



The Opportunities and Realities of NZ Becoming Self Sufficient in Liquid Biofuels

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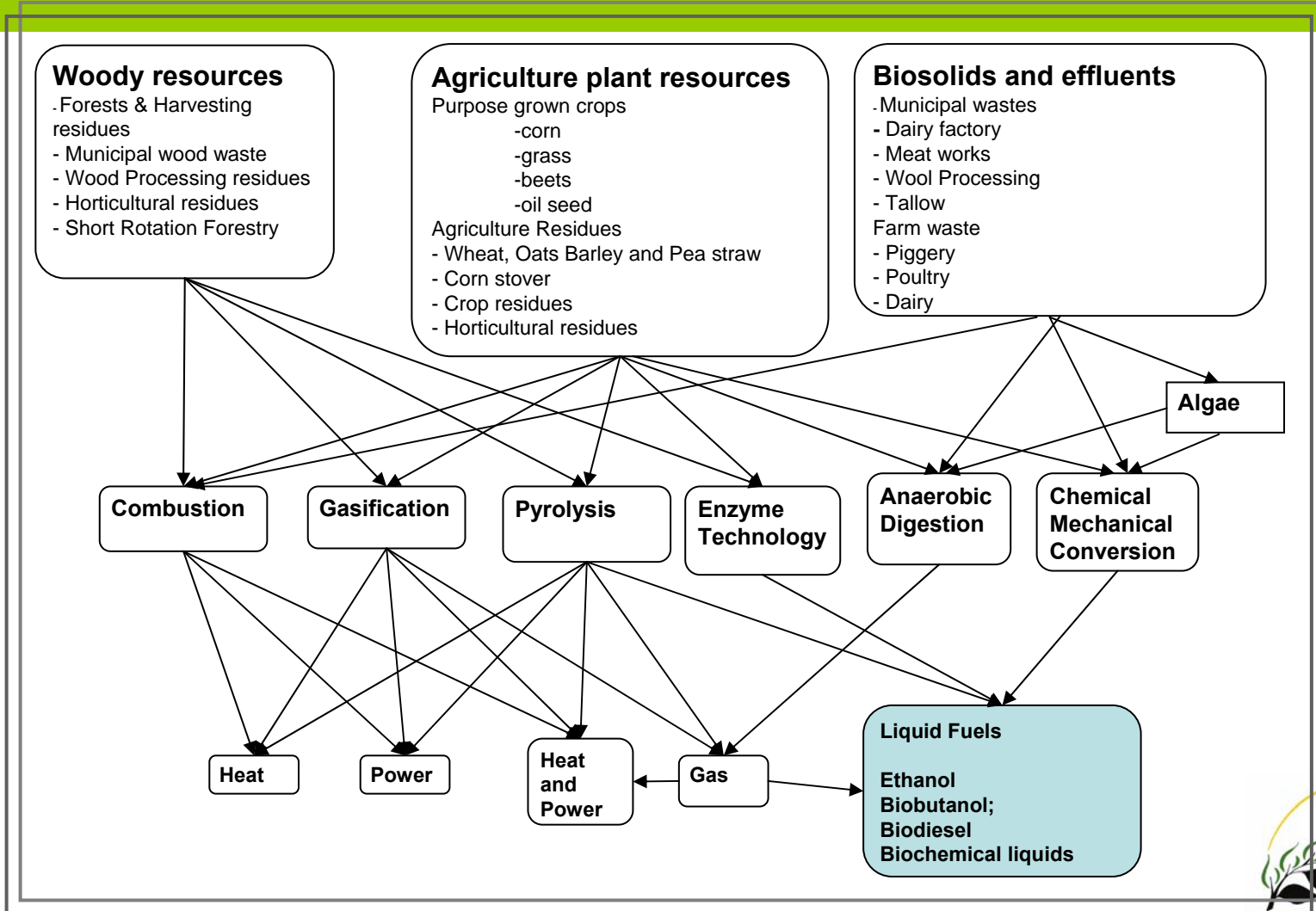
We Don't Have To Wait

- NZ has many options now and in the future
- Growth in liquid biofuels depends on
 - Establishing demand
 - Biofuel users
 - Infrastructure
 - Production plant investors
 - Feedstock supply management
- Government policies
 - Targets / obligations create volume
 - Provide confidence for investors
- Fuel quality standards –reliability of product
- Level playing field with regard to imported biofuel
 - No price subsidies
 - Sustainability of sources

Feedstock Options

- Ethanol
 - Whey
 - Grain, grass and sugar crops
 - Woody biomass
- Biodiesel
 - Used cooking oils
 - Tallow
 - Oil seed crops
 - Algae
 - Woody biomass -> bio-oil
- Whey, cooking oils, tallow are utilised now but limited supply
- Crops economic and extensive availability
- Woody biomass is the biggest opportunity but the technology is not proven

Range of Paths to Follow



Production

- Feedstock suppliers require certainty
 - Crops require lead time for planning, planting and harvesting
 - Woody biomass 10-25 years rotation
 - Algae growing and processing requires infrastructure
- Other technologies will be viable –
 - Coal to liquids plants.
 - Competition for biomass feedstocks used for heat
- We will need a range of technologies
- Feedstock costs are a significant proportion of biofuel cost (50% to 80%)
- Effect of biofuel production on feedstock market
 - Additional cash flow for feedstock producers
- Can reduce waste disposal costs

Fuel Quality

- Transport market requires high quality fuel
 - Safety when used in boats and vehicles
 - Engine protection
- 1st generation technologies are relatively simple
 - DIY can create problems for the market
 - Processing to required quality is not cheap
- Production standards must not be relaxed
 - Poor quality fuel will affect confidence of users
- Vehicle warranties
 - NZ has high proportion of imported older vehicles

Agriculture and Horticulture Processing Residues

- Whey
 - As a by-product limited by dairy processing
- Tallow
 - As a by-product limited by animal processing
 - Price set by export market
- Used cooking oil
 - Contamination from different oils
- Straw
 - Avoids emissions from burning
- Waste paper
 - Contamination
 - Zero additional collection costs
- Food processing residues
 - Seasonal supply
 - Competition from other uses

Quality and consistency of supply of feedstock is critical

Arable Crops

- Currently well established cropping industry
 - Existing equipment for growing and harvesting
 - Experienced in efficient growing techniques
 - Established distribution and storage arrangements
- Liquid biofuel crops value to farmers
 - Provides an additional revenue stream
 - Extends number of crops in a rotation
 - Improves land management
 - Can provide a secure market
- However competition from other land uses



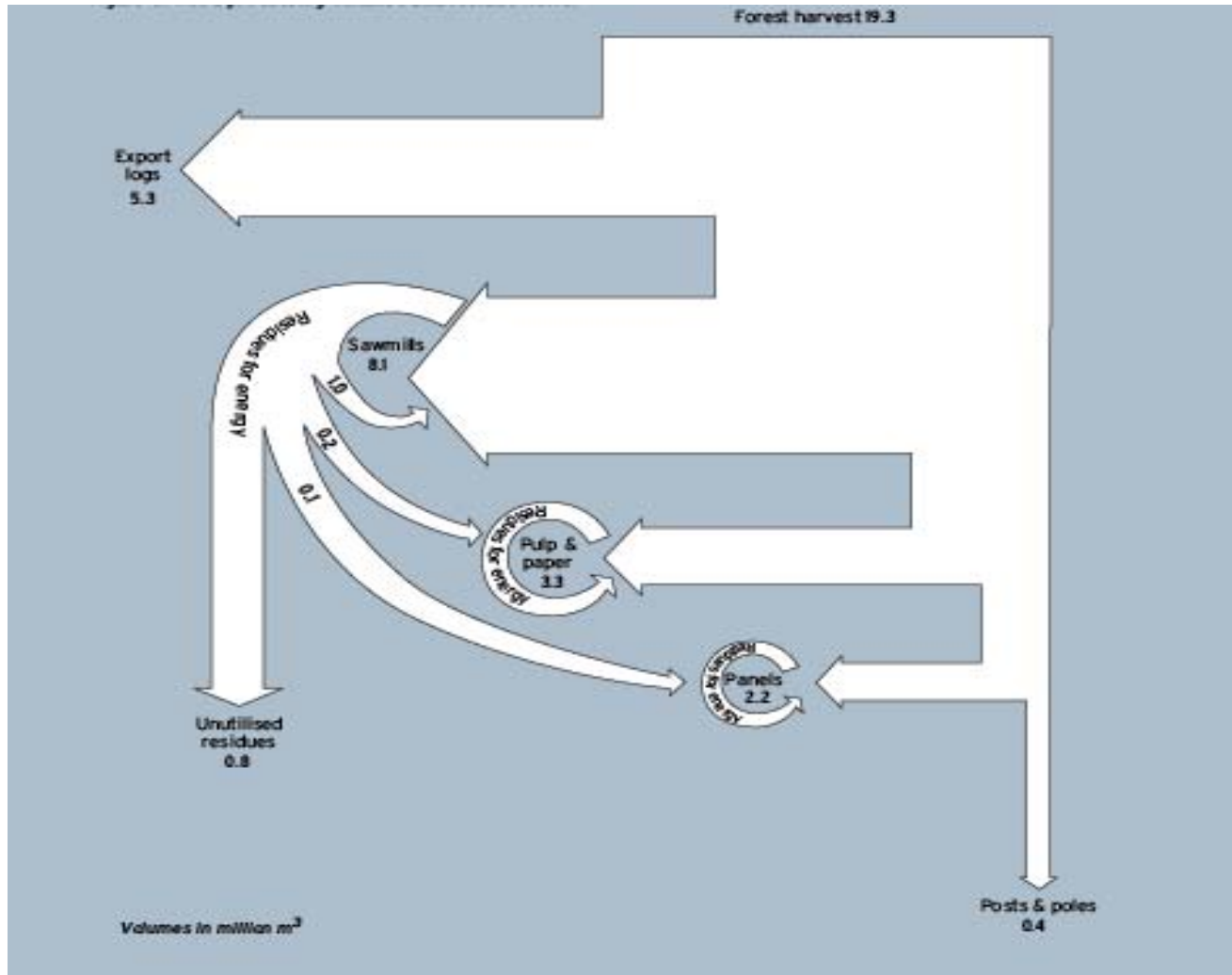
Arable Crops

- Ethanol
 - NZ has well established industry based on whey
 - Sugar crops have been grown in southland
 - Well established 1st generation technologies
 - Significant international research
 - 2nd generation technologies => grasses, straw, stover
- Biodiesel
 - NZ has small but established industry
 - Used cooking oil
 - Tallow
 - Is already underway
 - Biodiesel NZ – rape seed oil
 - Large scale processing plant underway
 - Already >5,000ha of oilseed rape is in the ground in NZ

Woody Biomass Availability

- Woody biomass
 - 8.7Mill ha of medium to low quality grazing land
 - Total heat and transport fuels could come from around 3.2 million ha of energy production forests.
 - 37% of available medium and low quality grazing land
 - Low grazing quality land is elevated and steep – suitable for trees.
- An energy forest sector would take a number of years to establish
 - Trees take a number of years to grow
 - Difficulty of attracting investors in energy forests when no proven demand
 - Tree crops not viable when unused residues available
 - Woody biomass -> bio-oil
- Woody biomass is the biggest opportunity but also most difficult

Woody Residues Availability



Rich Foresters Throwing \$\$ Away



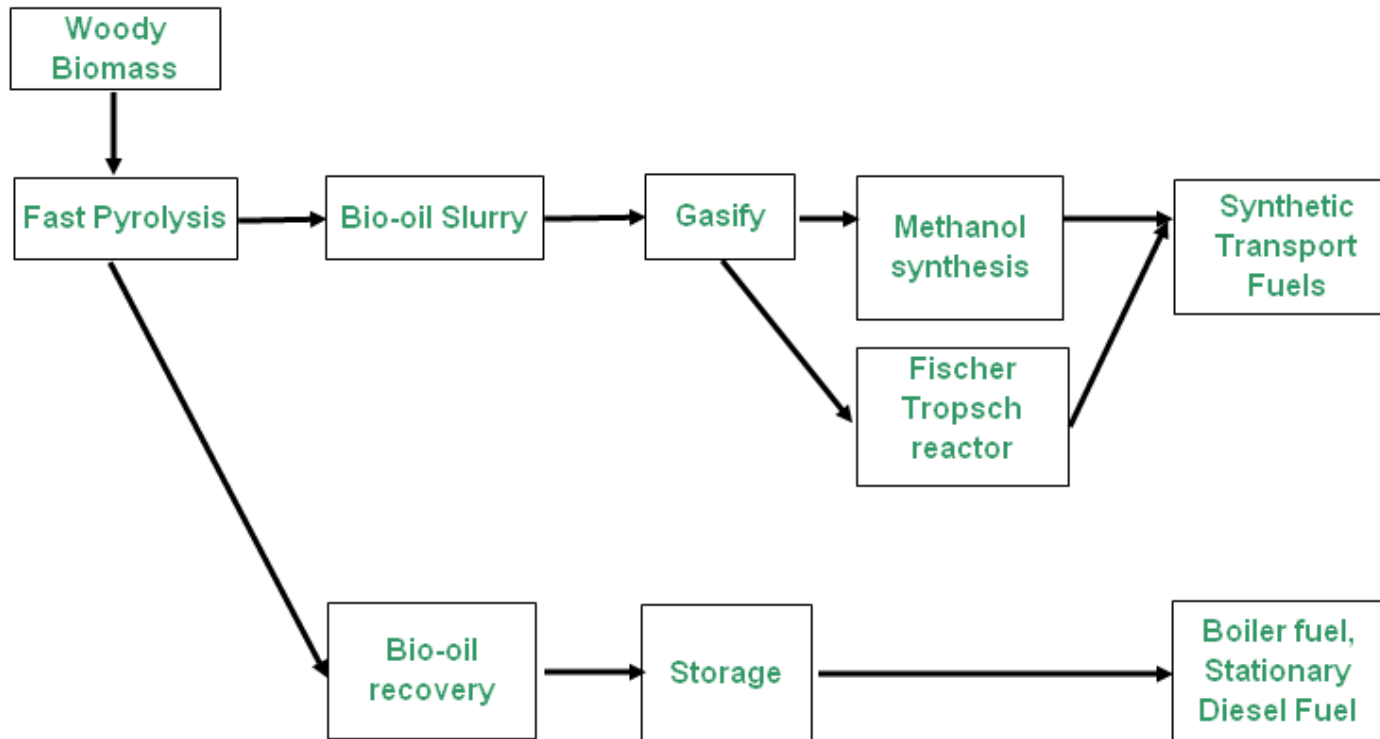
Residues Turned into a Valuable Commodity



We Have On-site Residue Processing Technology

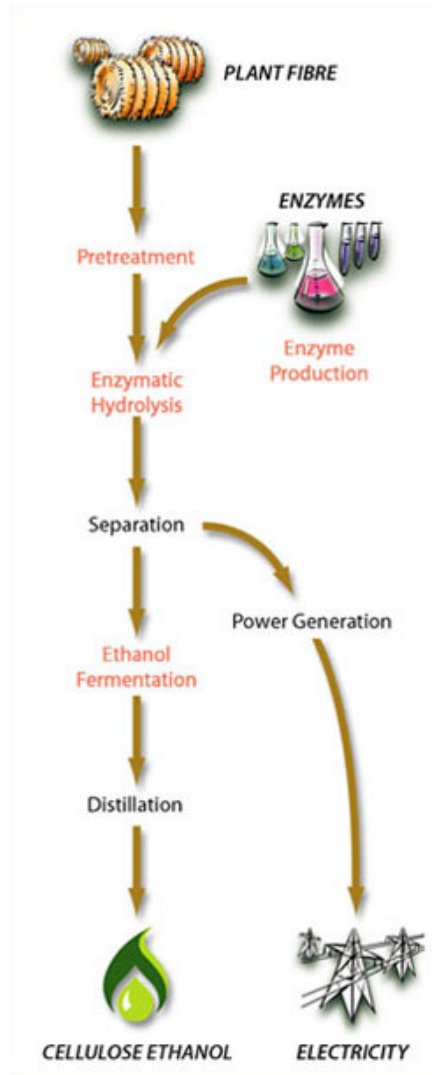


Bio-oil Technology



- Small mobile pyrolysis equipment
- Can concentrate energy at source and then transport

Iogen Cellulose to Ethanol Technology



- Opportunity for large number of woody biomass feedstocks
- Still at developmental stage
- Will open significant opportunities

Algae

- Laboratory scale is proven
- Issues of scale for move to commercial operation
- Need to focus on technologies that use less land
- Issues of harvesting
- Energy intensive conversion to liquid biofuels

National Benefits

Revenues from

*Agriculture and horticulture
processing residues*

New arable crops

Algae

Forest residues

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Immediate climate change benefits

Biofuels Sales Obligation can be achieved

*Can transition to a sustainable liquid fuel
future*

Risks

- Misinformation about food vs energy issues
 - Protection of existing fossil fuel interests
 - Global debate is influenced by subsidies
 - Increase in protein consumption driving demand for grain
 - Protection of existing vehicle manufacturers
 - New Zealand can be isolated from the debate
- Overseas subsidies can undercut local production
- Government will back off Liquid Biofuels Obligation
- Poor quality fuel will affect market confidence in the product.

Strategy—Vision

Strategy

- Build NZ industry on existing feedstocks
 - Whey, tallow, oil seed crops
- Expand to use biomass residues that are currently being wasted
- Transition to 2nd generation technologies when commercialised
 - Woody biomass
 - Algae

Government Actions

- Access to oil majors distribution network
- Stimulation of demand for liquid biofuels through the Biofuel Sales Obligation to provide market confidence
- Set quality standards
- Ensure local market not undercut by:
 - Imports sourced from unsustainable of feedstock sources
 - Imports of subsidised product