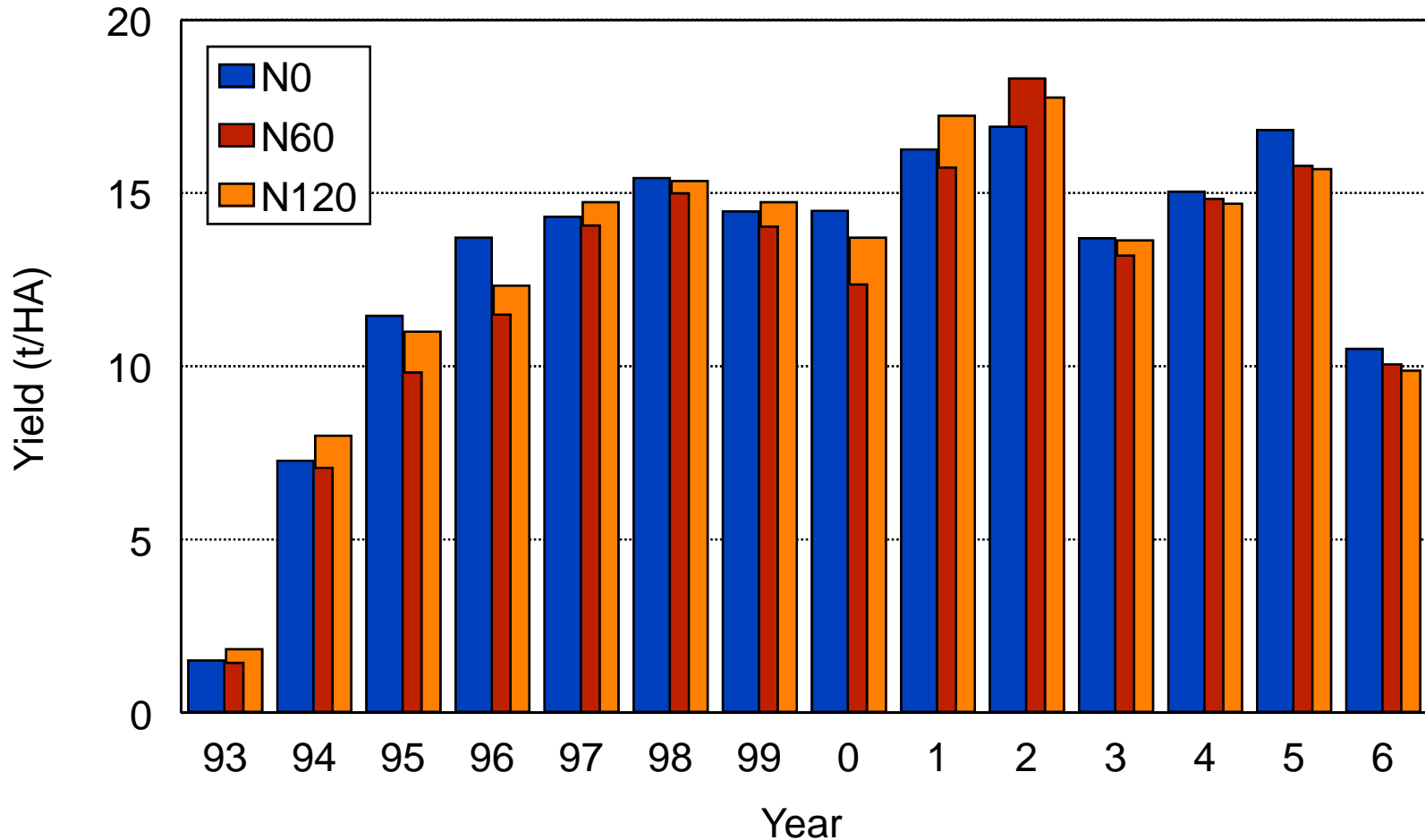
(and how do we grow, harvest, transport, store...)

Courtesy of Steve Long et al



2/27/2009

Sustainability: Response of Miscanthus to nitrogen fertilizer



2/27/2009

Christian, Riche & Yates Ind. Crops Prod. (2008)

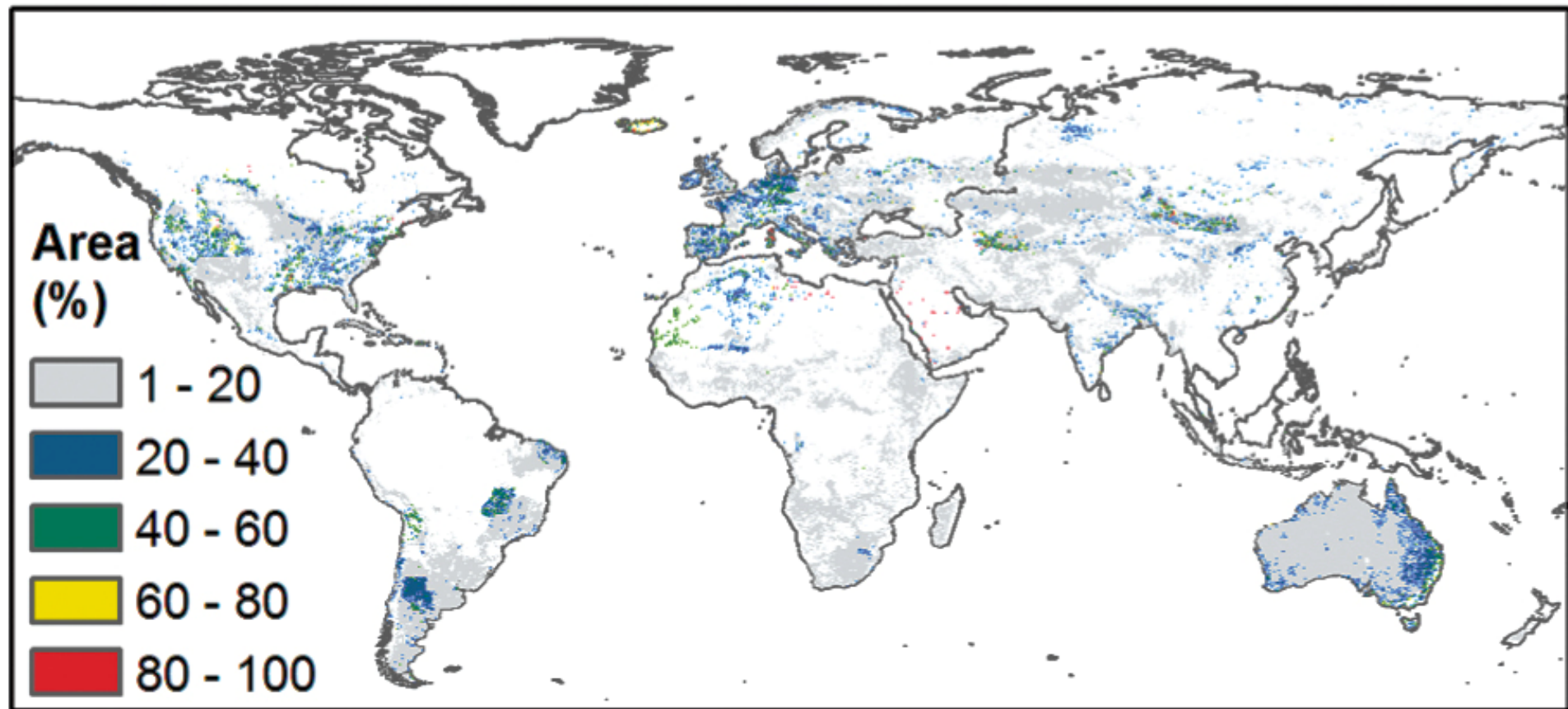
Harvesting Miscanthus



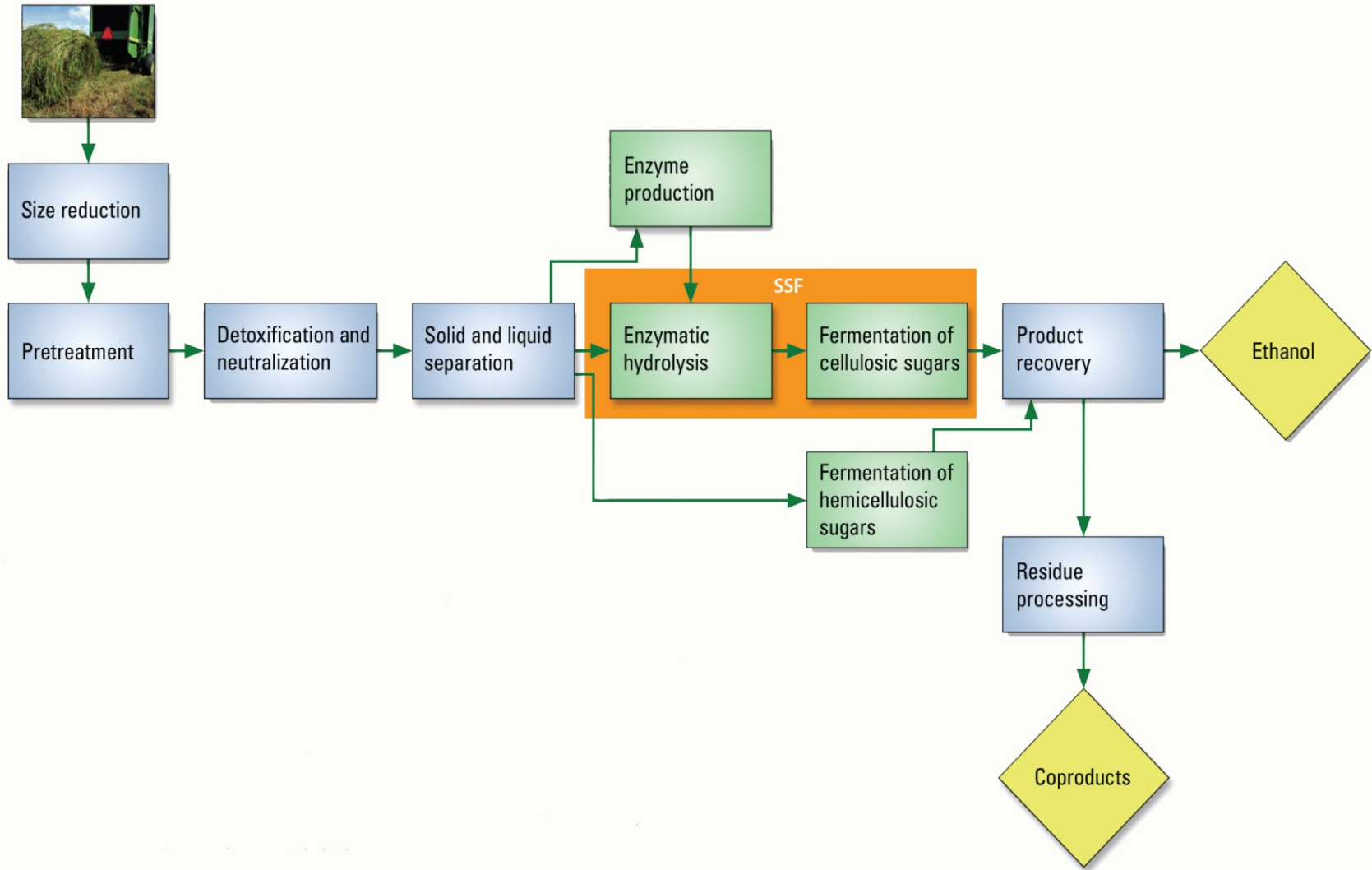
2/2/2009

<http://bioenergy.ornl.gov/gallery/index.html>

>>A billion acres of agricultural land have been abandoned

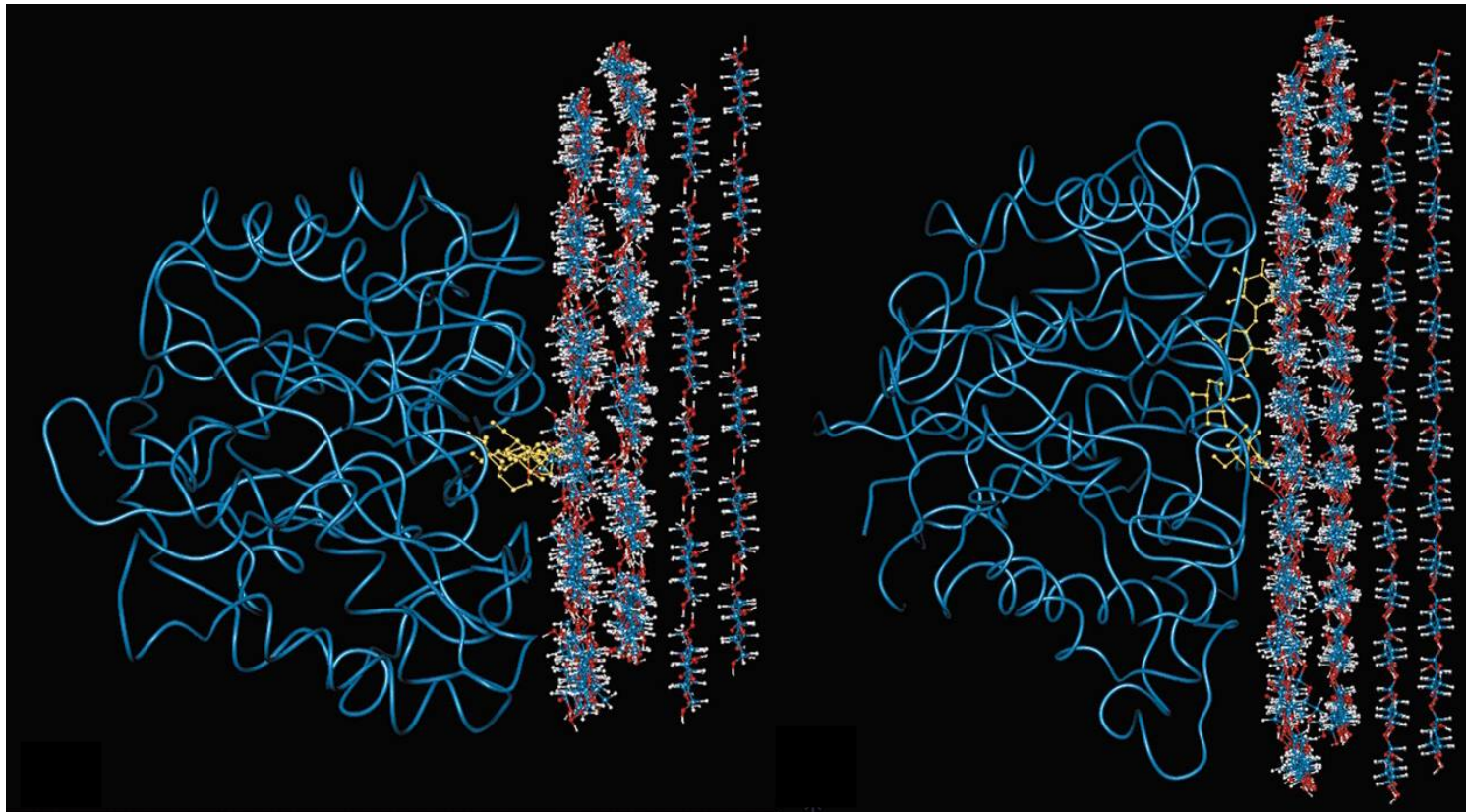


Steps in cellulosic ethanol production



From: Breaking the Biological Barriers to Cellulosic Ethanol

Enzymatic hydrolysis of cellulose is slow



2/27/2009

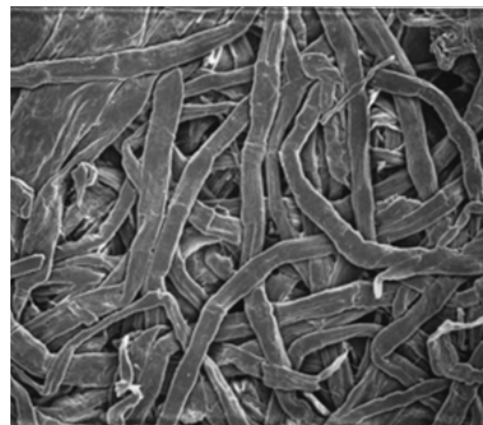
Skopec, Himmel, Matthews, Brady Protein Engineering 16, 1005

Dissolution of cellulose in an ionic liquid

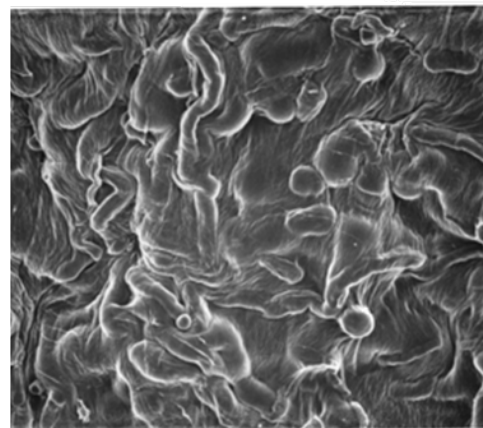
(novel pretreatment methods may create fundamental changes)



1-Butyl-3-methylimidazolium chloride

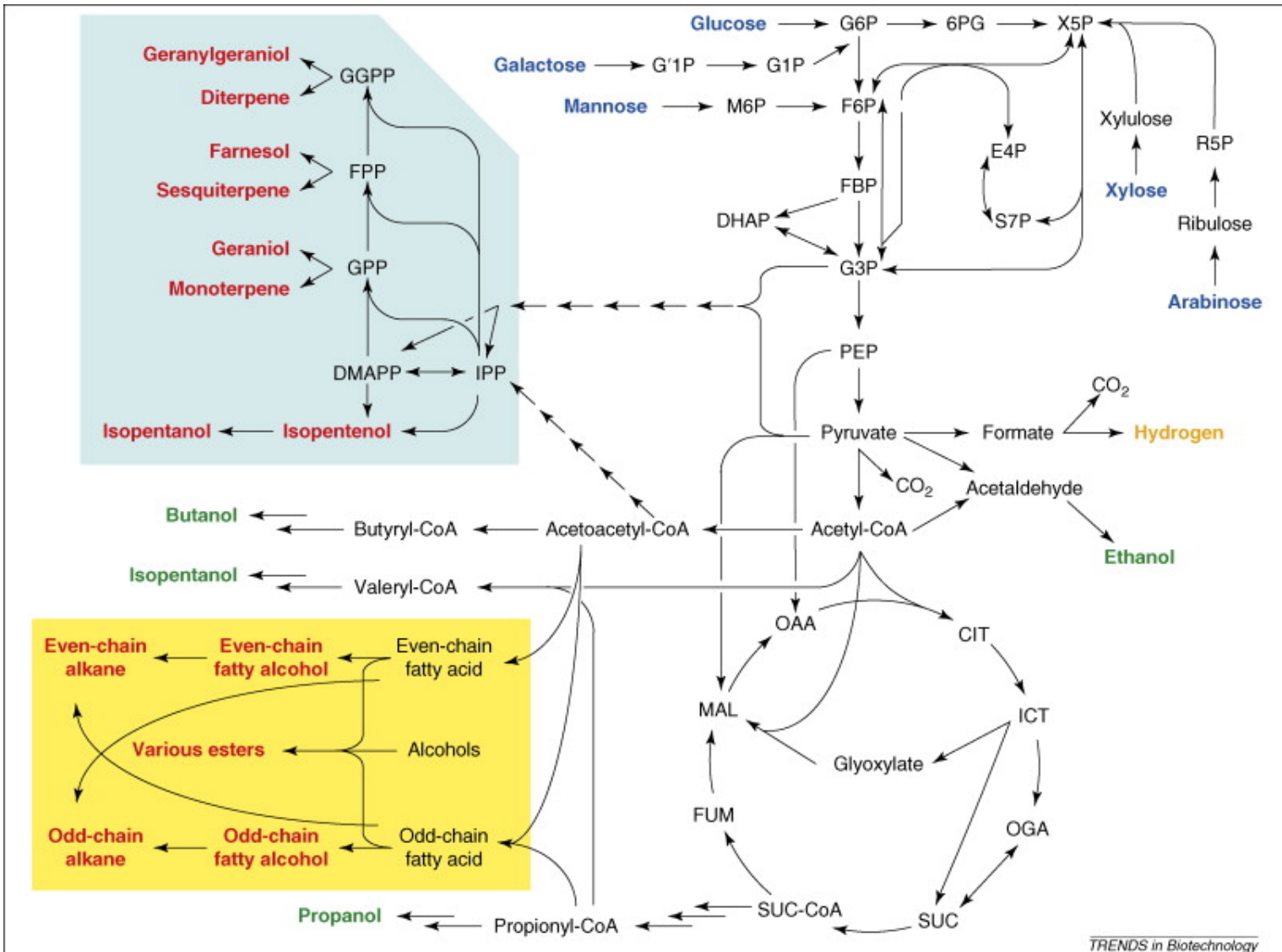


Untreated



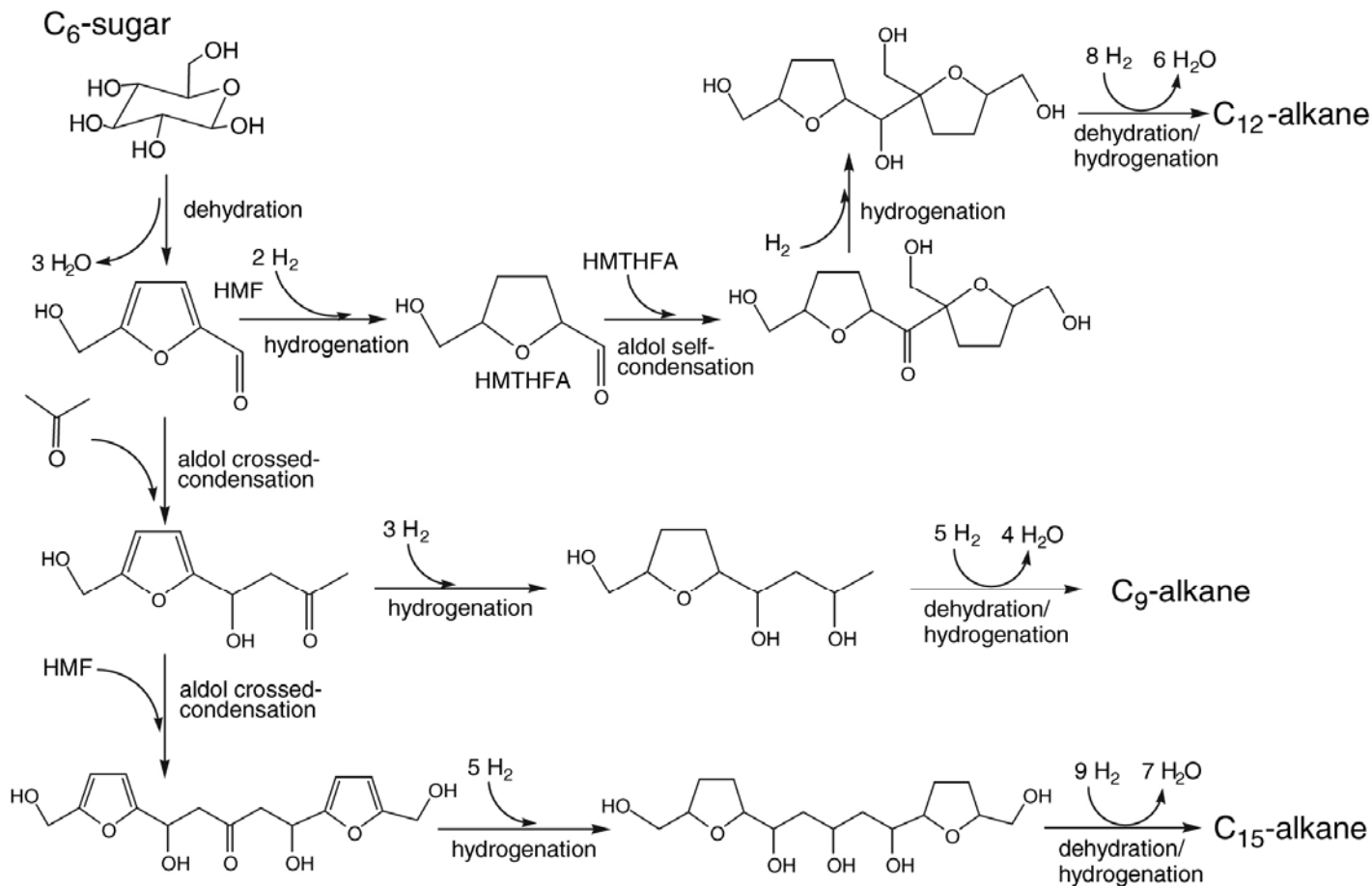
Treated

Routes to potential fuels



TRENDS in Biotechnology

Conversion of sugar to alkanes



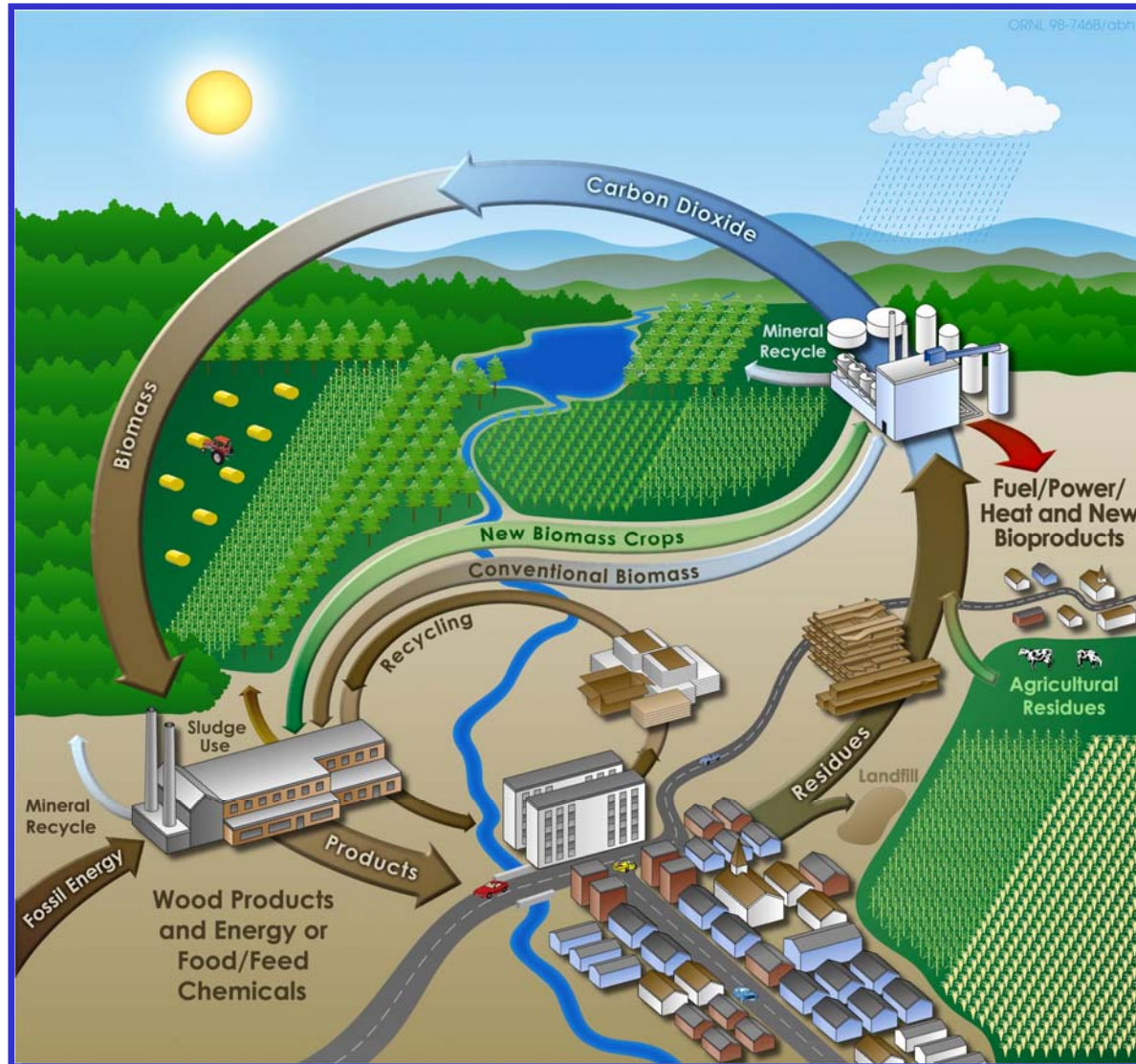
2/27/2009

Huber et al., (2005) Science 308,1446

Examples of business concepts

- LS9
 - Founded 2005 to develop microdiesel and petrol
 - Venture backed
- Mendel Biotechnology
 - Founded 1996 as genomics company
 - Income from R&D strategic relationships
 - First major product in commercial development 2008
 - Developed a biofuel division 2005
 - Co-developing non-transgenic products with strategic partners

The Future



2/27/2009

<http://genomicsgtl.energy.gov/biofuels/index.shtml>

HISTORY OF US FEDERAL GOVERNMENT R & D

