

# Bio-based Feedstocks for Fuels and Chemicals

**Professor Sagadevan G. Mundree**

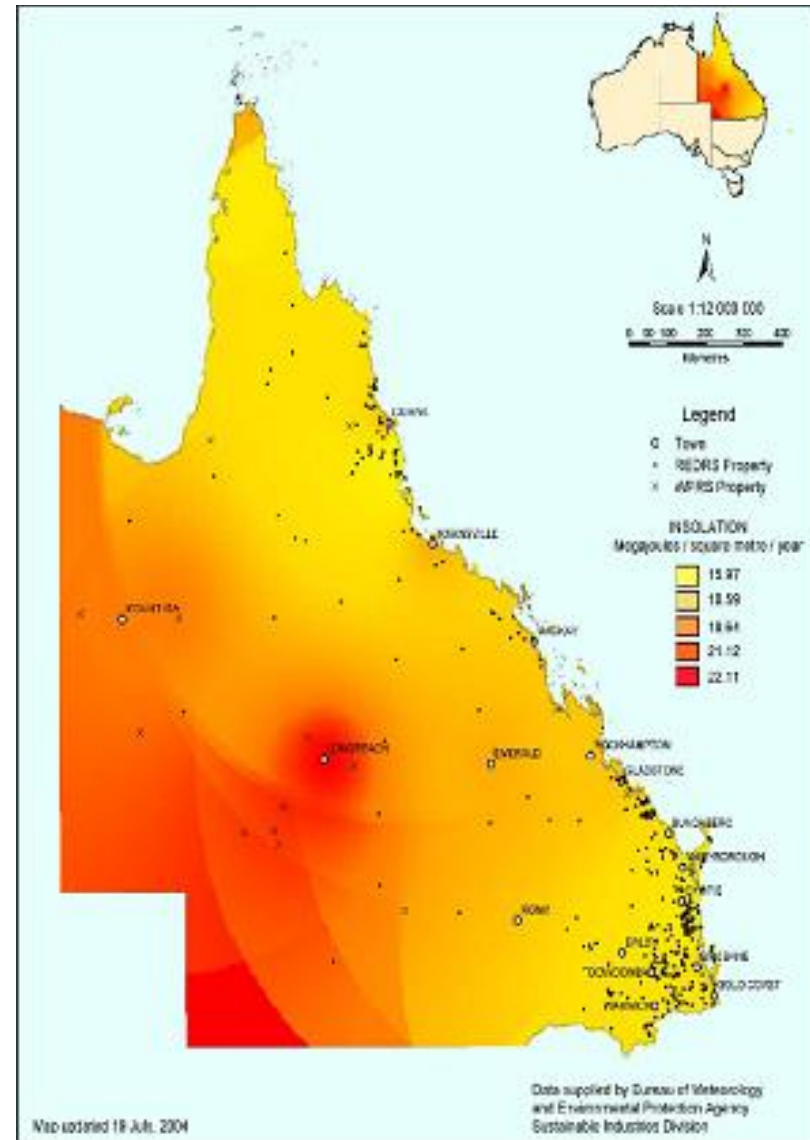
Director

Centre for Tropical Crops and Biocommodities



# Queensland, Australia

- **Population** of more than 4.8 million people, 20% of Australian population
- **Gross State Product (GSP)** \$300B
- Strong Government Leadership
- Competitive research infrastructure
- Clear and supportive regulatory and legislative frameworks
- Tropical climate favourable to agricultural production
- Access to Asian markets



# QUT at a glance

- ▶ One of Australia's major universities - 50,000 students
- ▶ 16% International students - 120 countries  
(North Asia 40%, South East Asia 14%, South Asia 28%, Europe 10%, The Americas 6%)
- ▶ Top Australian University - Under 50 Years Old (*Times Higher Education 2013*)
- ▶ Research - Consistently top 10 for Australian Government research funding based on research performance
- ▶ 88% of QUT research rated World Class or above (*Excellence in Research Australia Assessment*)





**Kelvin Grove  
campus**

**Brisbane central business district**

**Gardens Point  
campus**



# Science and Engineering Centre



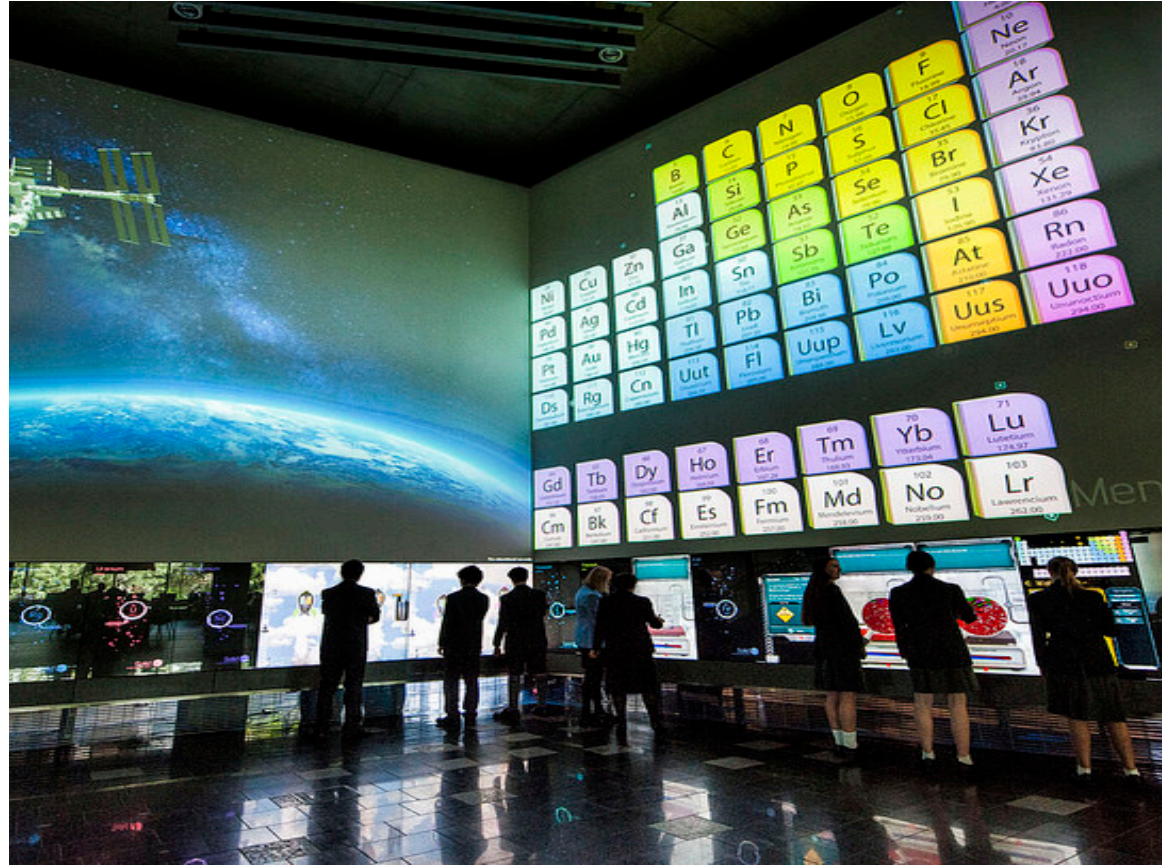
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# the cube

visualise | engage | discover





# Queensland agriculture....tropical/sub-tropical

- Major agricultural crops

- Sugarcane
- Cotton
- Bananas
- Wheat
- Sorghum (grain)
- Rice
- Tropical Pulses

Total agriculture \$11.1 billion

Total (incl. processing) \$13.8 billion

-\$8.9 billion in exports

-1 in 7 Queenslanders employed in food sector



**Institute for Future  
Environments**

**Centre for Tropical Crops  
and Biocommodities**

**Biotechnology**

**Bioprocessing**

**Tropical crop  
biotechnology**

**Bio-  
commodities**

**Bioenergy**

**Industrial bio-  
processing**

**Gene  
Discovery**

**Transformation  
and transgene  
expression**

**Laboratory  
process  
development**

**Commercial  
feasibility**



# Sustainable Tropical and Subtropical Production

## **Sugarcane:**

- Queensland's most valuable crop
- primarily export of sugar

## **Bananas:**

- Queensland's third most valuable crop
- almost exclusively for domestic consumption

## **Tobacco:**

- previously a valuable crop
- no contract leaf tobacco now grown
- potential as a biofactory crop

## **Tropical Legumes:**

- Chickpeas and Mungbeans
- Biotic and Abiotic Stress Tolerance
- Biofortification

## **Sweet Sorghum:**

- Bioindustrial applications

## **Cassava:**

- Bioindustrial applications

## **Rice:**

- Abiotic stress tolerance

## **Cotton**

- Drought tolerance

# The world we live in...

## Increasing scarcity (cost) of oil



## Climate change



## Consumer demand for “green” & value-added products



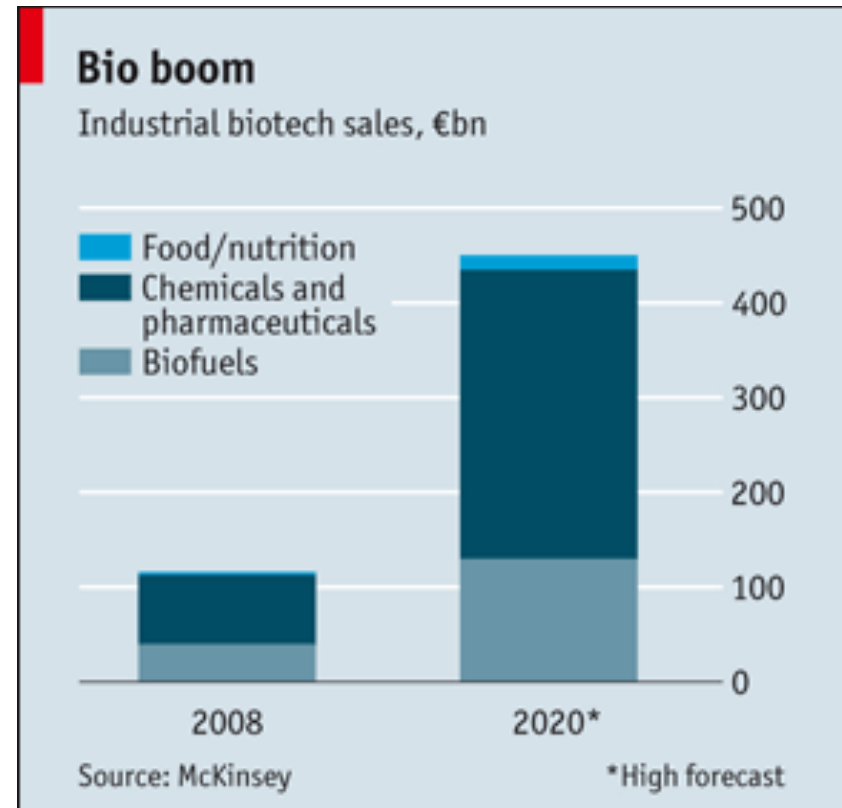
## Rapid advances in biotechnology & functional genomics





# Industrial biotechnology...

- McKinsey analysis
- Industrial biotechnology is a rapidly growing industry
  - US\$110 - US\$430 billion by 2020
  - Biorefineries create new markets US\$300 billion
- Dupont – industrial biotech sales:
  - US\$50 m (2007)
  - US\$1 billion (2017)
- Consumer preference
- Cost



[http://www.economist.com/node/16492601?story\\_id=16492601](http://www.economist.com/node/16492601?story_id=16492601)

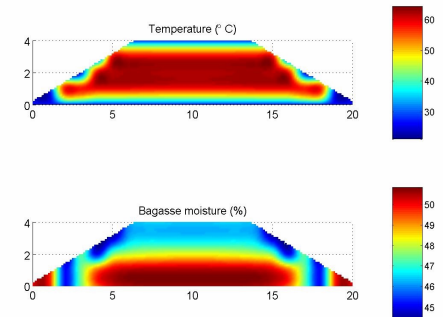
# Sugarcane...one of the best biorefinery crops

- Global sugarcane industry
  - Huge resource – 1.6 billion tonnes
  - Established industrial crop
- Australia
  - World's 3<sup>rd</sup> largest sugar exporter
  - Efficient and sustainable
- The world's best biorefinery crop
  - Crop residue already at factory
  - Low value component of crop



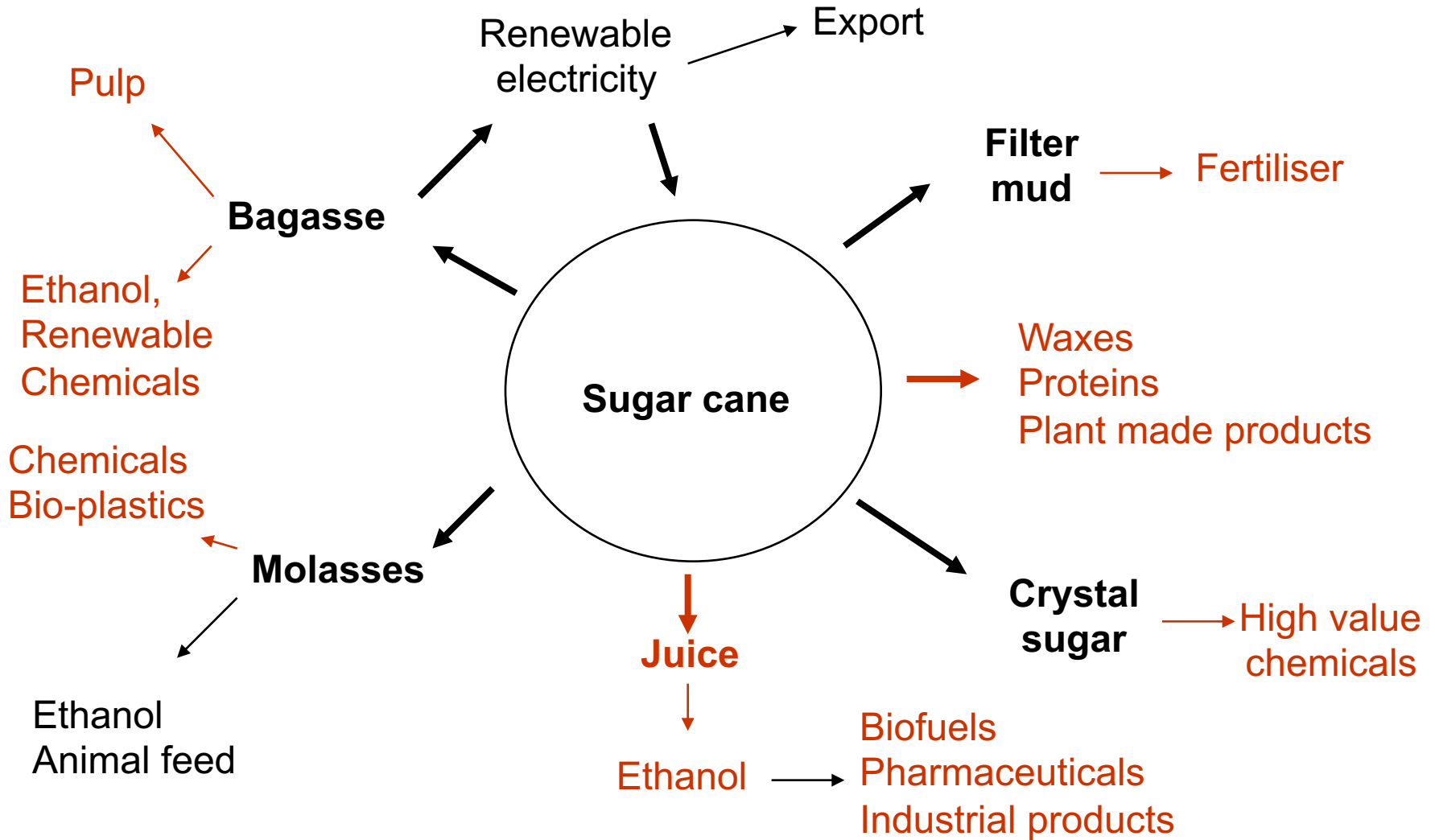
# Sugar Research and Innovation

- World leading expertise in sugarcane processing
- Research and consulting to Australian and global sugar industry
- Engineering and industrial chemistry focus
- Equipment design and commissioning
- Novel sugar technologies
- Biomass utilisation and diversification
- Post-graduate research training





# Bio-product opportunities from sugarcane...



# Mackay Renewable Biocommodities Pilot Plant



# Mackay Renewable Biocommodities Pilot Plant...

- Funding partners:
  - Australian Government
  - Queensland Government
  - Queensland University of Technology
- Located on the site of the Mackay Sugar – Racecourse Mill, Mackay, Queensland



An Australian Government Initiative  
National Collaborative Research  
Infrastructure Strategy



Queensland  
Government





# Bioprocessing



# Mackay Renewable Biocommodities Pilot Plant...

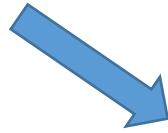
Publicly available research infrastructure to:

- *Bridge the gap between laboratory research and commercial investment*
- *Rapidly advance the commercialisation of new technologies*
- *Connect global innovators to investors and end-users*

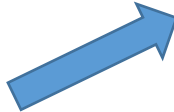


# Multi-partner collaborations driving investment

Research innovations



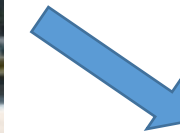
Global innovators



Commercial investment



Commercial investment



Commercial investment

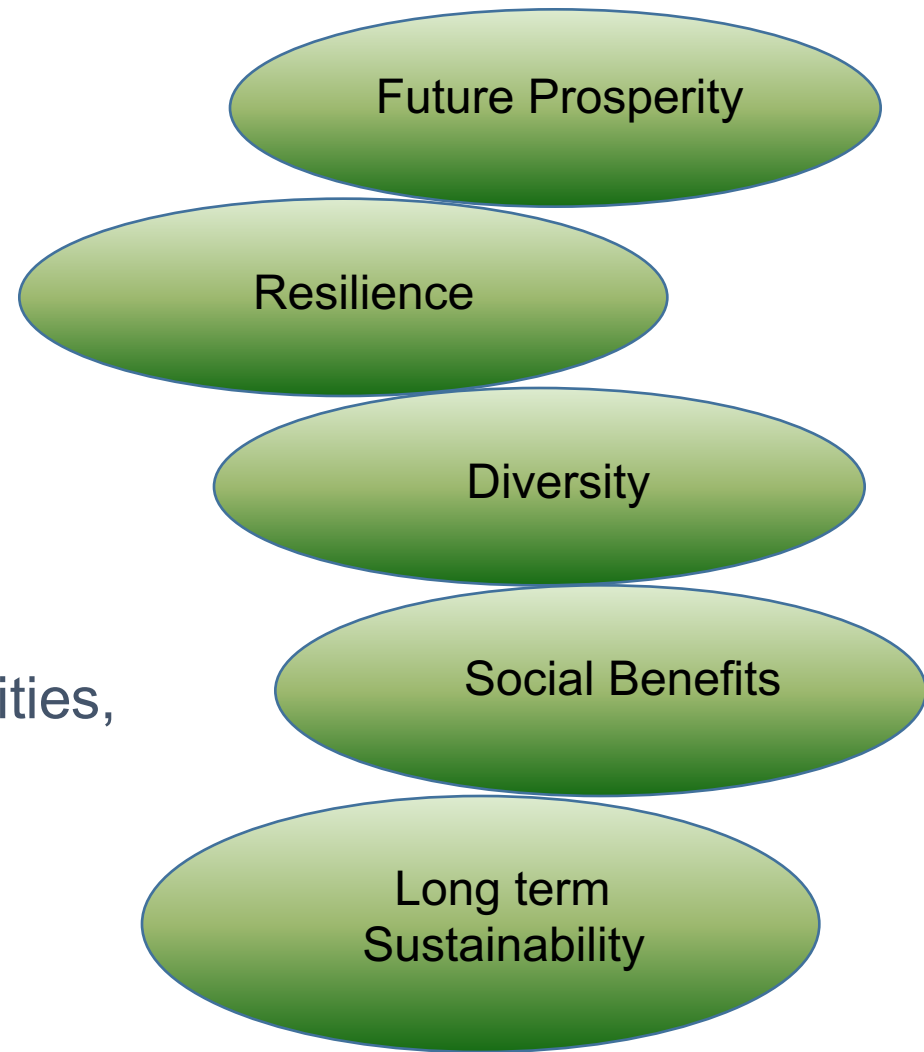
## Multi-partner projects:

- Feedstock suppliers
- Investors
- End-users



# Building resilience...

- Economic growth
- Low carbon industries
- Innovative technologies
- Opportunities for communities, locally & globally
- Profitable agriculture





Further information:

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