

**AUSTRALIA-USA BILATERAL
COOPERATION
ON SUSTAINABLE AVIATION FUELS**

**34th APEC Transportation Working Group
Aviation Experts Subgroup
13TH June 2011**

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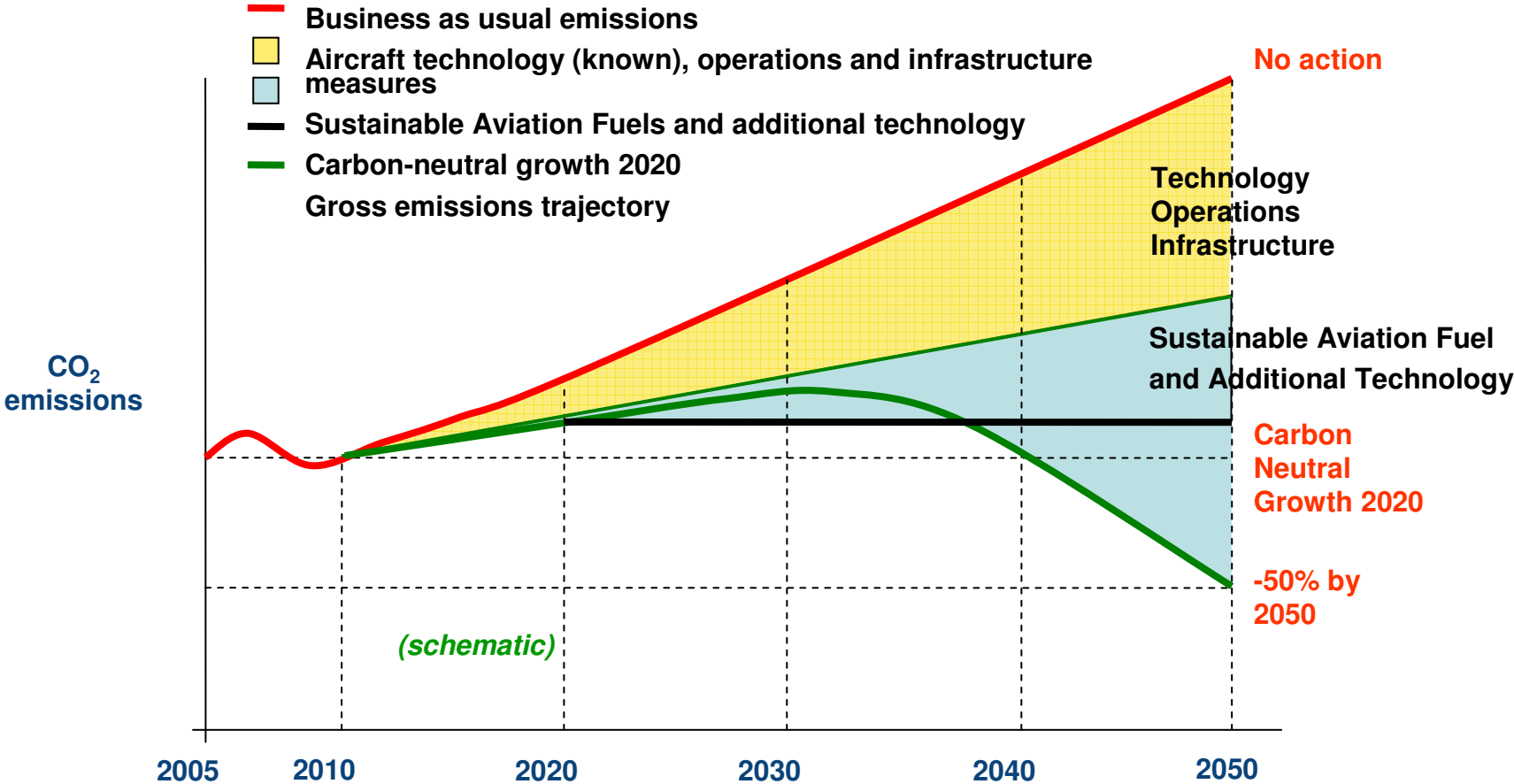
United States Studies Centre

- National organisation based at the University of Sydney
- Centre of excellence: study of the relationship
- Politics & policy, economics & business, culture & society
- Dow Sustainability Program addresses
 - challenges related to energy, water, food and soil security
 - commercial risks & policy settings for new technologies & markets
 - sustainable transport fuels in sectors with critical needs

Australian Aviation

- Essential to productivity, economic growth, regional & international engagement and way of life
- Demand growth will continue into future
- Percentage consumption of jet fuel ~ twice that of USA
- Percentage imported rising as refineries age
- Need to secure affordable future supply of jet fuel
- Australia already has highest per capita emissions of CO₂
- Need to dissociate economic growth from GHGe
- Carbon tax in EU challenge for international carriers
- Longer term, need to reduce GHGe by the aviation sector

IATA Emissions Reduction Roadmap

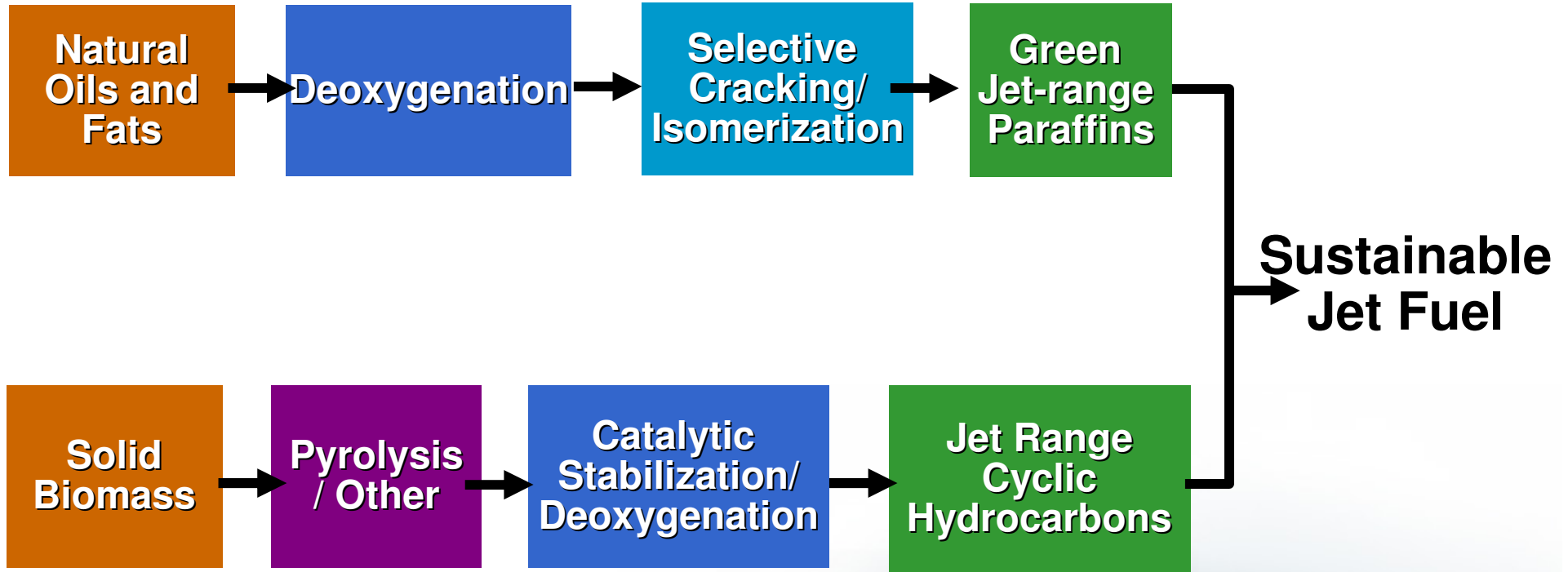


Source: IATA, 2010

Sustainable Aviation Fuels

- Aviation is global industry
- Transport mode committed to liquids and to “drop in” fuels
- Fuel qualification & certification via well understood pathway
- Operates under one environment framework via ICAO
- Airport “nodes” define distribution
- Logical, data driven customers
- Disciplined, skilled systems R&D
- Rapidly emerging sustainable aviation fuels industry in USA
- Strongly supported by FAA, other US Government departments including Defense, and Industry Organizations
- Working collaboratively within CAAFI (caafi.org)
- Recent ASTM certification of two new fuels
- Many potential synergies from Australia/US collaboration

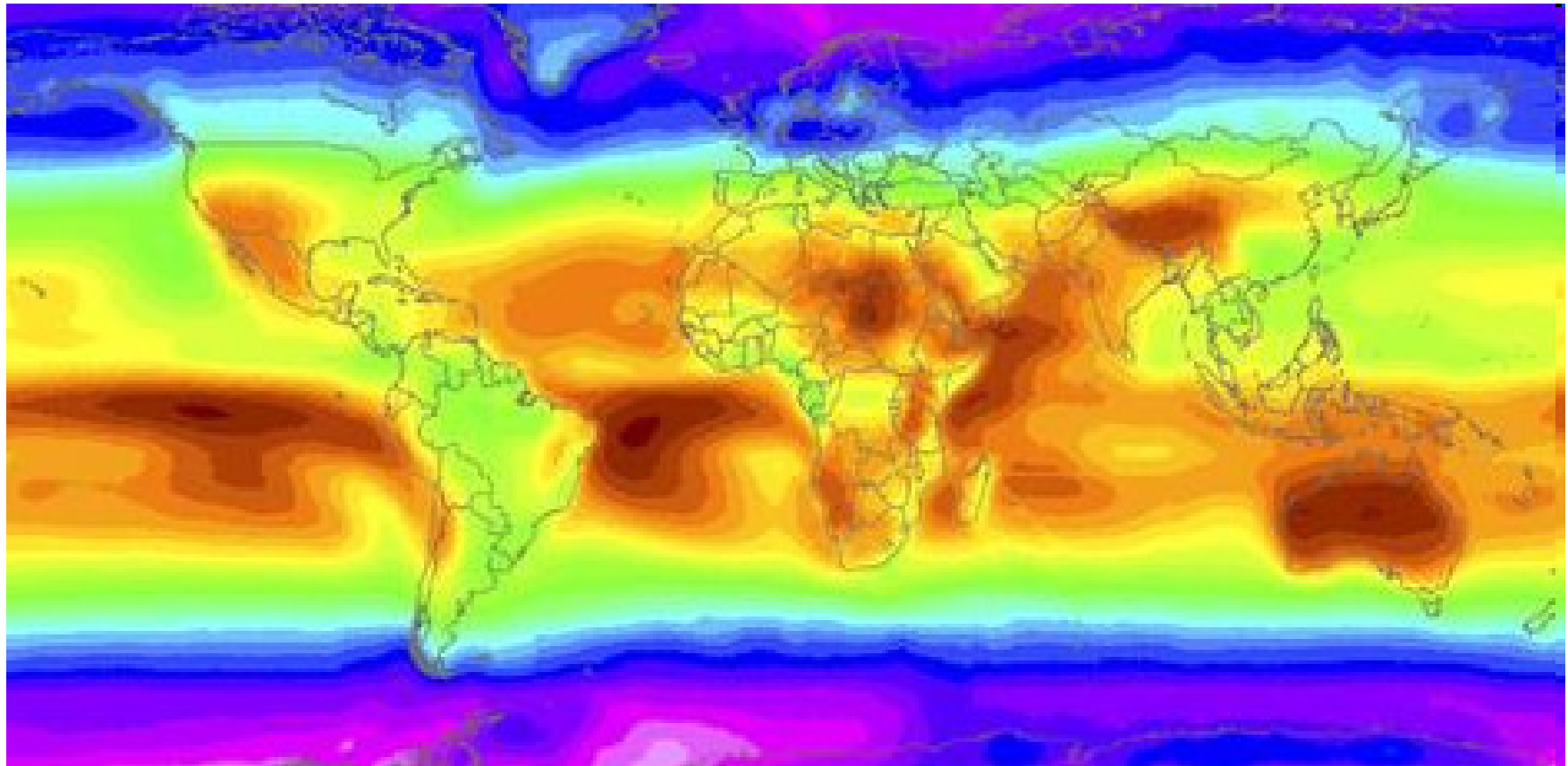
Feedstocks for Sustainable Aviation Fuels




**100% Renewable Jet Fuel from
100% of available plant resources
Significant GHGe savings**



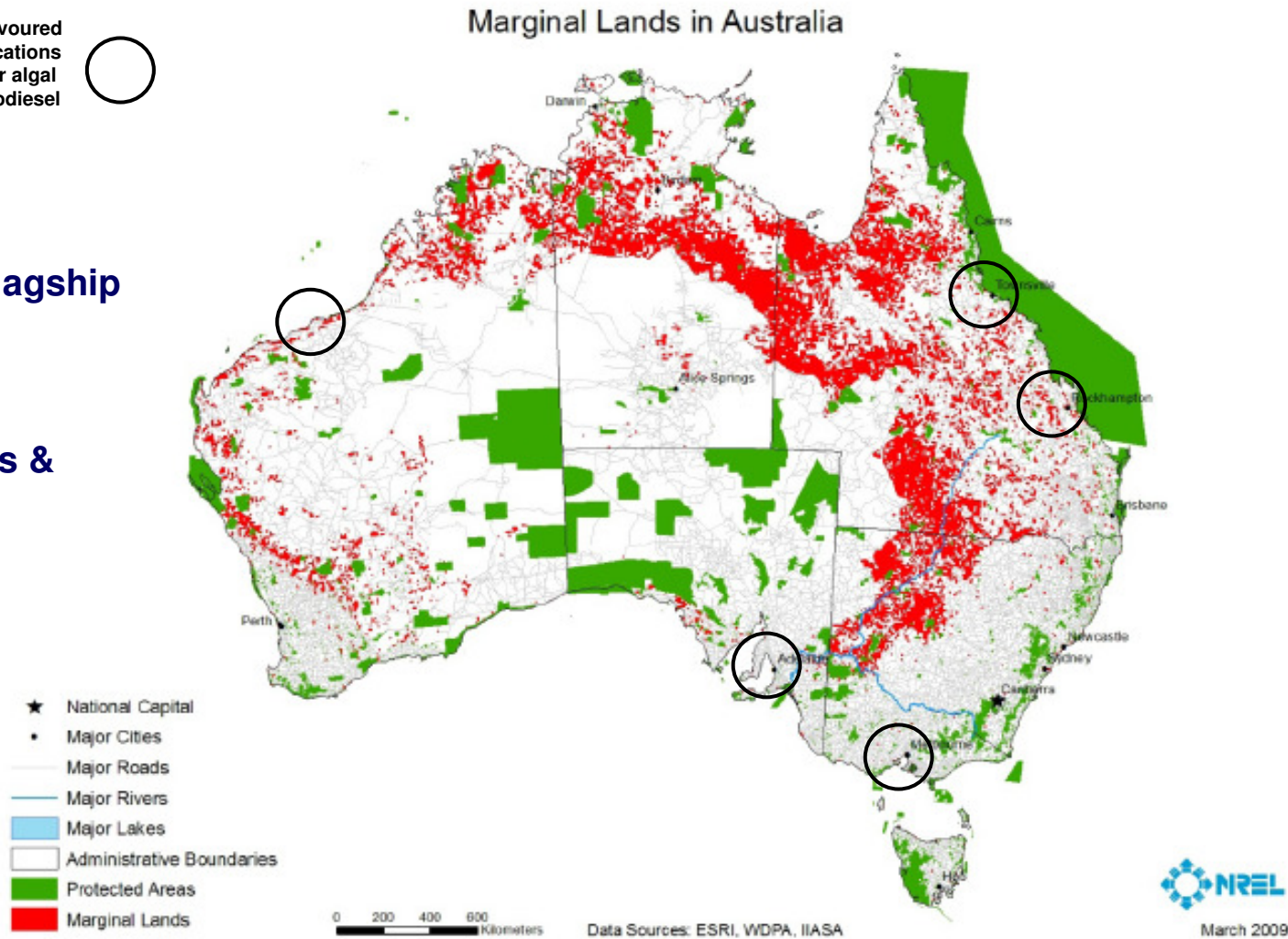
Australia Has Significant Biomass From Current Production and Can Produce More



Favourable sites for Algal Farming

Favoured locations for algal biodiesel 

CSIRO
Energy Transformed Flagship
David Batten
Project Leader
Algal Feasibility Study
Transport Technologies & Sustainable Fuels



Australian Capabilities

- Universities & Research Institutes
- National Research Organisations
- Multicultural workforce/links to Asia
- Agricultural, applied science & engineering sectors
- Private & public companies - early stage to multinational
- Sophisticated investment/banking community
- Strong legislative/IP protection systems
- Service providers - legal, financial, strategic, engineering
- Industry Organizations
- Non-government Organizations
- Media/Trade Journals

CSIRO (csiro. au)

- Commonwealth Scientific & Industrial Research Organization
- Sustainable Biomass Production (SBP) Project – review of opportunities for bioenergy and GHG mitigation in Australia
- SBP project provided the estimates of available biomass to the SAFUG Roadmap
- CSIRO estimates of future transport fuel use in Australia used in Treasury updates
- Energy Transformed Flagship - Reducing Australia's carbon footprint with economic modelling and technology
- CSIRO Australian National Algae Culture Collection; supplies aquaculture industry

Muradel Pty Limited (muradel.com)

- Murdoch University and University of Adelaide
- JV - SQC Pty Ltd, Aban Australia
- Elite microalgal species, tolerant to 3 x salinity of sea water, high lipid content
- Optimisation of large-scale culturing-harvesting-extraction
- Karratha - Site for fully integrated pilot plant
 - 3 x 200m² raceway ponds plus downstream processing
 - Commissioned Nov 2010



MBD Energy Limited (mbdenergy.com)

- Founded in Australia in 2006
- Large capacity R&D facility at James Cook University
- Utilizes outdoor photobioreactor system for algal cultivation; Origin Oil extraction technology
- Currently building demonstration projects at 3 coal-fired power stations to utilize waste CO₂ & water; 1st @ Tarong (Qld), 1 ha



Specific Aviation Fuel Initiatives

- Three day Forum on Alternative Aviation Fuels at *Australian International Airshow and Aerospace & Defence Exposition Avalon, March 2011*, USSC and CAAFI
- Sustainable Aviation Fuels Roadmap Consortium,
 - Flight Path to Sustainable Aviation Report, 25 May 2011
- Qantas relationships with Solena and Solazyme
- Queensland Sustainable Jet Fuel Initiative (University of Queensland, Virgin, Boeing, IOR Energy, Amyris, Mackay Sugar, Qld Govt.)
 - Multi-pathway techno-economic and lifecycle analysis
 - Three feedstocks – algae, sugar cane, pongamia

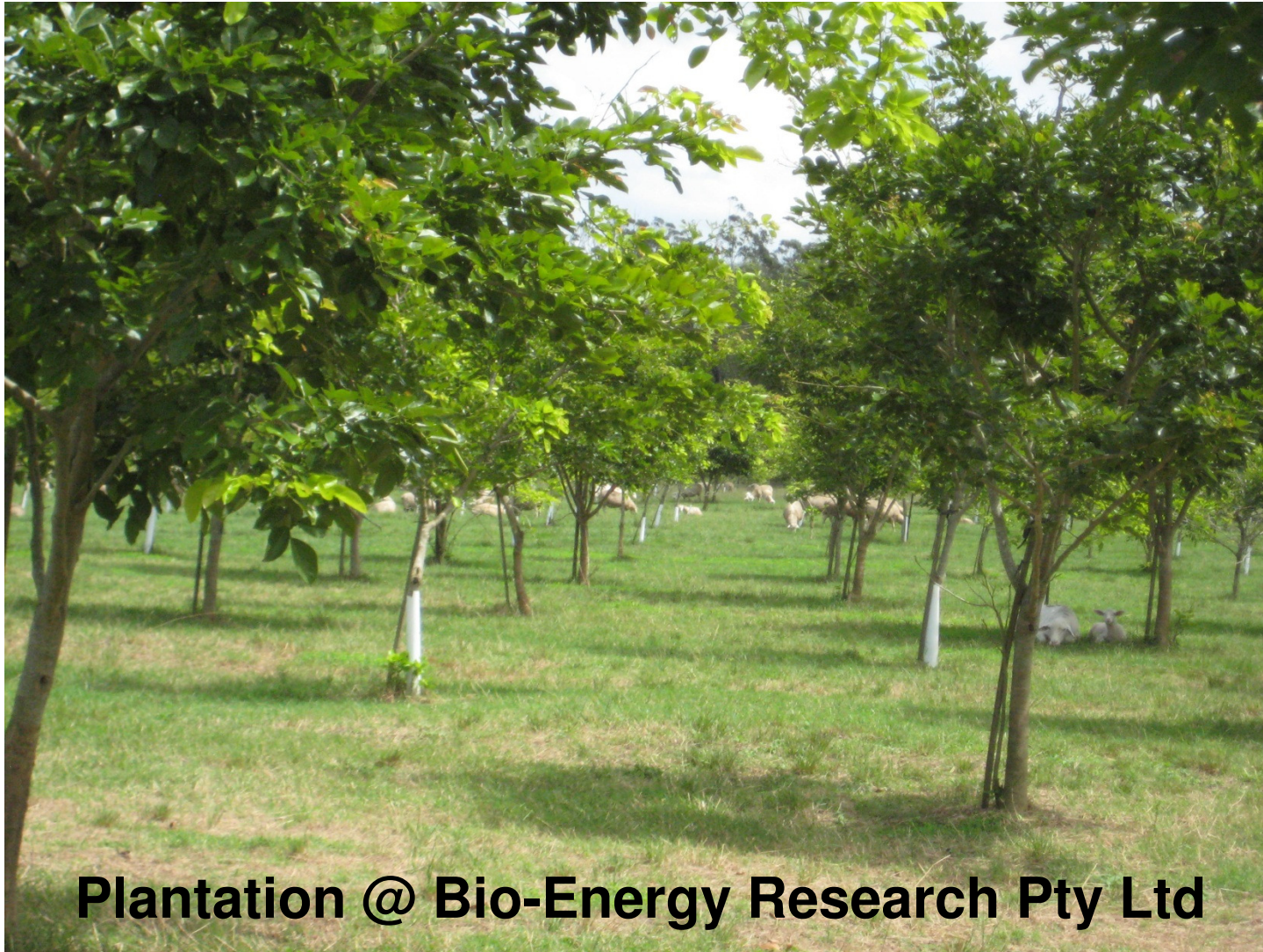
Pongamia Pinnata



- Native to Australia & SE Asia
- Marginal land, without fertilizers
- Legume; 4-7 years to maturity
- Mechanically harvested
- 30-40% oil yield
- Energy from residues
- CO₂ sequestration



Pongamia Pinnata



Australian Government

- Department of Resources, Energy and Tourism Alternative Fuels Strategic Issues Group - input into Energy White Paper
 - role of alternative fuels in meeting public policy objectives
 - barriers to development of sustainable biofuels industry
 - whole of government review
- Australian Centre for Renewable Energy (ACRE)
 - 2nd Generation Biofuels R&D Program
- National Collaborative Research Infrastructure Strategy
 - microalgal and biofuels facilities
- Australian Biofuels Research Institute –
 - establishment Committee formed & due to report Q3 2011
- Austrade in US actively promoting bilateral investment

Draft APEC US-Australia Sustainable Aviation Biofuels Work Plan

- Collaborative program aimed at development of sustainable aviation biofuels industries in Australia, the US and globally
- Will build on existing government/industry programs and decision making frameworks in both countries
- Aims of Work Plan include working collaboratively to
 - address R&D Roadmap recommendations
 - fill gaps and ensure complementary and aligned efforts
 - use respective methodologies to assess feedstock readiness and conversion technologies
 - develop scenario analyses of economic feasibility
 - leverage knowledge about environmental issues
 - advance standards and certification for new fuel options

Conclusions

- Australia has all the attributes for a successful sustainable biofuels industry, including particular geospatial & climatic advantages, strengths in plant genetics, R&D, biotechnology, farm production & process efficiency
- Aviation biofuels are critical need for Australia and USA
- There are multiple short and long term opportunities across the entire value chain for the USA and Australia to collaborate on sustainable aviation biofuels