

Bio-based energy at Warwick

Simon Bright
University of Warwick



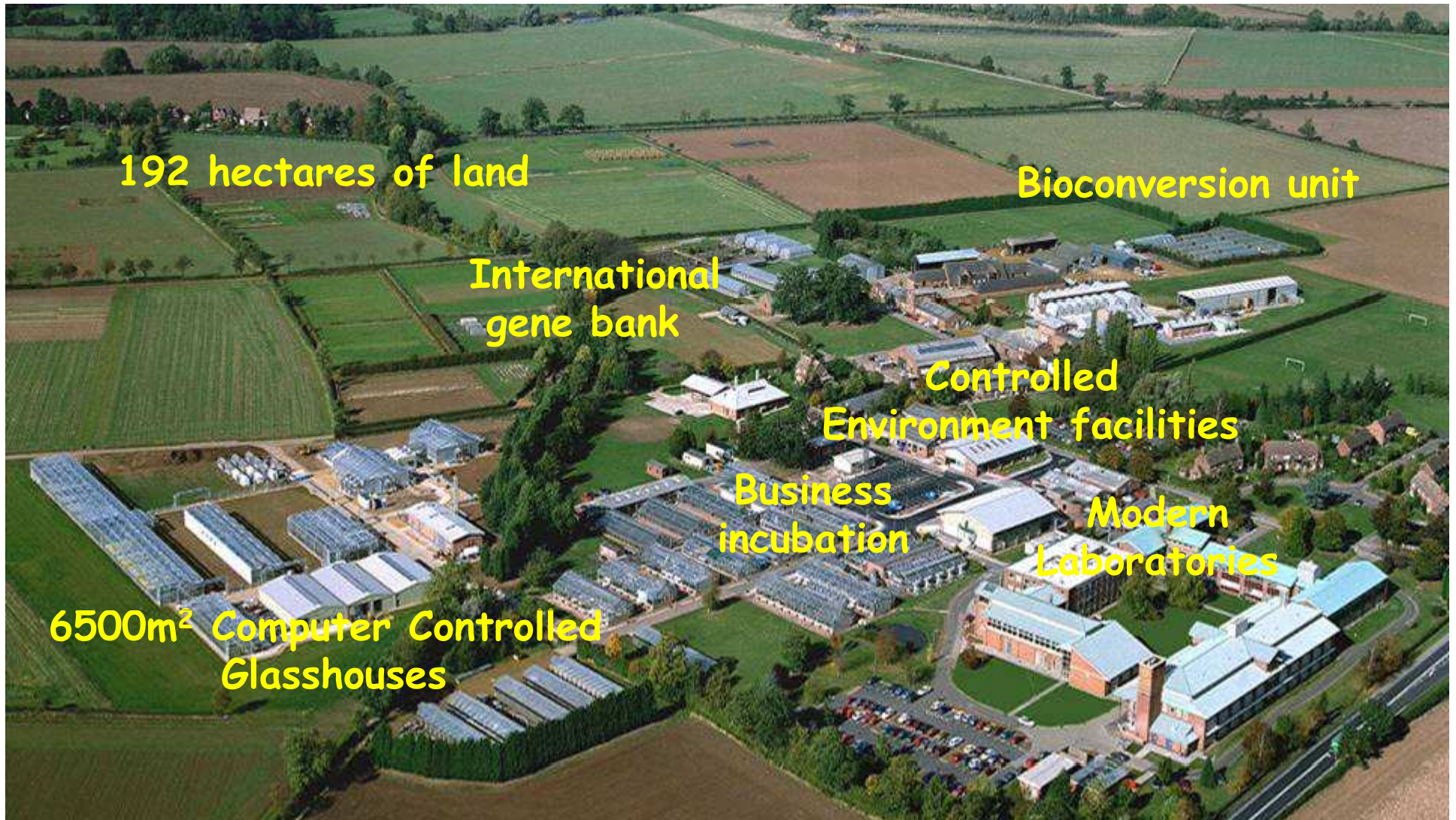
THE UNIVERSITY OF
WARWICK

Warwick HRI

- Plant, crop and environment research and teaching
- Two sites
- 240 staff and 40 students
- ~£12M/yr research



Wellesbourne Campus



192 hectares of land

Bioconversion unit

International
gene bank

Controlled
Environment facilities

Business
incubation

Modern
Laboratories

6500m² Computer Controlled
Glasshouses

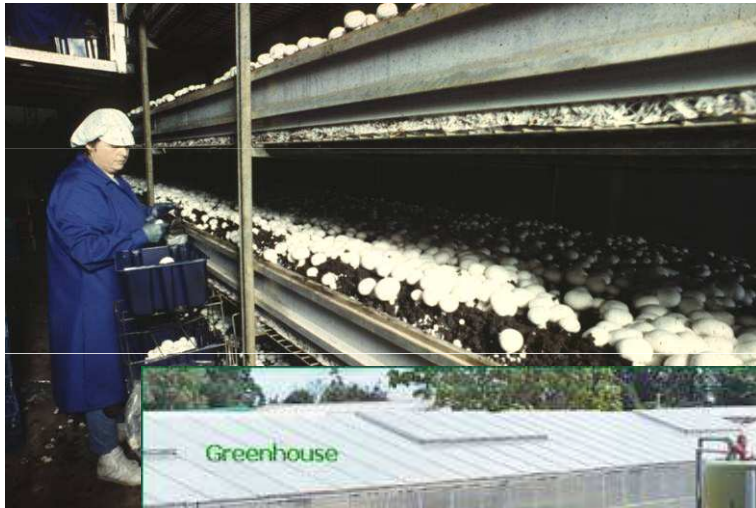
What do we do?

- World class plant, crop and environment research
 - ◆ Fundamental Plant Science
 - ◆ Crop Science
 - ◆ Applied microbial sciences
- Application areas
 - ◆ Sustainable crop production
 - ◆ Crop improvement and biotechnology
 - ◆ Bio-refinery:
 - Renewable plant-based materials and energy
 - Waste
 - ◆ Environmental footprint

University Linkages

- Warwick Life Sciences
 - ◆ Mathematics, Biological Sciences, Medicine, Chemistry, Statistics, Computer Science
 - ◆ Warwick Systems Biology
- WISER and Engineering
 - Automation, sustainable materials
 - Bio-based energy and fuels
 - Science Cities: Energy and Advanced Materials
- Social Sciences
 - Rural economy and politics

Bioconversion



Perennial v annual crops? energy v 'dual' purpose crops?



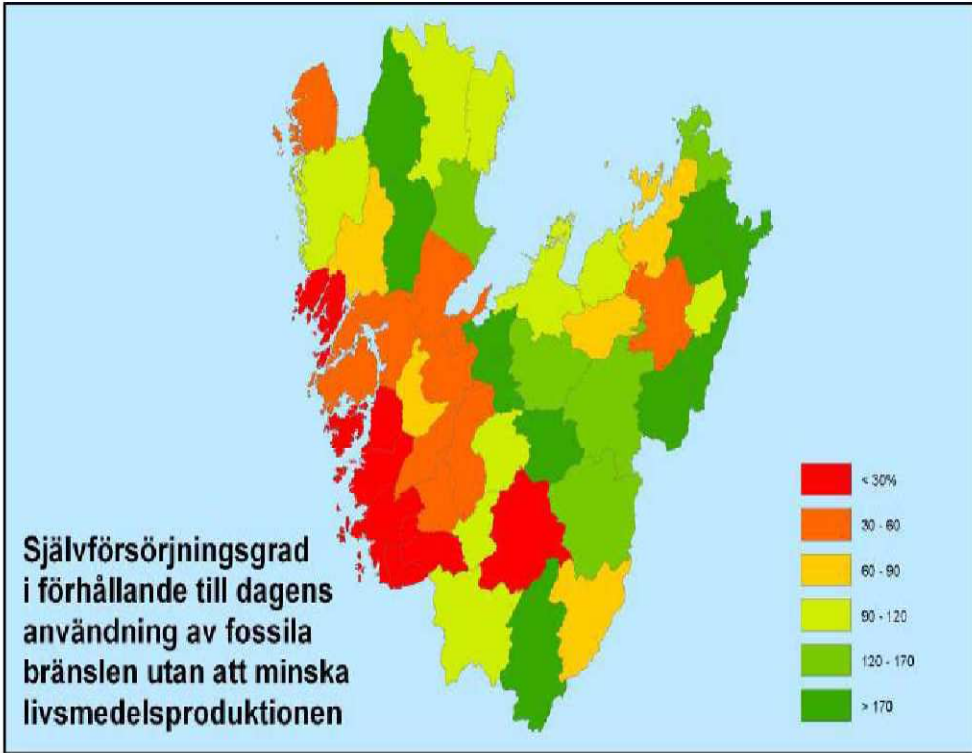
Food v Fuel?



High value compounds

- Utilise more 'captured' energy - efficient use of land
- Take advantage of plant breeding for disease resistance etc
- Fits current farming practices & rotations

Potential för förnybar energi från jord och skog



Västra Götaland

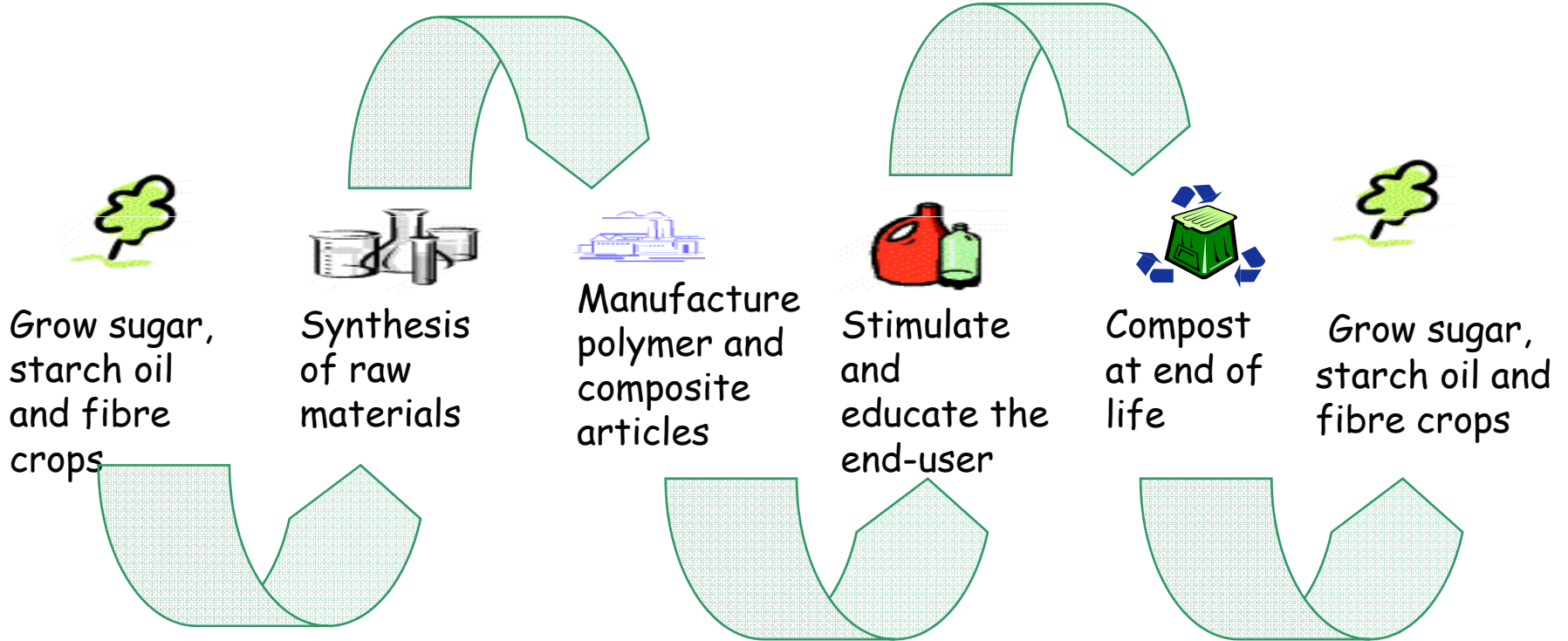
Källa: Agronväst-rapport "Potential från jordbruket i Västra Götaland" från juni 2008, samt uppgifter om akterskogens omvärdning och husdjursavfall till CO2 2004. Beräkningar gjorda av Kent-Olof Sködenback, Agronväst 2010-08-01

“Renewable Energy map” of districts in the Västra Götaland region of Sweden



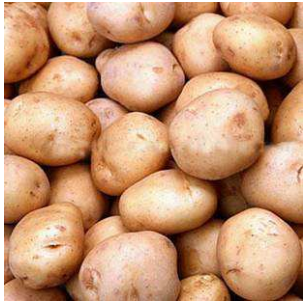
Swedish farmers are farming and selling energy not feedstocks and becoming energy SMEs

"Warwick Sustainable Materials Group"



Helping The Whole Supply Chain...

Eco one-the ecological racing car



Tyres with potato starch



Bioethanol from wheat



Brake pads from Cashew nut shells

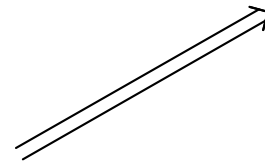
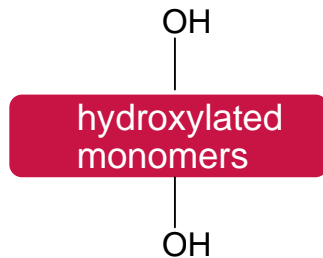


Biolubricants from rape



Body panels from rape and hemp

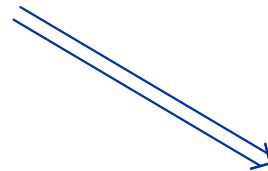
Potential applications of plant oils



POLYURETHANES

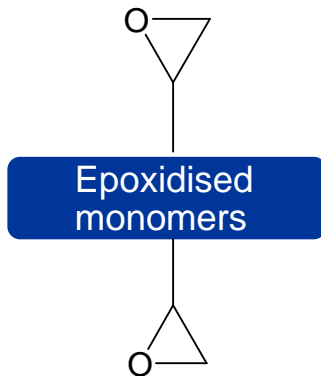
Flexible and rigid foams
elastomers and extrusions,
coatings, adhesives

10⁶ tonnes per annum



POLYESTERS

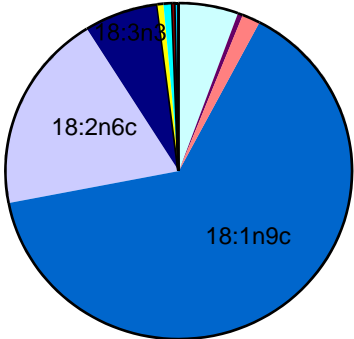
Flooring, autobody repair, boat hulls



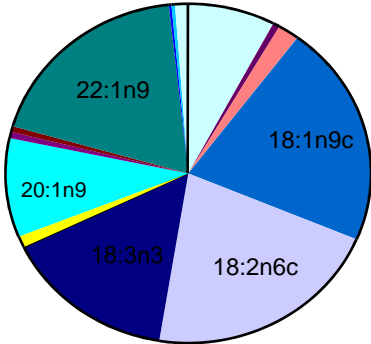
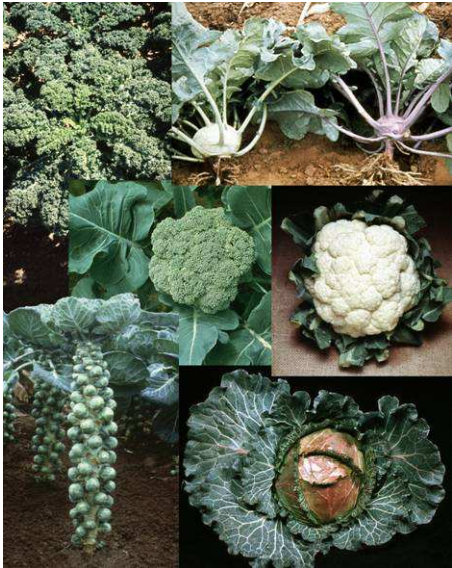
EPOXY RESINS

Protective coatings, adhesives
flooring, plasticizers, foams

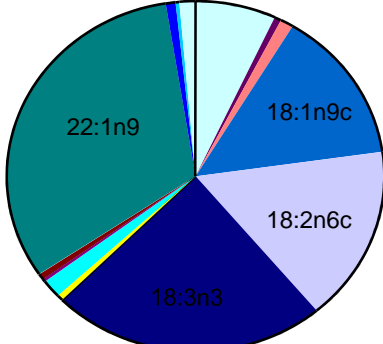
Exploit crop biodiversity



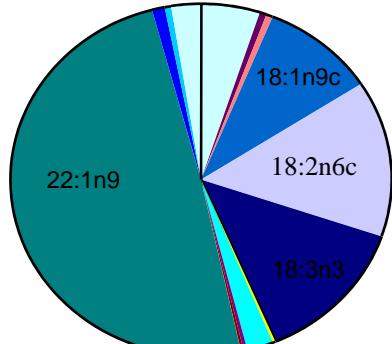
B. napus oleifera
(Modern oilseed rape variety)



B. oleracea gemmifera
(Brussels Sprout)



B. oleracea italica
(Broccoli)



B. oleracea italica
(Broccoli)

Bio-based energy: part of the bigger picture

- Sustainability of production, manufacture, consumption and recycling
 - ◆ Resource efficiency
 - Energy, Carbon, Nitrogen, Water
- Reinvention of agriculture as part of the bio-economy
 - ◆ Rather than a subsidy/ environmental problem
 - Food, Fuel, Feed, Chemicals, Materials
 - Environmental goods and services
- Public and business engagement