

“Down the track....”

James Dale

**Centre for Tropical
Crops and
Biocommodities,
Queensland University
of Technology**



Tropical Crops and Biocommodities



Keynote address at 28th Conference of the ASSCT, Mackay, May 2006

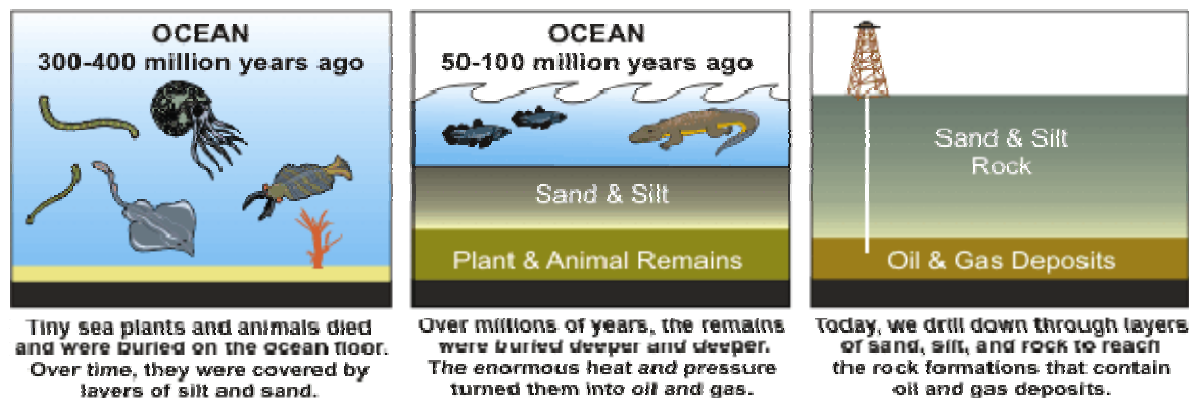
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- where can the Australian sugarcane industry be by 2020?
 - what should we be doing **now** to ensure we get there?

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- what are going to be the big global influences between now and 2020?
 - how will these impact on the Australian sugarcane industry?
 - how can we take advantage of these influences for the Australian sugarcane industry?

World Oil Price and Supply

- We are using oil at an infinitely more rapid rate than it is being made at!

PETROLEUM & NATURAL GAS FORMATION

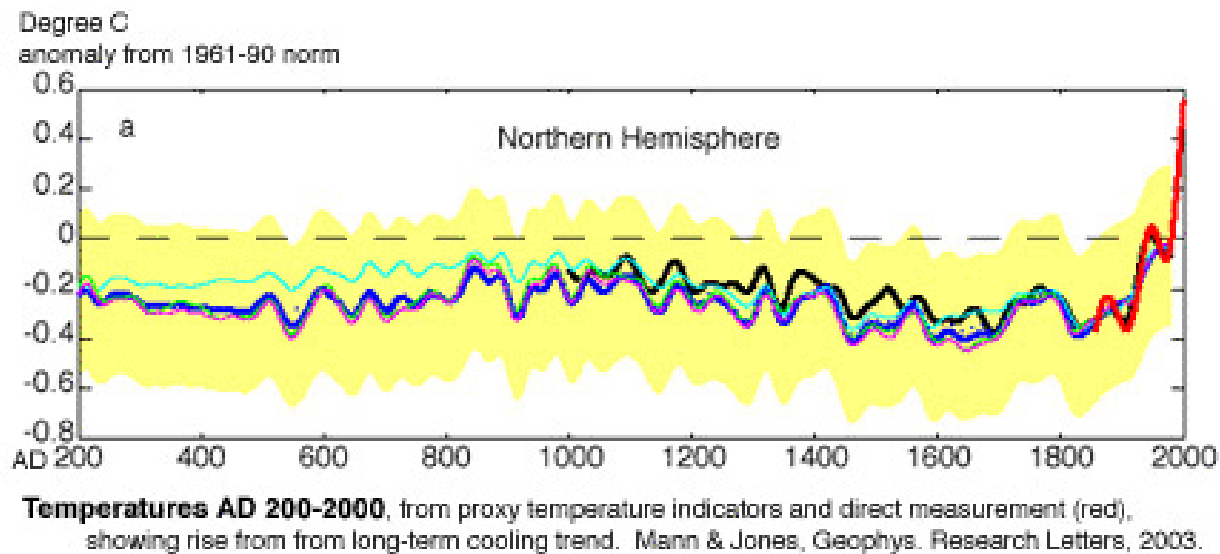


World Oil Price and Supply

- We are using oil at an infinitely more rapid rate than it is being made at!
- The current oil price surge is being driven by increasing demand and concerns over the geographical location of majority oil supplies
- By 2020, there will be significantly less oil and very probably greater demand
- new discoveries slowing, harder to extract
- Crude oil → petrol, diesel, tar, chemicals and fertilizers, plastics.....→ increased prices with reduced supply

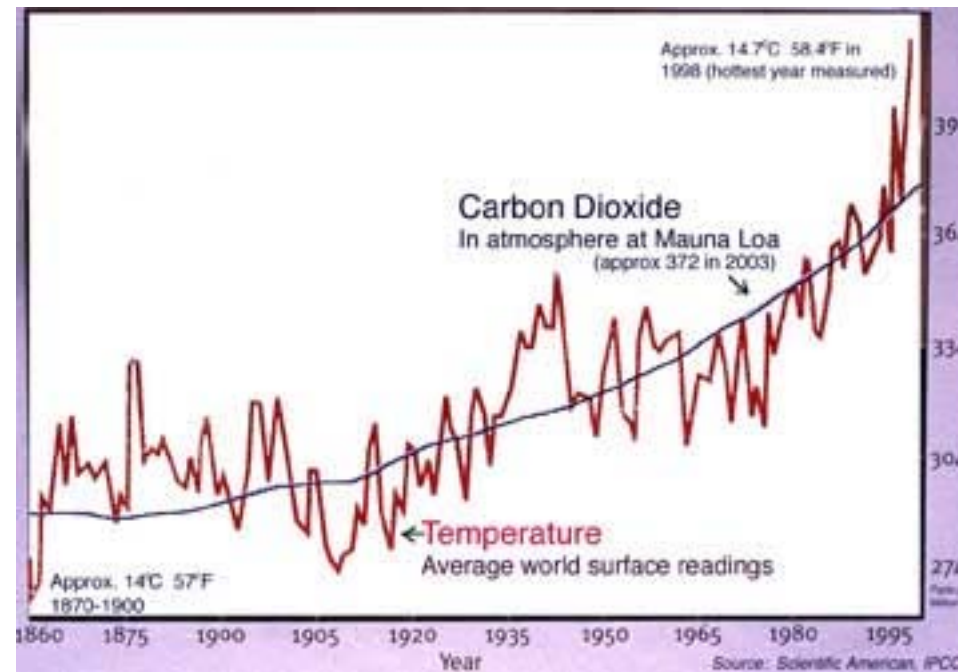
Climate Change (Global Warming)

- atmospheric temperatures are rising



Climate Change (Global Warming)

- atmospheric temperatures are rising
- CO₂ levels are increasing



Tropical Crops and Biocommodities

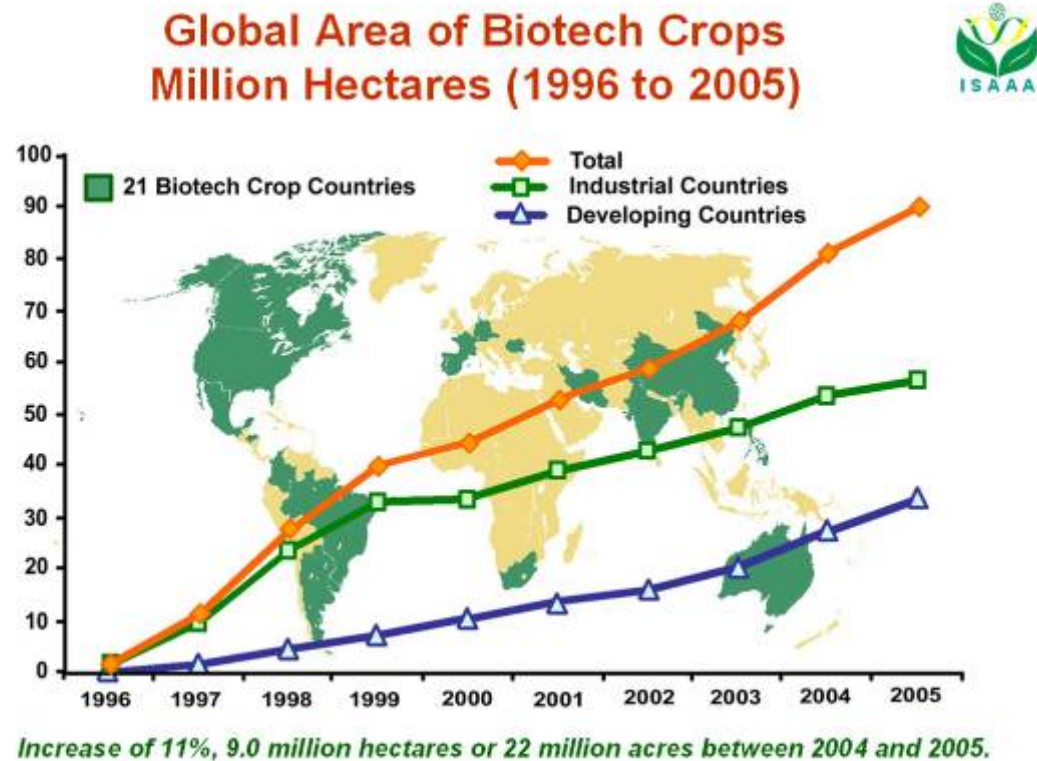


Climate Change (Global Warming)

- atmospheric temperatures are rising
- CO₂ levels are increasing
- consequences by 2020
 - greatest impact in the tropics and sub-tropics
 - greater extremes of climate (drought, floods, temperature)
 - increased biomass

Biotechnology and Genetic Modification

- current limited acceptance but increasing



Source: Clive James, 2005

Tropical Crops and Biocommodities



Biotechnology and Genetic Modification

- current limited acceptance but increasing
- another major new technology for crop development

Biotechnology and Genetic Modification

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- 9000 BC: domestication and selection
- 1650s AD: hybridisation
- 1850s AD: agricultural chemicals
- 1980s AD: genetic modification
- 2030s AD: ?????

Biotechnology and Genetic Modification

- current limited acceptance but increasing
- another major new technology for crop development
- By 2020, GM will be a standard technology for crop development:

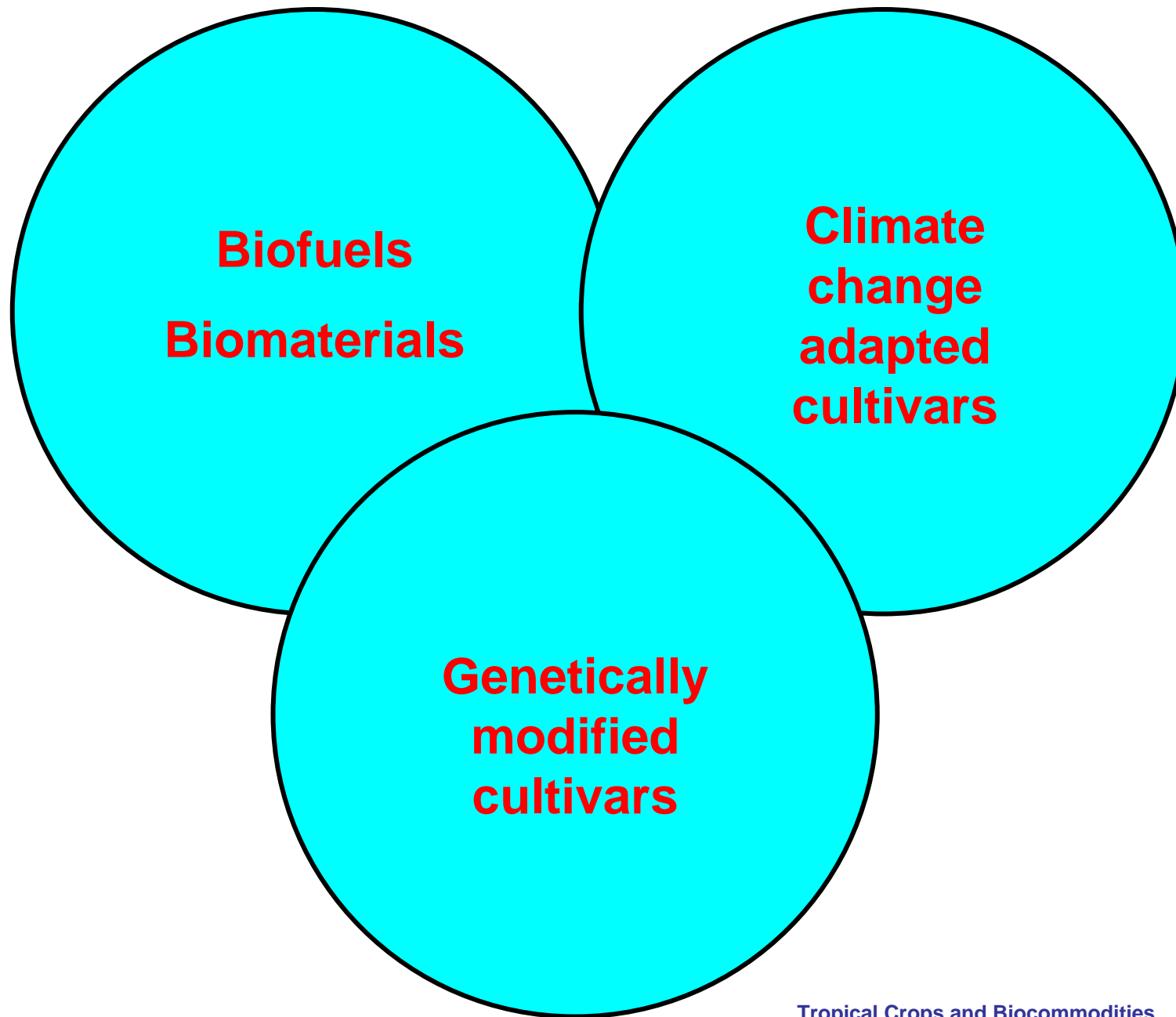
- **new traits**
- **new products**



World Oil
Supply &
Price

Climate
Change

Genetic
Modification



Biofuels and Biomaterials

Replacements for oil-based products

Bioethanol

- currently from sucrose and grain but not sustainable from grain.

“One of the goals of this initiative is to accelerate research and make cellulosic ethanol cost-competitive by 2012, offering the potential to displace up to 30 percent of our nation’s current fuel use by 2030. ” *USA DoE Biofuels Initiative*

Biofuels and Biomaterials

Replacements for oil-based products

Bioethanol

- currently from sucrose and grain but not sustainable from grain.
- cellulosic bioethanol: the conversion of cellulose and hemicellulose into fermentable sugars
 - corn stover, wheat straw, sugarcane bagasse and trash
 - fast growing trees (poplars, salix, eucalypts)

Biofuels and Biomaterials

Replacements for oil-based products

Biomaterials (from non-GM sources)

- biomass fractionation primarily into lignin and cellulosic material
 - cellulose converted into fermentable sugars for bioethanol production
 - derivatisation of lignin into replacements for many currently petro-chemical based products

Biofuels and Biomaterials

Replacements for oil-based products

Biomaterials (from GM crops)

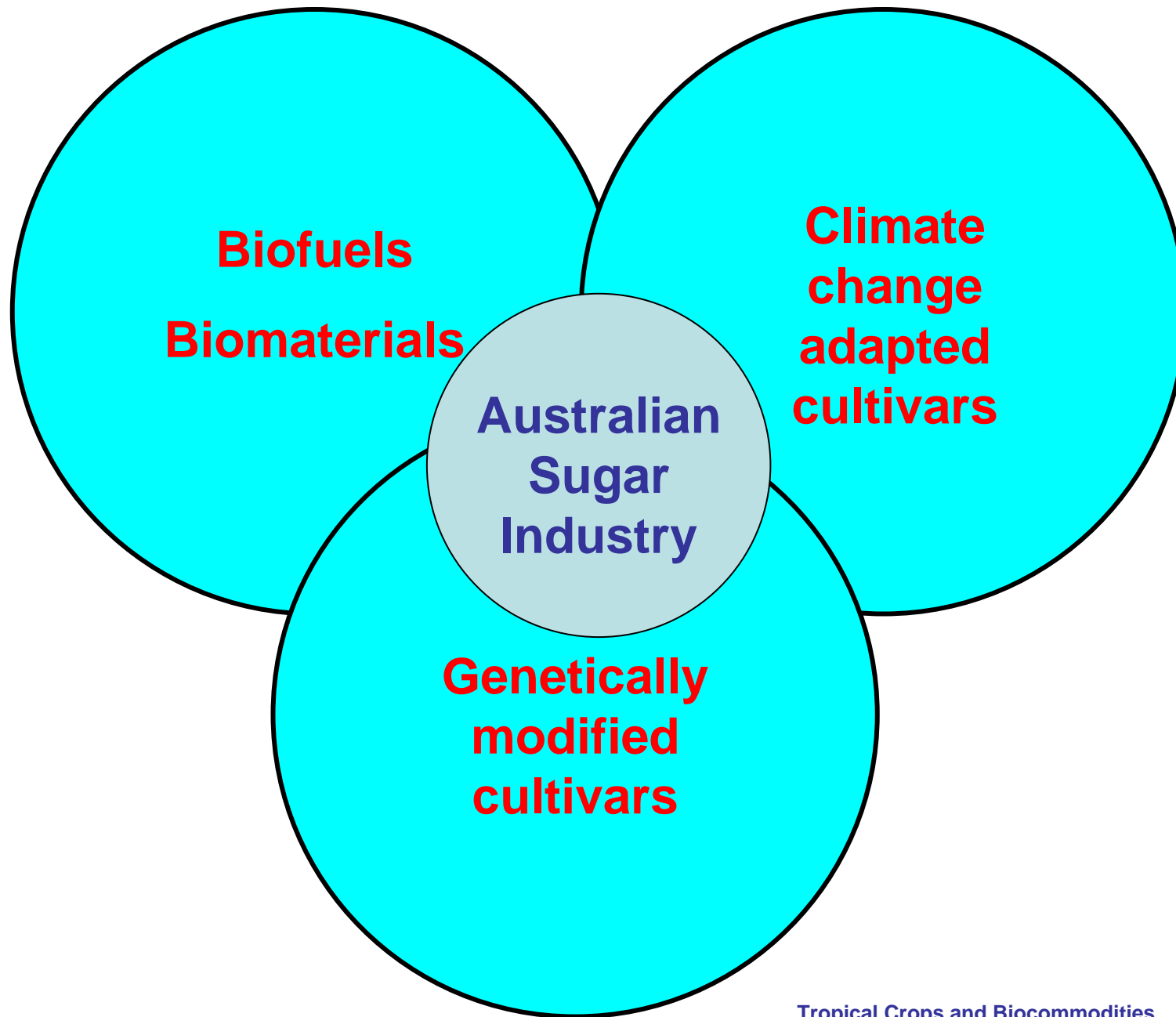
- proteins (high value/low volume)
 - therapeutics, vaccines, medical proteins
- proteins (moderate value/high volume)
 - food additives, industrial proteins (cellulases, proteases)
- bioplastics

Climate change adapted cultivars

- genomics era: identifying genes and traits from model and crop species
- abiotic stress genes are becoming available:
 - drought tolerance
 - water use efficiency
 - nutrient use efficiency
 - cold tolerance, heat tolerance, salt tolerance
- not necessarily sugarcane genes: model plants, other crops, extremophiles, wild relatives

Biotechnology and Genetic Modification

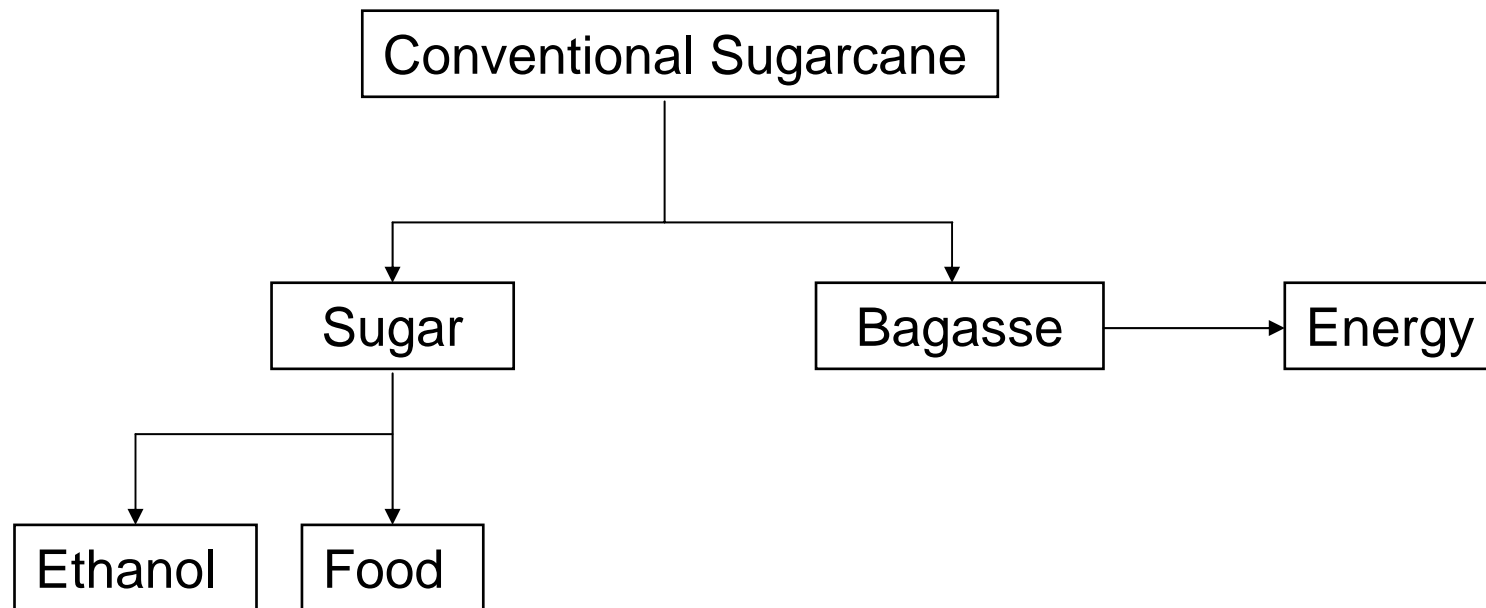
- insert sugarcane genes by conventional breeding;
insert non-sugarcane genes by genetic modification
- an additional technology for cultivar development rather than a replacement
- at least 7 years from transformation to commercial release



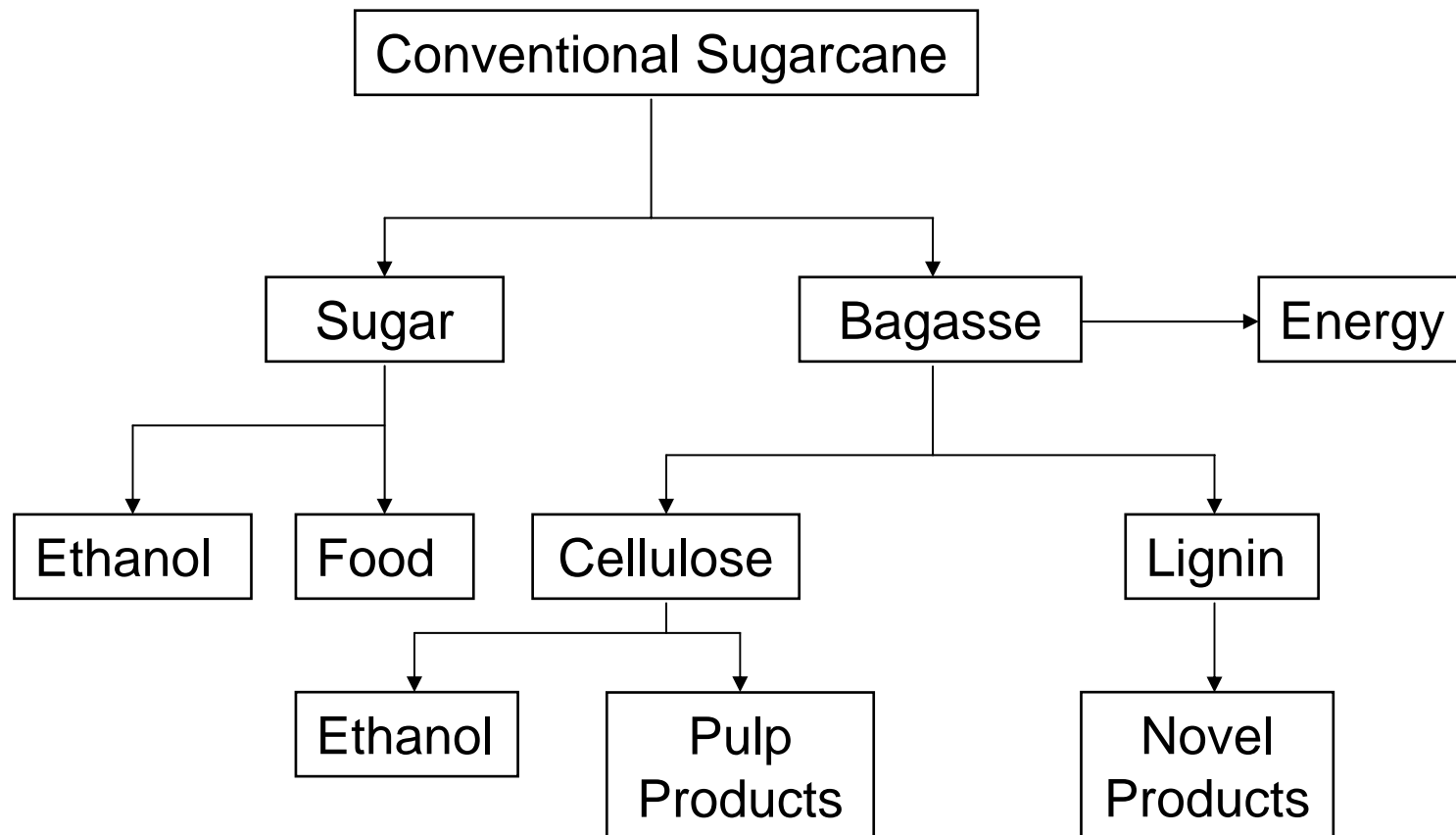
Tropical Crops and Biocommodities



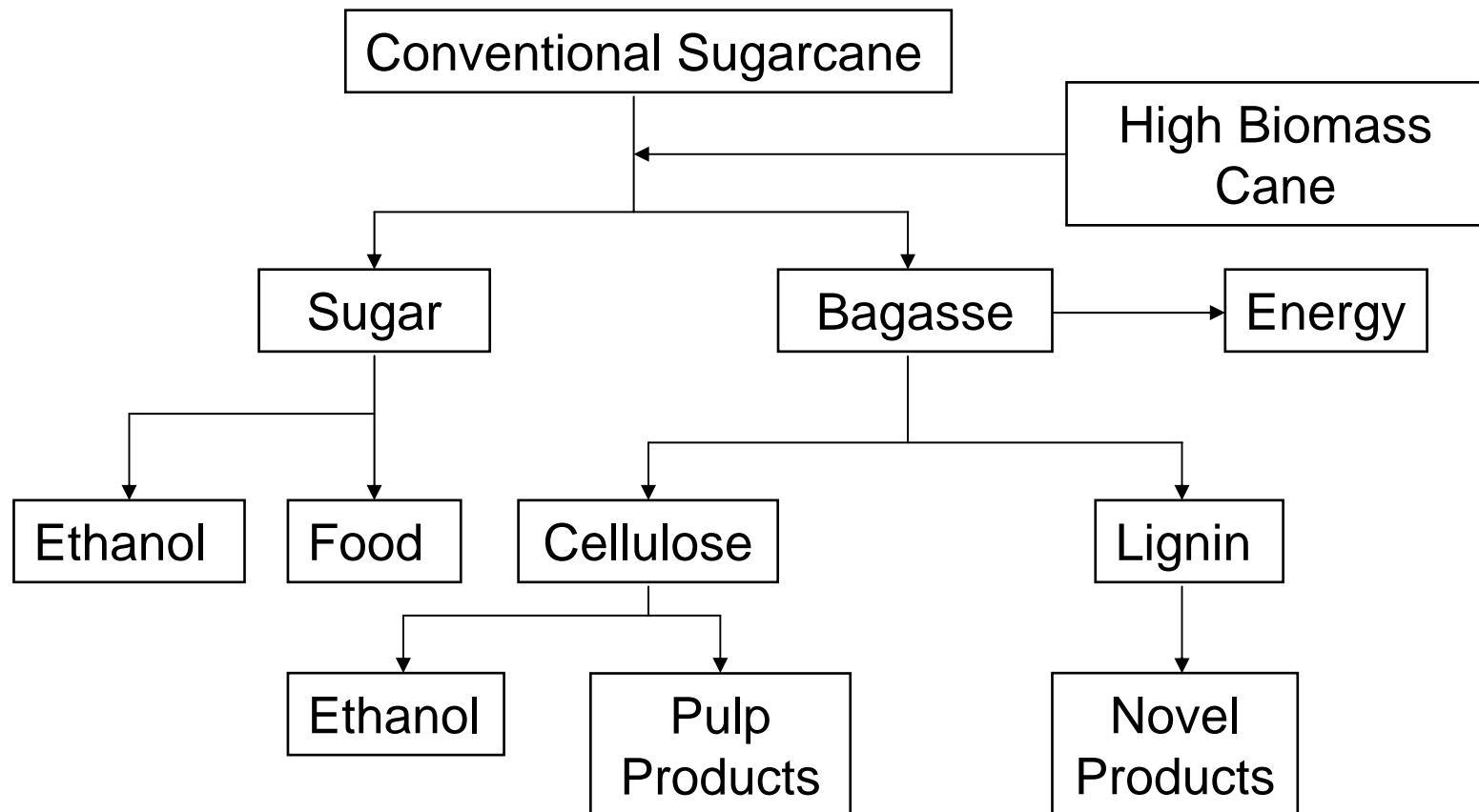
Sugarcane: 2006



Sugarcane: 2010

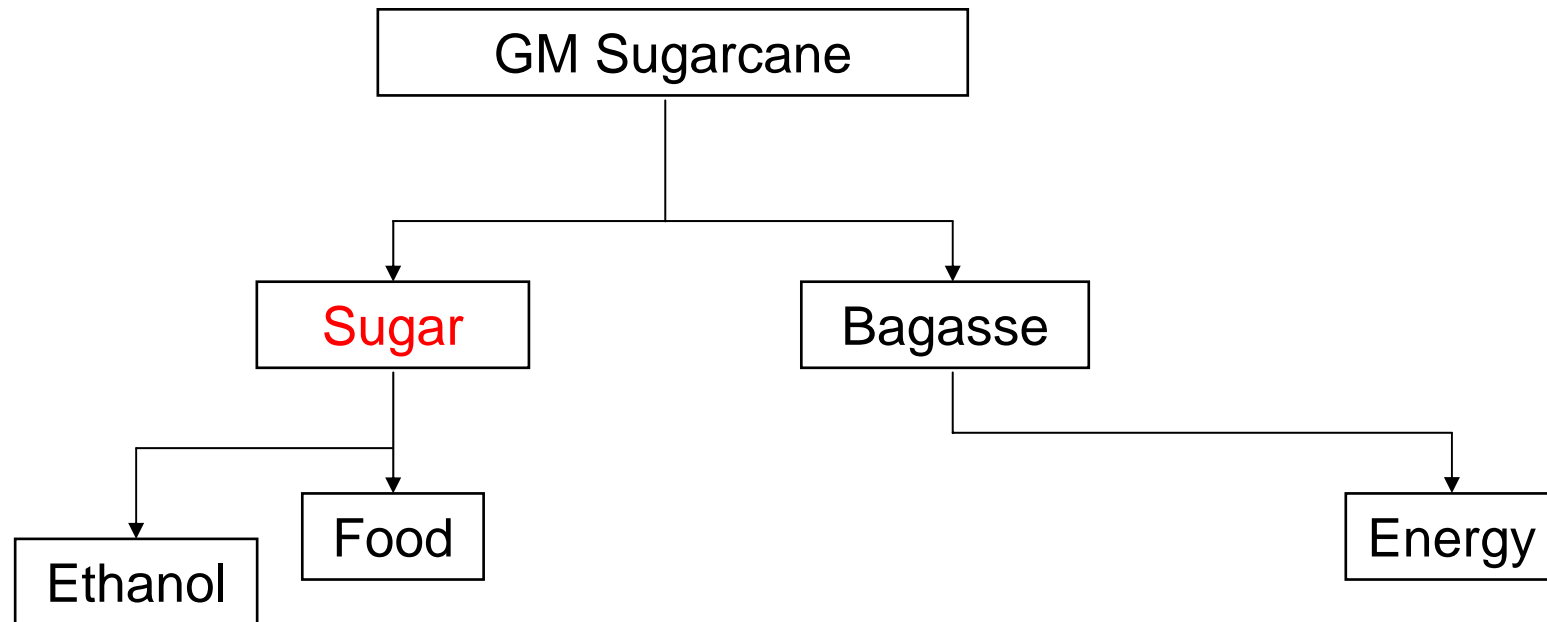


Sugarcane: 2015



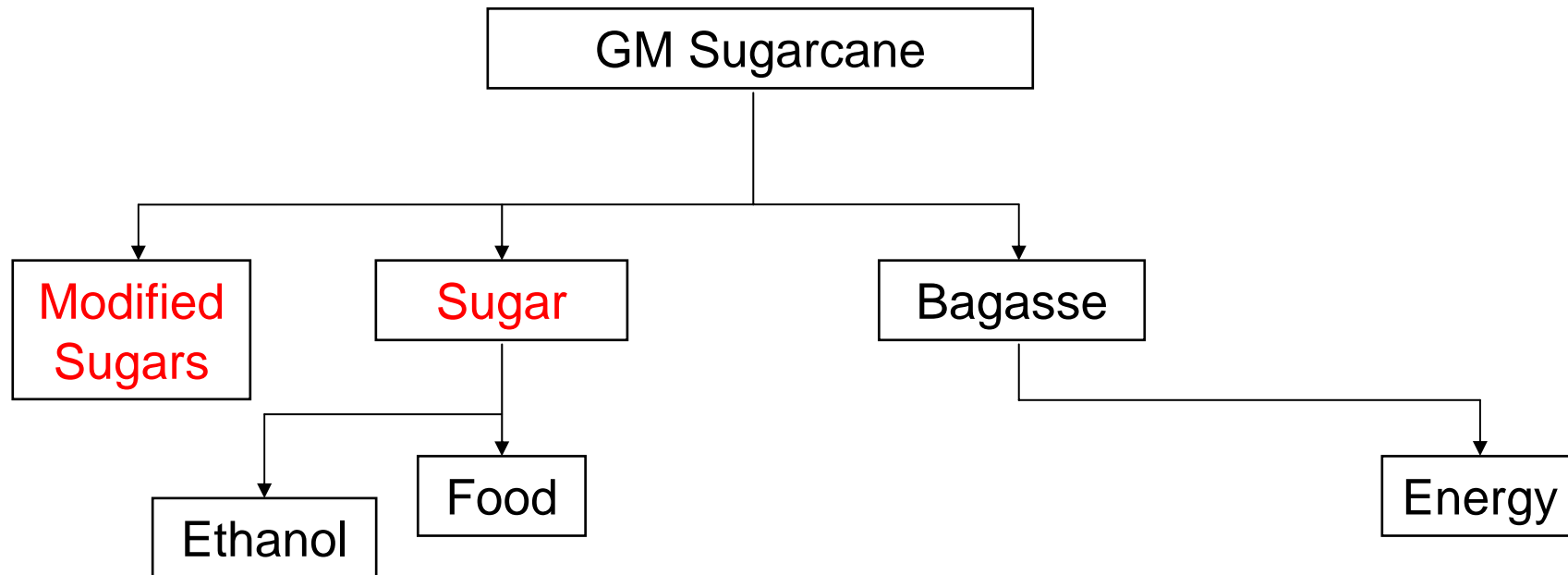
GM Sugarcane: 2010

Modified
Trait



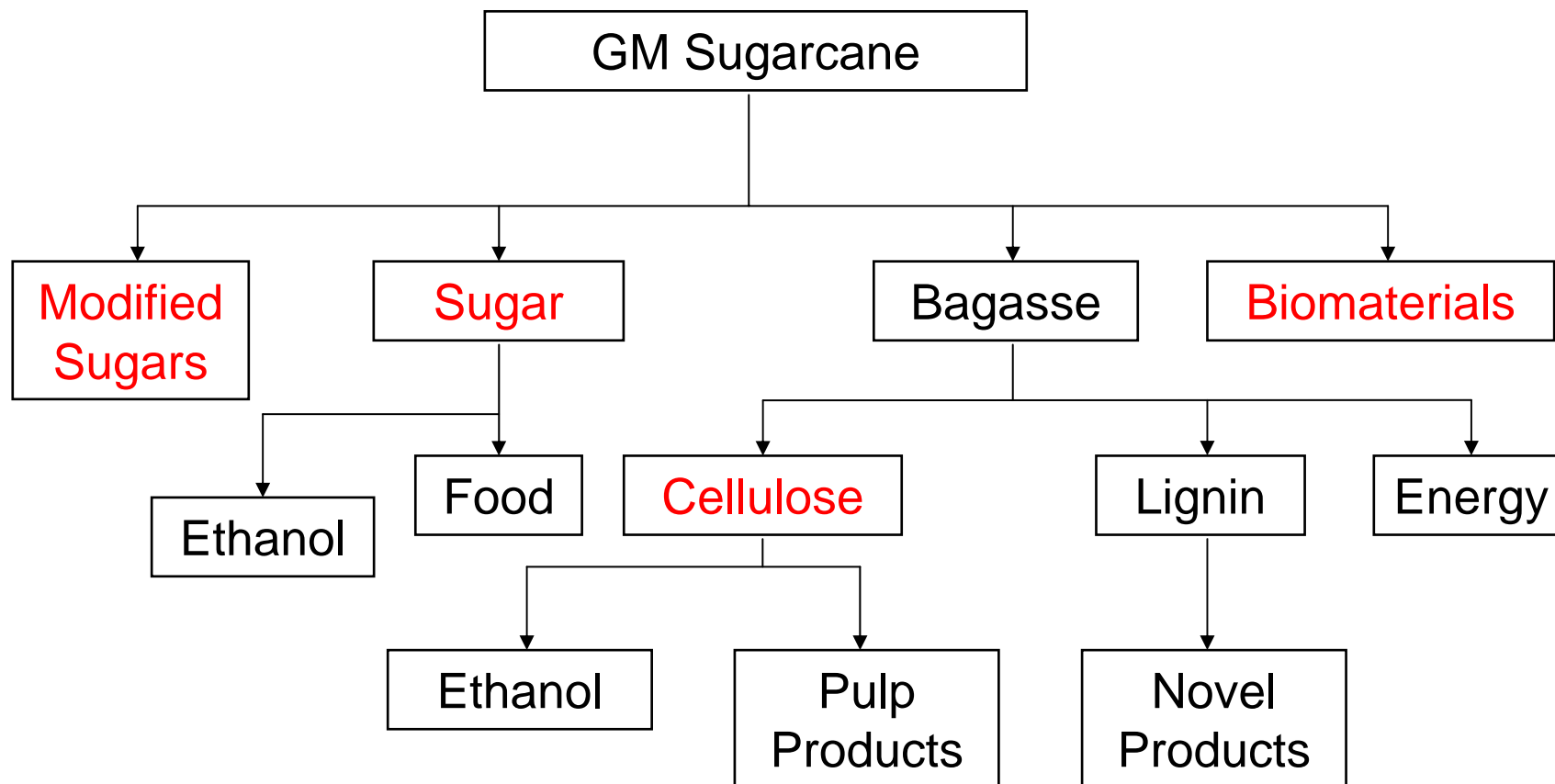
GM Sugarcane: 2012

Modified
Trait



GM Sugarcane: 2014

Modified
Trait

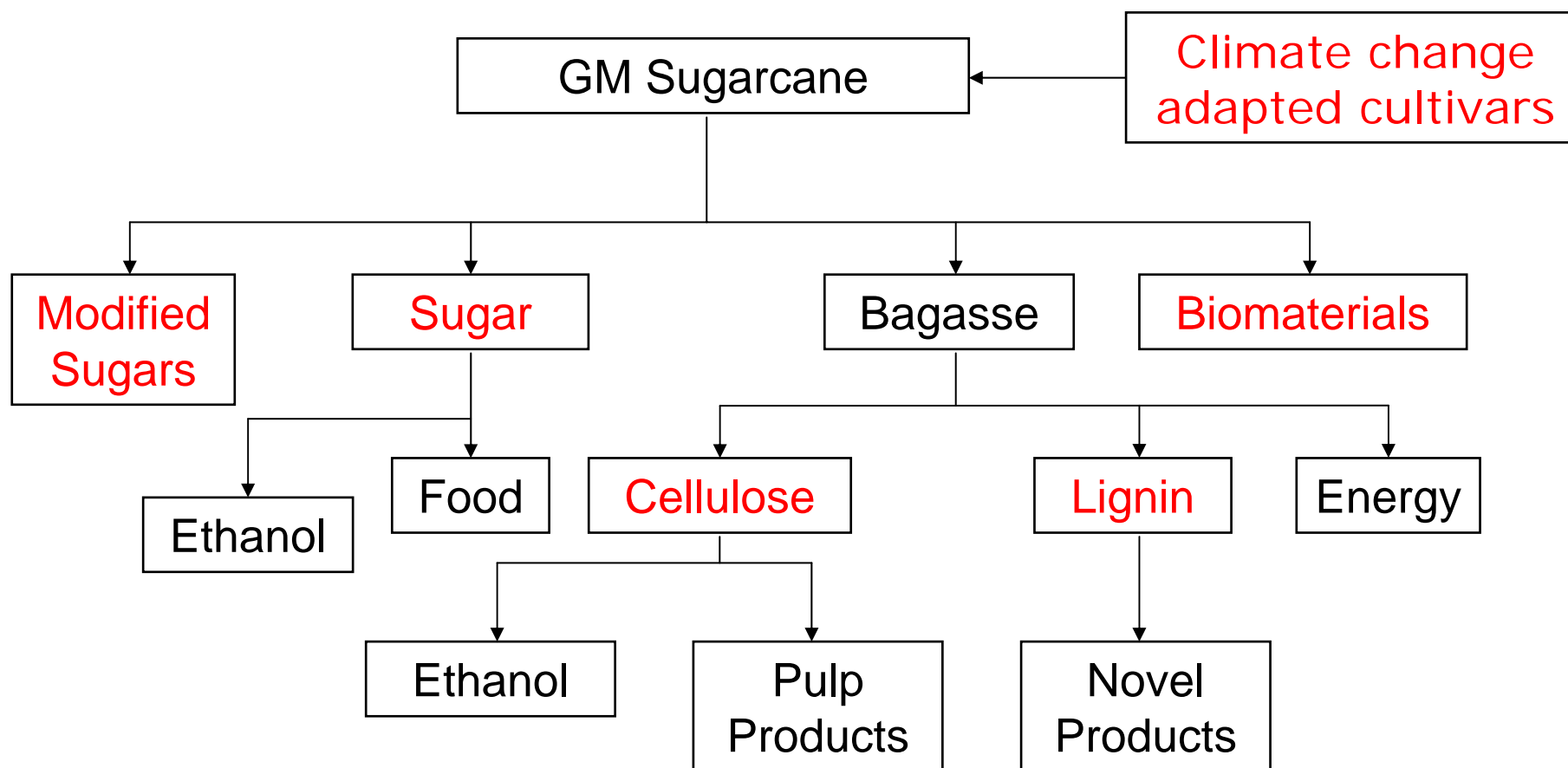


Tropical Crops and Biocommodities



GM Sugarcane: 2016

Modified
Trait



Tropical Crops and Biocommodities



Where can the Australian sugarcane industry be by 2020?

- a robust industry producing a wide range of bio-based products
 - sugar
 - molasses and cellulose derived ethanol
 - derivatised lignin products
 - new biomaterials
- a robust industry based on sustainable production

What should we be doing now to ensure we get there?

- the industry has available world class R&D capacity and facilities (QUT/SRI, UQ, BSES, CSIRO, CRC SIIB...)
- significant funding and R&D management is available through a wide range of sources including SRDC, SRL, industry, Federal and State schemes.
- pulling these resources together will deliver an Australian sugarcane industry that is highly internationally competitive: **investment in and development and implementation of new technologies**